

DWP SANITARY ENGINEERING

An Interview With:

William Ree
Lester Louden
George Thomas
Milton Zim
Albert Forthal

Interviewed by Dick Nelson

One of a series of oral histories covering the growth and development of the Los Angeles Department of Water and Power as seen by the participants - its employees.

Produced by

Special Projects Section
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Los Angeles Department of Water and Power

1992

CONTENTS

Biographical Notes iii

TAPE NUMBER: 1, Side One (September 12, 1991) 1

 Division Jealousy... Laboratory Assistant...

 Sample Collecting... Don Graham... Taste and Odor...

 Madelene Lake... Ray Derby... Water Biologist...

 Raymond Goudy... Water Storage... Corrosion

 Engineering... R.C. Alexander... WWII... Early

 Filtration Chlorination... Water Borne Diseases...

TAPE NUMBER: 1, Side Two (September 12, 1991). 24

 Crustaceans... Anhauser Busch... Working in the

 Owens Valley... Mammoth Village Sewage Treatment

 Ponds... Whitney Portal... U.S. Forest Service...

 Staffing... Crowley Reservoir... Water Testing...

 Water Seepage From Hollywood Reservoir...

 Fluorides... Baldwin Hills Reservoir Failure...

 Sylmar Earthquake... San Fernando Power Plant...

 Granada Tank... George Adrian... More Earthquake...

 "Rather Thick, But It's Safe To Drive." Water

 Reclamation... Happy Hayes... W.R. Ree... Changes in

 the Division and the Department Over the Years...

TAPE NUMBER: 2, Side One (September 12, 1991). 44
Harry Hayes... W. R. Ree... Changes in the Division
and the Department Over the Years...

Biographical Notes

William Ree

Born in Oxnard, California on November 18, 1920.

Parents: Williams Russell and Ethel (Campbell) Ree.

Married: Edna Elizabeth Singleton, May 25, 1945 in Santa Paula, California.

Children: Donald Steven Ree
Marilyn Susan (Ree) Giacinto

Grandchildren: William Rocco Giacinto
Misty Vivarito

Military: U.S. Navy, July 1, 1943 - March 6, 1946. Destroyer Escorts in the Atlantic Ocean.

Education: University of Southern California - Chemical Engineering.

DWP History: Hired, February 10, 1947 as a Civil Engineer Assistant; Retired, April 1, 1980 as Senior Sanitary Engineer (Acting Division Head).

Affiliations: American Water Works Association.

Biographical Notes

Lester Louden

Born in Los Angeles, California on August 9, 1913.

Parents: Samuel G. C. Louden and Celia (McCarty) Louden.

Married: Nena (DePalma) Louden.

Children: Lester Jr.
Bruce David

DWP History: Hired, November, 1940; Retired, August 1, 1978.

Biographical Notes

George Thomas

Born in Seneca, Missouri.

Parents: George G. Thomas and Helen C. (Laughlin) Thomas.

Married: Unmarried

Children:

DWP History: Hired, August, 1948; Retired, September 1, 1979.

Biographical Notes

Milton Zim

Born in San Diego, California on March 16, 1912.

Parents: Marco Zim, professional artist, and Orlo Zim, health food specialist.

Married: December 28, 1941 to Natalie Adalyn Bell in Santa Monica, California.

Children: Leandra Adalyn Zim, born November 21, 1943 (Holland).

DWP History: Hired, 1940 as a Lab Assistant - July, 1940 to 1946;
Temporary Civil Engineering Assistant - March, 1946 to September, 1946.
War Service - May, 1942, Private Army Engineers, November, 1942; 1st Medical Administrative Corps - Discharged February 1946; Captain MAC.
Chemist (passed exam while overseas) September, 1946. Assigned to Chemical and Biological Research about last seven years.
Retired - March 31, 1973.

Degrees: B.S. and M.A. Columbia University, 1934-1939. Majors in Physical and Biological Science.

Biographical Notes

Albert Forthal

Born in New York City, New York in 1921.

Parents: Benjamin Forthal and Ida (Bierman) Forthal.

Married: November 18, 1942.

Children: Barbara Capruth, Susan Forthel and Donald Forthel,
M.D.

DWP History: Hired, December, 1948; Retired, June, 1978

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William Ree date

witness date

witness address

Lester L. Louden 12/9/91
Lester Louden date

Nora Louden 12/9/91
witness date

witness address

George Thomas date

witness date

witness address

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Milton Zim Dec. 6, 1991
Milton Zim date

Boulder Ho-Dawson 12-4-91
witness date

221 RIVERFRONT DR, PARKER, AZ
witness address

Albert Forthal date

witness date

witness address

TAPE NUMBER: 1, SIDE ONE

**WILLIAM REE
LESTER LOUDEN
GEORGE THOMAS
MILTON ZIM
ALBERT FORTHAL**

GIVEN THURSDAY, SEPTEMBER 12, 1991

IN THE REE HOME

AT CAMP NELSON, CALIFORNIA

THE INTERVIEWER IS DICK NELSON

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William Ree date

witness date

witness address

Lester Louden date

witness date

witness address

George H Thomas 21 Dec 91
George Thomas date

James W Butler 21 DEC 91
witness date

633 Webber
Santa Fe, NM 87501
witness address

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William Ree Dec 11, 1941
William Ree date

Edna S. Ree 12-12-41
witness date

371 Aspinway, Ventura Ca. 93003
witness address

Lester Louden date

witness date

witness address

George Thomas date

witness date

witness address

This is to certify that I have reviewed this transcript and attest that it is true and accurate. Also, by my witnessed signature below, I grant the Los Angeles Department of Water and Power, or its designee(s), sole right to use this material in any way, and for any purpose, it deems appropriate.

Milton Zim date

witness date

witness address

Albert Forthal 7/25/92
Albert Forthal date

Margaret J. Malone 2/25/92
witness date

P.O. Box 949 Murrieta, Ca 92564
witness address

TAPE NUMBER: 1, SIDE ONE

**WILLIAM REE
LESTER LOUDEN
GEORGE THOMAS
MILTON ZIM
ALBERT FORTHAL**

GIVEN THURSDAY, SEPTEMBER 12, 1991

IN THE REE HOME

AT CAMP NELSON, CALIFORNIA

THE INTERVIEWER IS DICK NELSON

NELSON: Okay it looks like Les and Milton are the old timers among us here, coming into the Department in 1940. What were your impressions of the Sanitary Engineering Division in 1940? Do you recall how large a staff and who the division head was at that time?

LOUDEN: I can certainly remember the division head, R. F. Goudey. My impression of the division at that time was that it was a closed corporation within the Department of Water and Power because all the division heads hated one another. Wouldn't speak to one another unless they had to. My orders as I entered the division was, "Don't be seen talking to anybody else, or you're going to be in trouble."

NELSON: Don't be seen talking to anyone else outside the division?

LOUDEN: That's right.

NELSON: If you were in Sanitary Engineering, those were the people you associated with?

LOUDEN: That's right.

NELSON: Why do you think that was?

LOUDEN: Just for the jealousy between the division heads.

NELSON: The problems were on the top, not among the employees?

LOUDEN: That's right.

NELSON: And that policy was system-wide?

LOUDEN: It seemed to be from my direct recollection at that time, it was pretty system-wide.

NELSON: Of course you couldn't talk to anyone.

LOUDEN: Couldn't find out anything. All we got was the usual scuttle-butt from the bottom up.

NELSON: What did you start as in 1940? What was your first job?

LOUDEN: Laboratory Assistant.

NELSON: What does a laboratory assistant do, besides not speak much.

LOUDEN: At that time the laboratory assistant did everything that was the dirty work because it was the entering position and from there you went on up if you were lucky.

NELSON: What was some of the dirty work? Maybe Zim can help on that too.

ZIM: When I started, I was a sample collector, laboratory assistant, but sample collecting out in the field. I didn't get too much of an overview of what was happening in the Department itself so I can't help you too much on that.

NELSON: You could speak to people. Who was your supervisor, Milt, at that time, do you remember?

ZIM: I'm not even sure at this point. Don Graham may have come in after I did. I don't know. No, I think he was there.

LOUDEN: He was there.

ZIM: Don Graham was a good guy.

LOUDEN: You bet he was.

NELSON: Who was your supervisor, Les?

LOUDEN: Don Graham. He was a great man, too.

NELSON: He had spent his career in Sanitary?

LOUDEN: No, he came from USC, which was a phi gi gamma, but he came from the Bureau of Alcohol from the Federal Government.

NELSON: Oh that Treasury Agency of Firearms and Alcohol?

LOUDEN: Yes. He was a graduate chemist from USC and he took hold and learned more about sanitary engineering than a lot of people had ever learned.

NELSON: I bet during those years, if you had a degree in Sanitary Engineering, it was from Berkeley? Was that the main school?

LOUDEN: That was the main school, yes. Very few of them came from Cal Tech. Berkeley was about the only one, unless he came from one of the eastern universities.

NELSON: Zim what did you, as a sample collector, what did that entail?

ZIM: That entailed traveling to a large number of sample points daily; during the weekend I had a much smaller group of sample points to collect from. Collecting the samples carefully, bringing it into the laboratory, getting it written up and that was the main portion of the daily operation.

NELSON: Where were these samples collected from?

ZIM: All the main lines, all the reservoirs, outlets before and after chlorination, and that sort of thing.

NELSON: George, you say you came to the Department in 1948 on what you thought was a temporary position?

THOMAS: No, I didn't say a temporary position. I thought I'd only be there temporarily. I took it as more or less an interim job and retired 31 years later.

NELSON: How did you get the job?

THOMAS: Well, I had a degree in Zoology so there was a lot to do in my field in the division and I just went down and applied for the job and at that time they were looking for people. It was 1948 and there were a lot of us that came into the division just about that time because there were a lot of people that were qualified and they were able to hire them. And as I say, I was looking for a job and I went down to the city hall and saw this announcement and went and took the examination and was hired.

NELSON: What was your position, initially?

THOMAS: It was a lab assistant and I worked in the laboratory because I had enough background in chemistry. I did not work in the bacteriological laboratory, but I worked in the rest of the lab.

NELSON: What was the nature of that work to a layman?

THOMAS: Well, it was sort of the thing you might see in the movies. People in lab coats and holding up graduated cylinders

and pouring things and all this. It was just a normal chemical, physical laboratory.

NELSON: Basically you took the samples that Zim brought in and analyzed them for...?

THOMAS: Well we were given things to do with the samples that he had brought in.

NELSON: In 1948, what was the chief concern of the division as far as L.A.'s water supply was concerned?

THOMAS: Taste and odor. Bacterial safety. At least that's what I remember. Of course, the bacterial safety, I guess, was certainly most important thing to us. The one thing we weren't too concerned about trace elements and such in the water. We did run a lot of tests, but at the time it seemed that we didn't need them.

In later years, we had lots and lots of information that was very, very helpful and kept us out of trouble with the EPA and all these people a long time later. It's a place that you could feel good about working for because you felt that you really were working to furnish good, potable water to the consumers.

NELSON: The bulk if the water supply at that time being served to Los Angeles customers was from the Owens Valley?

THOMAS: Oh yes.

NELSON: And that was a very good water supply quality-wise?

THOMAS: Yes, it was. I don't know what you'd say about the water supply then because we were, I think, extraordinarily careful about our water and as I said before, we did a lot of analyses and investigations that really didn't have to be done. The records, of course, are still available and still valid.

NELSON: Who was your boss at that time?

THOMAS: In the lab? Lester Louden.

NELSON: He would speak to you?

THOMAS: Yes, he would speak to me.

NELSON: And Al, you came in on that same year. How did you get to the Department of Water and Power?

FORTHAL: I was offered a temporary job. I had been working for the Department of Animal Regulation for the City of Los Angeles in rabies control and the pay wasn't that good. I went to work in the bacteriological lab and my superior was Madelene Lake. I worked there for almost six months when it all of a sudden dawned on me that my tenure was as a temporary employee and I didn't know

if I was going to be terminated at the end of six months because that was all that the civil service would allow a temporary employee to work.

So I went to Ray Derby, who was the head of the division at that time and asked, "Mr. Derby, according to the books, I'm fired tomorrow." I had been there almost six months to a day. He said, "Well if you don't tell anybody, I won't tell anybody and if you work here over one day, you're permanent." So that happened. Soon after that, they transferred me, still as a lab assistant to Water Quality. I was on the telephone for a while handling complaints and slowly worked out into the field on complaints of taste and odor and dirty water problems. I worked there about three years as a lab assistant.

REE: It was about that. I don't remember exactly when the water biologist was established. I thought it was around 1950 or so.

FORTHAL: It might have been three years as lab assistant and then I took the exam for water biologist and was assigned as a water biologist.

NELSON: You say that position of water biologist was just created, that had been done, obviously, before but under some other title or it was a number of people who shared those duties?

FORTHAL: Actually it was part of a reorganization that Don Graham had created. He had created a more specific investigation of water quality in the distribution system.

LOUDEN: Then Al and George were two of his people that were taken from the lab assistant classification and were reclassified into water biologists. There were actually four that were so reclassified, I believe.

FORTHAL: This was under consideration when I went to work there because Don Graham interviewed me and he told me then, before I went to work for him, they would be considering creating these positions as water biologists. So I know that it was certainly underway by 1948 because that was when I was hired.

NELSON: What was the difference in duties between the water biologist and the people in the lab working? Did you handle specific cases or how were those duties different?

FORTHAL: It was still mainly monitoring on the job. Some of the water treatment operators would go to Owens Valley regularly, but they would bring back samples because they happened to be there even though that was not their duties. It was a matter of taking many things we had done before and putting them under one person or one section. I think we did a lot more monitoring after that.

NELSON: Were Derby and Graham farsighted individuals in your opinion?

FORTHAL: Yes, absolutely.

ZIM: Graham was not only farsighted but he was innovative as well.

FORTHAL: Yes, he was. Surface water that was stored for a long while created problems. Algae, of course, exposure to the sun, temperature and winds and they exacerbated the water quality problems after the water got into the distribution system, the organic material that got by George's area and got blown into the distribution system, would then decompose and create worse problems.

George was a water biologist and I was as well, but we had specific jobs. George was responsible for surface water, storage, open reservoirs where plant life was a big problem and he had to monitor that it was under his advise that the treatment would occur that would eliminate or control these problems.

My specific job was that I still had water quality and distribution problems to contend with, but I also ran chlorine demand tests at the reservoir sites which were considered more accurate than had we transferred samples to the lab and done them in the lab. I had a laboratory built in the back of the city car which I had at home and on call and these chlorine demand results

were the criteria we used to set chlorine doses if the water leaving San Fernando Valley into the distribution system.

The surface water quite often has a high and varying chlorine demand, which means that the amount of chlorine we put in is not the amount we get out because the water will absorb it or conditions of the water would cause it to be used up or dissipated before it even gets into the system and we also like to keep the small chlorine residual in the system to safeguard the safety of the water in the water distribution system. This was my job to set that dose and then to work with the chlorine operators in maintaining changes in those settings.

NELSON: Had chlorine or any other chemicals been added to the water supply from what date? Were they added originally when the aqueduct was completed? That may have been a little before everyone's time.

FORTHAL: I don't know when they started treating copper sulfate up in the valley.

ZIM: I think one of the things that precipitated this change in the type of operation in the division was the change in division heads. Raymond Goudey left and was replaced by Derby and their management style was entirely different. Goudey was a very dogmatic, positive person and when he said something, why you'd better believe it and do what he said. His philosophy as far as sampling was was to bring all the samples into the lab and

centralize the work in the lab. Under Derby and Graham, they realized that there was a lot of samples that didn't have to come into the lab. It could be analyzed in the field and get quicker and more indicative results. Quicker interpretation and such as that.

So when they actually put these water biologists in the field doing the sampling and the testing right in the field. Then it was a matter of coordinating information and deciding what to do and all that. This was the philosophy that Derby and Graham operated under and it was a diversification and division of lab work and reduction of work that had to be done in the lab. The lab still did the major part of the complete analysis, like the mineral analysis and the sanitary analysis, but a lot of the microscopical examinations and many of the chemical tests were done right in the field by these water biologists in their cars.

NELSON: You guys mentioned that Derby and Graham were really right up on, what's the word today, "the cutting edge" of water treatment and were very innovative. Did that then cause the sanitary division to be probably one of the most modern operations in the area or the country or the state or how did we rank at that time? Did they have the money to do all these things that they wanted to do?

ZIM: I would think that because of the essentially the unique character of our system where when they used to say we had to keep a year's water on hand. So we had storage problems that

essentially no one else had. Los Angeles being the desert, why we didn't have enough water down here at all, so it required a change from what would be standard methods of treatment because of the unique problems that we had.

NELSON: How did the lab in the operation compare to other operations? Being unique, how were we rated? Did we always have a very good rating and a very good reputation within the industry?

REE: We were way ahead of most other water labs in the methods that we used and the operations that we did. That was because of Derby and Graham.

NELSON: Fighting for budget money to buy the equipment and the tools that were needed to implement their innovation?

REE: Both Derby and Graham were very active in American Water Works and American Chemical Society and they were writing articles for the journals. They were participating in new developments and techniques and this provided a chance for them to interface with other people from other areas. They also encouraged people within the lab within the division to participate in these other off-site functions and this brought the lab in contact with other people and the development of new methods. So they encouraged the participation of people in our division and they were supported by the Department too. That was in contrast with Goudey.

NELSON: How did the Sanitary Engineering Division fit within the confines of the Water System at that time? In management philosophy, was water treatment a number one priority or were there other priorities?

THOMAS: We had pretty good support didn't we?

LOUDEN: We were always considered an unnecessary evil by all the other divisions. We interfered with their operations.

REE: I think they didn't understand what our mission in life was and a lot of the work that we asked them to do or in the way of treating reservoirs and such as that was an imposition on them. They in a way kind of resented it. Thought it was extra work that we were putting them through and they didn't realize that we had certain criteria that we had to meet from water quality standpoint.

NELSON: But at the system head level you feel that was understood?

REE: Not too well even at the system head level. Gradually it changed.

NELSON: Les, you and Zim came in in 1940 and apparently by 1948, you were a supervisor. Let me go back and ask you, how did you

get to the Department of Water and Power, besides thumbing or the street car or whatever?

LOUDEN: Well, I knew several people who worked in the laboratory. I had gone to school with them and of course when I got out of school, I got married and had to go to work. They told me to take the examination for laboratory assistant. So they coached me and I took the exam and passed it by enough to make it in. I was lucky. I didn't have to go out and be a sample collector. It was just pure luck. Missed going to be a sample collector, I went right directly into the laboratory.

NELSON: Generally speaking, an assistant would become a sample collector first?

LOUDEN: Well, they could be most anything because one of the first things they told me when I stepped into the division was, if you know how to type, don't admit it. Two of the typists in the office staff were laboratory assistants which worked out very nice in later years because I could grab them out of the office and make them go to work in the lab when I needed help.

They just did everything. The laboratory assistant was paid about \$20 a month less than a clerk typist so rather than hire a clerk typist, they put a lab assistant in to save money because they knew how to type.

NELSON: How long were you a lab assistant?

LOUDEN: I don't remember when I changed over. The war broke out the following year and all these guys went to war. Milton went to war and some of the other people in the lab are chemist that we had at the time went to war. They had to have somebody supervising the place and they gave the examination for a chemist and I took that and passed it, so I became a chief chemist.

NELSON: Within just a couple of years?

LOUDEN: Well, this is the first of the war years and all the men are going into the service. By that time I was married and had two kids, so they weren't about to take me. Besides they were getting desperate. The Department asked for waivers when they tried to draft me. So just by pure luck I became a chemist.

NELSON: Zim, went to war then. You were drafted or enlisted?

ZIM: No I enlisted on account of at least I'd be able to pick one branch of the service I was going in to.

NELSON: Famous last words.

ZIM: I went into the engineers because they had water supply and treatment as one of their jobs and I was a little disheartened that all the good jobs that were available in the engineering battalion was taken over by a bunch of New Jersey kids that had practically no experience at all with water supply and all of us

including some who had 20 years service in water supply were the privates. I put in for officer candidate school. If I had another year at the Department, I would have had a first lieutenancy in the sanitary division and I was just short of work experience time. I had the school requirements, but I didn't have enough experience in time working for the Department.

I ended up in the medical administrative corp as medical supply officer in hospitals, prisoner-of-war camps, and working at the Assistant General's office. While I was overseas in France, the department inquired whether I wanted to take the chemist's test and I said I did, and they sent the chemist's test out to the commander of our group and I took it, but no opportunity to study at any time. I passed! So when I came back after the war, Mr. Goudey put me on a project for finding out what the problem was at the Harbor Steam plant that caused them to lose their condenser tubes in a very short time.

So part of my time with the Department, I was requisitioned by the Power System to do special studies and doing whatever I was doing either in the lab or in the field as far as biological and chemical analyses. I had a wider range than most of the people in the Department that were working in the lab.

NELSON: That job at Harbor Steam Plant sounds like corrosion engineering.

ZIM: Yes, that's what it was. Actually it was sulphide which ended up with us working to get the harbor cleaned up, which we did.

NELSON: How long did that project take?

ZIM: Roughly six or seven years.

NELSON: Who did you report to during that time?

ZIM: I reported to many of the supervisors of the steam plants.

NELSON: Was that R.C. "Russ" Alexander?

ZIM: Yes.

NELSON: Les, you're the only one of the five who is here in the home front, I guess at DWP during World War II. What special precautions were taken that applied to sanitary or the Department as a whole do you remember to defend our facilities from the enemy?

LOUDEN: One of the things we worried about more than anything else was mustard gas getting into the water supply. The chemists that we had working there at the time I went to work had developed a method for detecting mustard gas. We set up a procedure of collecting samples and would analyze them for mustard gas and that was done on a routine basis. We also were very careful to monitor our tests called "oxygen consumed" and b.o.d's and so forth to make sure we didn't get any organic matter of any kind induced into the system.

NELSON: What is a b.o.d.? I know c.o.d.

LOUDEN: Biochemical oxygen demand.

NELSON: Okay. What was the concern with mustard gas?

LOUDEN: That was one gas that could get into the water supply if you got into it, it would be kind of irritating to people who used the water. So that was why we monitored it.

NELSON: It's not a dilution problem with mustard gas? How would it be introduced to the water supply?

LOUDEN: Just by accident. Exploding the shells to harm our personnel in the field, Army, Navy personnel. From there it could get into the water supply.

NELSON: What about security during that period of time? Did we have security in our buildings, at our facilities that you remember?

LOUDEN: I don't recall that to be any different, although I imagine it was.

NELSON: With a lot of the men leaving, did you have a lot of women take their places?

LOUDEN: Well, naturally we had a lot more women than we had men. Very good ones too.

NELSON: Did you have women in that division before or when you came into the division? Were there women in the laboratory?

LOUDEN: Oh yes, sure. Maybe it was because they could hire them cheaper than they could get men at that time.

NELSON: Were there different pay schedules for females versus males?

LOUDEN: Well they did a lot of manipulating with the titles of the jobs.

NELSON: George, you mentioned that Department philosophy and management policy was to have a year's supply of water because of the arid situation. Was the San Andreas fault part of the scenario too?

THOMAS: Certainly it had to cross the San Andreas fault, but I don't think it really had much to do under the operations of the department and division. I think they just figured there's not much we can do to anticipate it as far as we were concerned. Maybe the distribution system had to do something, but we really basically didn't.

NELSON: Al, was there ever thought of that some day, back in the 40's about the possibility that some day more expensive treatment was going to have to be given to our supply, i.e. filtration? What were the schemes of filtration at that time?

FORTHEL: I wasn't familiar with any schemes of filtration. The quality of the water although safe and kept safe by the chlorination that we were doing, was not what you might call aesthetically perfect. We did have our problems because of storage. I guess it must have been the time before I got there that they did not chlorinate the water and we did have some inherent problems of macro organisms in the distribution system. Planaria and leeches, way down in the Woodland Hills area. Although not significant as disease producing organisms, they're not very nice to see in a glass of drinking water or clinging to a bottle and swimming around in the water. They were macroscopic and very obvious and we did a lot of treating and flushing water mains, we worked with water distribution on this.

It got to the point where water distribution felt that I worked in their division because I was very familiar with the personnel and had no problems getting personnel to work with us in clearing up our problems. Actually I didn't even show my face in the office but once a week. I'd start out from home - I was on call 24 hours a day as I had the facilities at home, the City car and the small laboratory which enabled me to analyze the problems in the field and then I had the authority to call out water

distribution people to work under my direction. We were in different divisions and I had complete cooperation from the field.

My territory, geographically, normally was the San Fernando Valley. Hollywood Hills on one end and the inlet in Saugus or Van Norman Reservoir. So we were a big district and I had complete cooperation for years and years which came in very handy during the earthquake days in Sylmar.

The question was, "Did I feel further treatment would have been necessary." Because of those problems I did feel that something had to be done. We were making strides in eliminating. We got rid of most of our organic problems such as planaria and leeches in the distribution system, but we still had the problem of crustaceans, a big headache in spite of what George could do. They were getting into the system and when the bigger industries came in like Anhauser-Busch and Schlitz and Paramount Packing which packaged frozen orange juice came in, they had a tremendous problem with crustaceans. Of course, the breweries would filter their water as did Paramount.

TAPE NUMBER: 1, SIDE TWO

WILLIAM REE

LESTER LOUDEN

GEORGE THOMAS

MILTON ZIM

ALBERT FORTHAL

FORTHAL: Back to crustaceans which are macroscopic organisms from the shrimp family. I remember Anhauser-Busch would send samples of our water periodically back to Milwaukee for analysis and although the taste and odor was fine in their filtered water, they would also send samples of their raw water which was our finished water and only chlorinated. To sample there on the spot we were perfectly alright, but in standing and in travel and time lapse, chlorine by-products or organic by-products due to the effect of chlorine, would appear in the water by the time it got to Milwaukee and they would come back with all sorts of condemnations of our water supply.

So I consulted with the breweries and the packing houses in this regard and yes, definitely there was a need for something to

be done and I think that eventually everybody started to think that way and, of course, now there's a filtration plant there.

NELSON: Well George you worked more closer to the source during those years?

THOMAS: Yes.

NELSON: What exactly or generally did you do, what were your duties?

THOMAS: Well because I was the only representative of the Sanitary Engineering Division in Owens Valley for many, many years, I did all sorts of things completely out of classification. I had a lot of contact with the Forest Service, State Fish and Game, and the various government organizations up there.

I don't know if I'm just casting about here or not, but there was a time when the sewage treatment ponds for Mammoth Village mysteriously disappeared overnight. Of course that whole country there is covered with a volcanic formation and they were very concerned about where all that sewage went. Again I hate to say we never found out because it could have just gone any place. It could have gone down a volcanic tube deep into the earth. It was about three or four miles, maybe five from Lake Crowley. There seemed to be all these things. They'd have trouble with algae growth in their fish ponds at Fish and Game and we'd go in and help them out. The furthest north reservoir we treated during the

early times when I was up there, was at Haiwee. We tried to keep potable water coming out of Haiwee, but we used chemicals for killing the algae there and had to keep very close track and it had to be done very regularly.

NELSON: Were you assigned in the Owens Valley and you lived there or did you commute? How did you work that?

THOMAS: I commuted every week for about 23 years.

NELSON: Drive up on a Monday?

THOMAS: Drive up on a Monday and be back on Wednesday or Thursday and because I was there I was a sample collector too. We did a lot of chemical analyses and we had monthly or bi-monthly sampling of all of our sources, annuals on some of the creeks, but everything up there was sampled.

It was one of those cases where they found me and I found them. It was a very good arrangement because I felt like I did do a pretty good job of public relations up there too because they could understand what we were doing - infringing on their territory but still we were able to go ahead and do what needed to be done.

NELSON: So your work was source protection, I guess. Something similar to that?

THOMAS: Well, I guess you would call it that. I built a summer place at Whitney Portal that I had some 25 years so I'd go up and spend the weekend there and be there ready to go to work on Monday morning.

NELSON: This working with the Forest Service, was this advising them on developments of camps or public areas?

THOMAS: To a certain extent, yes. They would need information on this and, of course, I remember the Forest Service when they had one permanent employee in Lone Pine and three summer rangers. The last I heard, which was several years ago, they had 35 permanent employees at Lone Pine.

NELSON: Spending all that time away from the division, did you become a non-division employee to a certain extent?

THOMAS: Not really. I was in contact with them every day, every morning and they always knew what I was doing and I always had their okay for doing these things and sometimes I was asked to do them, fine. It was really a fascinating, fascinating job.

NELSON: Who were, over the period of time that you worked in the Owens Valley, who did you succeed? Or did you succeed somebody?

THOMAS: No, the position was created because of the increasing surveillance, sampling and treatment of the water supply.

NELSON: Water biologist? First time a water biologist, per se, had gone up there on a regular basis?

THOMAS: Yes. We had water treatment operators that would go up there before I went and they would bring back bacterial samples and chemical samples and such. But then their duties were cut back because I was up there. Of course we treated Tinnemaha Reservoir for blue green algae and much later on we did some very light treatments on Crowley Lake for the surface growths there. Crowley was a great fishery and it was a peculiar lake. It developed in a very different way from a natural lake. As the lake filled, it covered a great pasture where there was all this organic material. So there were lots of algae growths and the fish just did beautifully.

But over the years as this organic material leached out and the water got better, the fishery almost disappeared. They never caught the great big fish again. The lake was actually becoming a better lake instead of a poorer one, which is contrary to the normal course. But they used to damn all sorts of things because they weren't getting the fish out of Crowley that they had in the past and I'm convinced that's what it was. There just wasn't as much fish food as there had been in the past.

NELSON: Did you notice over the 25 years a deterioration in quality of the supply up there?

THOMAS: No I don't think so. It stayed fairly steady, but we controlled the quality more up there than we had previous to that time. There was more control work done.

NELSON: What do you mean by that?

THOMAS: Well I mean that the chemical treatments at the reservoirs were algae control and such as that, but as far as the surface water was concerned, I don't think there was any particular deterioration in it.

FORTHAL: I would get constant phone calls from them for problems that they had and, of course, mostly with rise and fall of water quality. When the organic presence was very high, we would get calls and complaints from consumers. We did make some recommendations which enabled them to operate under the conditions that we had. Sand also was a big problem in some parts of the system, particularly after the Sylmar earthquake. That took a lot of my time working with water distribution in flushing water mains.

THOMAS: Incidentally though, with regard to this cooperation between the divisions that they were talking about how bad it was in the beginning, when I was in Owens Valley, I had access to anybody up there I wanted to talk to and they were always very helpful. I just wanted to throw that in. Things have changed from the time that Mr. Goudey was there.

NELSON: Les could talk to anyone, and did as a matter of fact. Well I guess you could take as a biologist, you could take a sample of water anywhere in the city and pretty much determine pretty quickly what part of the city it came from without it being identified?

LOUDEN: Yes, as a matter of fact, quite a bit of the work we did with water distribution was in determining whether a leak or seepage was ground water, our water, sewer water or what. We would have to identify it. I would go out and sample it and the equipment I had in my car, quite often was enough to determine what it was and by knowing what the water, that the surge in that community was and here is some conductivity. Sometimes a mere conductivity test would indicate to me whether it was ground water or aqueduct water or our well water or whatever. It saved the laboratory work and many times I didn't even come in. In fact, lots of times I could almost tell if it happened to be our water main leaking and seeping down below our water main, many times I would tell them where to dig for the leak by taking a chlorine residue. If chlorine showed up in the leak and it was almost gone, much lower than it was higher up, I could tell them well it's possibly within five or ten feet of where the leak is or where the seepage was and they'd look for a leak thing and sometimes it amazed me. I was right.

THOMAS: Do you remember determining that one of the small bottled water company's water was seepage out of Hollywood Reservoir?

LOUDEN: Yes, that was done by our lab.

THOMAS: Yes, that was done by the lab. But they discovered this was where this wonderful bottled water was coming from and it was just a seepage out of one of our reservoirs.

NELSON: How were they picking it up?

THOMAS: It was a spring. There's normal seepage from all reservoirs.

NELSON: Sure, and that leakage created the natural spring?

THOMAS: The natural spring that was their source and it was coming out of the reservoir.

NELSON: Now, with more water transfers going on around throughout the system, is it more difficult to pinpoint where the supply was originating from?

FORTHAL: Yes, well water or some other ground water may parallel the conductivity, or the minerals may be the same in our well water as it is in the nearby ground water. Therefore, in that case we would compare the source in the area with the seepage water and if it was the same, we would hesitate to say

that it was one or the other without further testing. Sometimes further testing helps because we can test for other chemicals including the more obscure ones and maybe give them an idea as to when to look. Sometimes the test took so long that leak crews found the leak before our testing could determine where it was coming from.

THOMAS: Our fluorides were pretty good.

NELSON: Where were you folks all in 1963 when Baldwin Hills dam failed? What impact did it have on your work at that point, if any? Bill?

REE: I very well remember where I was. It was on a Saturday. I was visiting friends at Santa Paula and I was reading a new book, "Manmade Disaster," that had just been released. I was looking at the book and I went into the house where we were visiting. The kids were sitting in the car listening to the radio and they came running in and they said that Baldwin Hills dam had just gone out! Boy, what a coincidence.

THOMAS: But you should tell him what "Manmade Disaster" was about.

REE: "Manmade Disaster" was a story of the Saint Francis Dam disaster in 1928. As soon as I heard that the dam had gone out, that Baldwin had failed, I called Don Graham and told him where I

was and asked what I should do. He said, "Well there's nothing we can do right now. Come back when you can." So in the morning I reported down to the GOB and I believe Joe Sanchie and I went out together and took some samples and initiated some chlorination of mains that had been ruptured and took care of that part of the emergency. That was the immediate follow-up of the disaster.

NELSON: Les, how about you?

LOUDEN: Well, of course, several days after it had happened, we started getting a flurry of samples in trying to determine the sources of seeps and leaks and so forth and so on. We finally traced it down that they thought the whole thing was caused by sinking of the earth around there from oil wells pumping salt water out. So it was several weeks on the whole mountain, as it were, that were suspicious and we traced it down to leaks of salt water being introduced at the underground.

NELSON: This was by the salt water introduced by the oil company?

LOUDEN: Right. Of course, had that leak checked because it meant chlorides on it. That's about all we had to do.

NELSON: George were you involved?

THOMAS: No, I really wasn't involved. I was in contact and there wasn't much for me to do so I went on to Owens Valley Monday morning.

NELSON: Very thankful. Zim?

ZIM: Oh I remember hearing of it on the radio and going right up that way and checking, but there wasn't really a lot you could do under the circumstances besides of checking what the samples could show and actually the main operation was a matter of the department and health controlling as much as I could, the out flow.

NELSON: Al?

FORTHAL: I didn't have much to do with the aftermath of that. I think I was in the San Fernando Valley. I believe in the division we did have a lot of flushing going on afterwards.

REE: There were a lot of mains that had to be flushed because they had been disturbed and broken. There was a lot of main repair and a lot of main chlorination that had to be done because of the ruptured mains or distribution mains, not necessarily the trunk line.

NELSON: Where were you all on that other famous date in February of 1971 when the Sylmar quake occurred?

REE: I was probably up and shaving by about that time. I was getting ready to go to work and I checked around the house to make sure there wasn't any damage locally there right at the house and then I went on down to the GOB and reported and various ones of the chlorine operators that were supposed to check the chlorination stations were checking them and giving their reports and so forth. It was a little bit hectic there until they finally zeroed it in as to exactly what had happened and where the major damage was.

There were a lot of conflicting reports early in the day, but little by little they got sorted out. At that time I was in the water quality section and actually the water treatment section was heavily involved because they had to chlorinate the broken mains that had ruptured and chlorinate the mains as they were repaired and put back in service. I was not involved in that direct work although I knew it was going on.

LOUDEN: We weren't involved too much with that.

NELSON: Were you still living in North Hollywood at that time?

LOUDEN: No I was living where I am now, down in the Crenshaw District. I was shaving too at the time. Had half my face shaved and I delayed a few minutes getting the other half shaved.

NELSON: What brand of razor were you using? We don't allow any profanity here.

LOUDEN: I had already done that.

NELSON: George?

THOMAS: Well I was sitting in the "Round House" up at Sun Valley. I had been skiing. I had come in for coffee or something.

NELSON: This is like Idaho?

THOMAS: Like Idaho and I called from there and I actually got through and they said, "There's nothing you can do here, so go on ahead and ski."

NELSON: Zim?

ZIM: When I heard the news of the earthquake, I immediately drove up to Lower San Fernando Reservoir and spent a lot of time checking turbidities that were going out the mains from there. The outflow there had really very turbid water coming through. There was considerable damage to the tower and the area below the interior paving. I remember I was there until about midnight checking and phoning information out.

NELSON: When did you get out the dam?

ZIM: I drove up above and then I came down and I was able to get to the chlorination station down below. It was accessible. I think one of the main worries was whether the dam would hold.

THOMAS: You didn't know how close it came to going out at that time.

NELSON: You were probably on the wrong side of it.

THOMAS: Right.

NELSON: Al?

FORTHEL: Well I had already shaven. I was putting my shoes on.

NELSON: You were always a lot faster than these other guys.

FORTHAL: I liked my job better. When I tried to get out of bed I usually couldn't make it. My nine year old daughter was screaming in the other room. It was a mess but anyway I finally got out of the house and put the department frequency on on the department radio and there was a lot of noise going on, of course about where it was and so I started off first to Granada tank and I saw the dimple in it and I figured that the radio reports were not exaggerated. Then I headed to just below Van Norman reservoir and saw the damage to the tower. I was quite involved in the chlorination and the flushing after repairs of the ruptured water

lines. I worked with Water Distribution Division at the temporary command post when it was set up at Sylmar.

REE: It was set up pretty immediately. I don't remember the exact timing.

FORTHAL: Water Distribution had sent over gate crews and regulator crews from western district to help out the Valley gate crews in shutting off ruptured water lines and determining where they were. The first day we only had one portable chlorinating crew working with us plus the gate crews and it got to the point when we had as many as three, actually we were hopping around so much I don't have exact numbers. As the repair crews got organized on the main repairs, they started from where there was pressure in the water lines and made their repairs on the way up. We chlorinated and flushed as we worked our way up to the ends of the system.

Sylmar was evacuated so most of the people were out of there. At the same time our department division heads had coordinated bottled water companies and tank trucks that could transport potable water into that area and we had to sample and check the bacterial quality of those tanks.

This continued with me for four days and I got a phone call from Mr. Adrian who was the system head at that time at home just as I was sitting down for my first dinner for four days at home and he said, "Al how much chlorine you got up in Sylmar?" I said, "100 parts per million." He said, "How long has it been in there?" I said, "In some cases, just about an hour." He said,

"Okay, go get it out." So back we went again and flushed all that area and the chlorine out of the lines. The chlorination and flushing went on even after that. In fact, two years after that we still had a routine for a concerted program in flushing sand and rocks out of the water system, not only locally around Sylmar, but in the whole San Fernando Valley. Some of the rocks were so big in the Stone Canyon trunk line that we had to cut a 36" hole in the bottom of the line where it crossed the river to roll the rocks out.

NELSON: Those were pretty good size rocks.

FORTHEL: Yes, you could hear them come tumbling down the water line.

NELSON: Was the aqueduct closed at that time, the aqueduct flow or was there a way to bypass Van Norman Reservoir?

FORTHEL: You'd better direct that to Bill Ree.

REE: The aqueduct was ruptured as well so there was a time that there was no in-flow, but as soon as that was restarted, then there was an emergency connection made that would permit water to come into the city.

NELSON: There had not been that emergency connection prior?

REE: No. There was an emergency connection known colloquially as the "Phillips Bubbler." It was a pressure release deal that they built up there for the riser to release the pressure from the penstock and let it go into the tailrace and on into the upper reservoir. Of course the lower reservoir was out of service. This was going into the upper Van Norman. Zim's comment about turbidity also brings to mind the fact that as an early immediate reaction, probably within the next day, emergency treatments were set up at the inlet to Hollywood and Stone and Franklin to provide the turbidity control, turbidity reduction was needed because of the extreme high turbidities that were coming out of Van Norman Reservoir and entering the system. This turbidity control was done with alum to precipitate the turbidities and reduce the turbidity that would show up in the outlets from the Hollywood, Franklin and Stone Canyon reservoirs.

NELSON: Was that turbidity, I guess it was noticeable throughout the system?

LOUDEN: Very definitely.

NELSON: Everything got shipped a little bit even down in San Pedro.

FORTHAL?: The turbidity was ultimately from the water coming out of the lower Van Norman Reservoir before they could stop it.

ZIM: Adrian coined his famous phrase as "Rather thick, but it's safe to drink."

NELSON: You guys were also, I don't think any of you were directly involved, maybe you were and correct me, but we also had a pilot plant down at Hyperion on tertiary treatment of waste water. Were any of you involved in that?

REE: Yes, I was involved in that. It was done under the water treatment section when I was that section head. We were taking secondary effluent from the Hyperion Treatment Plant and passing it through carbon columns to reduce the organics and attempt to make a tertiary treated water that would be suitable for re-use. Two uses were planned for that. One was to use it in the injection barrier. This was operated by the West Basin Water District down there along the coast. The injection barrier prevented the infiltration of sea water into the aquifer along the coast. The other use that was planned was industrial use such as cooling water makeup for the refineries or irrigation water perhaps if that could be arranged.

There were several refineries in the proximity there. The closest one was Standard Oil in El Segundo and there were a series of them down in the Torrance/San Pedro area. There was a plan that if the reclaimed water proved satisfactory, that a distribution line could be installed in that direction to provide those refineries. The main reason that nothing was done further on that other than experimental was that the health department would not

give us a green light to use it for injection into the underground because they were concerned about the possibility of trace organics being present and ultimately causing problems even though they didn't know what the problems might be. They were concerned about what might happen in the future.

An interesting point there was that our work was aimed at producing a reclaimed water for \$25 an acre foot. At that time, that was the price that West Basin was paying MWD for imported Colorado River water for their injection barrier. \$25 an acre foot nowadays is a drop in the bucket. It's now on the order of \$600!

NELSON: Someone had told me once that the product produced there was better quality than the Colorado River Aqueduct water. Is that true?

REE: Well you have to qualify the word "quality." So far as total dissolved solids, I think it was better. It's difficult to compare waters like that. The total dissolved solids of the reclaimed water was on the order of 500 ppm whereas the TDS or total dissolved solids in the MWD water at that time was over 750 ppm.

NELSON: I also remember that George Adrian, who was division head at that time in sanitary, on a number of occasions, drank that water to demonstrate that it was okay. As the section head, did you drink much of it?

REE: I never drank any of it. However, all of the tests that we ran from a chemical, physical or bacteriological standpoint showed that it was absolutely safe. Even tests for virus failed to find any detectible virus. At that time, the laboratory was just starting to use a gas chromatopgraphs for identifying organics. Perhaps with their present day techniques and methods for analysis, they might be able to find something that might be objectionable. The main objection that the state health department had was that they were concerned about what might be in there and that they might not be able to test for it.

TAPE NUMBER: 2, SIDE ONE

WILLIAM REE

LESTER LOUDEN

GEORGE THOMAS

MILTON ZIM

ALBERT FORTHAL

NELSON: Going back, George, just one thing to pick up. You mentioned a while ago, you and Al about the bottled water company using the seepage. Are they still operating?

THOMAS: I don't think so. I think they went out of business shortly after that.

NELSON: One thing I wanted to ask, and I ask often here, is during your careers with the Department, were there any individuals that you met that were role models for you, guys that you said, "I'd kind of like to model after?" Bill?

REE: I think Ray Derby and Donald Graham were two of my favorites. Not favorites necessarily, but people that I respected a lot. Of course I had a respect for Graham because he and Harry Hayes were the people who interviewed me for my first job on a temporary appointment as a Civil Engineering Assistant.

NELSON: He was without flaw.

REE: He was a very unusual person that's for sure. I think that Derby's feelings on water quality and the need for monitoring and the need for additional testing were very important, were necessary and were part of the reason that we continued to have good water for the Department to serve. Both men were very innovative and they were interested in using new techniques and developing new ways of doing things better.

NELSON: Les?

LOUDEN: My role model, no doubt, was Donald W. Graham.

NELSON: Is he still alive?

LOUDEN: No, he died a couple of years ago.

NELSON: Had he spent his entire, more or less his entire career in sanitary?

LOUDEN: Yes.

NELSON: He was your first boss?

LOUDEN: Yes, right. In on the interview that hired me too.

NELSON: Well two mistakes. Can't hold that against the guy. George?

THOMAS: I wouldn't call him my role model, but I certainly had as much respect for him as I had for anyone in the Department. And, of course, I remember when I retired, I was kept on as a consultant for a short time and he said, "George charge them all you can. You did an awful lot of work they never paid you for." So there is a reason for my having a lot of respect for him.

NELSON: Did he retire from the Department?

THOMAS: Yes.

NELSON: What was his last position? Do you happen to know that?

LOUDEN: Sanitary Engineer. He was in charge of the laboratory and the water quality sections. He retired in, I think, 1968.

NELSON: Zim, anybody comes to mind?

ZIM: Don Graham and Ray Derby. I have great respect for both of them. I got along with them beautifully.

NELSON: He didn't hire you?

ZIM: No. Goudey hired me. Unfortunately, I did not have much respect for Mr. Goudey.

NELSON: Mr. Derby replaced Goudey? Is that it?

ZIM: Yes, Derby replaced Goudey. Unfortunately I didn't think Goudey had the background or knowledge to do things right.

NELSON: Mr. Goudey was the one that you indicated was an authoritarian and had some very definite....

ZIM: Very definitely. He had his own mind made up and you weren't about to change it.

LOUDEN: Laboratory results were always come out to verify what he had already said.

THOMAS: Good of you to do it, I guess.

NELSON: Al?

FORTHAL: Undoubtedly, D. W. Graham. Not only was he everything that these guys said, but to me he was the role model in other things besides the Department. Life qualities. But I have to also say W. R. Ree was also a role model.

THOMAS: Yes indeed.

FORTHAL: In fact I still call him for his advice. Bill Ree was a "hands-on" supervisor and he knew how to do it himself and he often did it himself. Bill could have run the water distribution department. He knew about water and where it went and who it served and what it did.

NELSON: Well from what I understood he obtained a lot of that knowledge from that large system map that hung in his office all those years.

FORTHAL: He also used a gate book as a Bible when I knew him and he taught me how to use it.

NELSON: Well the system map I am referring to is about the Canyonlands.

THOMAS: I was going to bring that up because basically when I got to know Bill Ree as a person was when we first went to Canyonlands (Utah) together. Fact is I was going to go up by myself in a Corvair of all things and Bill said, "Would you mind if somebody went along?" I said, "Well no, if he'd like to." Bill and his wife, Edna, ended up putting a whole camping outfit in the back of that Corvair and we had the most wonderful trip up there and we've had so many of them since. Just been one of the pleasures of my life.

REE: The Department fouled us up on that because we were all set to go over the Memorial Day holiday in 1965 and it happened that that was the weekend that the Sanitary Engineering Division was to move into the GOB. So we had to put off our trip until the 4th of July weekend.

NELSON: Les I need to ask you a couple of questions here. You came aboard in 1940. Where was sanitary engineering located at that time?

LOUDEN: 10th floor of the Second Street building.

NELSON: Did it stay there until the move to 111 North Hope?

LOUDEN: Right. It grew a little bit up there. We took up a little bit more of the floor, but essentially we stayed on the tenth floor.

NELSON: Where did you park?

LOUDEN: I rode to work with Ray Derby.

REE: I think it is interesting too for a short period of time there, after the end of the war, we had two senior sanitary engineers in the division - Ray Derby and Harry Hayes. Ray Derby had gone away to war and he came back and the Department created a position for him so there were two Senior Engineers on the same

level. One carrying administrative duties and the other looking after the water treatment and the field operations. When Mr. Goudey left, Ray Derby was promoted from the senior position and since that time there's only been one Senior Engineer in the division.

NELSON: Let me ask you a final question, all of you, and that is during your careers and they all span 30, 40 years, from the beginning to the end, what particular changes did you notice or come to mind that you can think about from the time you went to work in 1947 to 1980? How did the Department evolve in your mind or the division or both?

REE: Well I think one of the things that happened was that the division head developed a better communication with the department. Or at least the department was listening to the division a little better. Particularly as far as management was concerned. At the time I left, Paul Lane was in charge of the water system and he was very receptive to suggestions, recommendations, and budgetary requests as well. It was quite a far cry from what it had been back in the 1940's. I think part of the change was that the Safe Drinking Water Act had been enacted in 1974 and other divisions were aware of the increasing, more stringent requirements that were being placed on us as water quality. They realized that we were between a rock and a hard place and we had to do something about it. Management's feelings have changed considerably and it made our work a lot simpler.

NELSON: Les, what changes did you see in your almost 40 years?

LOUDEN: 37 years, 8 months and 14 days.

NELSON: But who's counting.

LOUDEN: I just did. I think that the most marked change was when Mr. Derby took over from Mr. Goudey. Things started gradually changing from about that time. We were allowed to speak to other divisions. Things like that. The whole atmosphere changed to where it was more permissive to do new things, innovative. So I attributed it to that. Of course, what Bill brought out follows that.

NELSON: George?

THOMAS: Well I was a little isolated from this although I was back in town the last five or six years most of the time. Rather than talk about changes I'd just like to say I can't help but think how fortunate I was to take that temporary job and it was a very, very good place to work.

ZIM: Fortunately the Department was too.

THOMAS: Well I hope so. It's sort of hard for me to go by and not stop in, but I don't know anybody down there any more so I drove by a couple of days ago and I didn't even stop.

NELSON: New faces, yet nothing changes, but everything changes.

ZIM: Well I always felt that I had one of the best jobs in the department.

THOMAS/LOUDEN: That's not true, I did.

ZIM: I felt the Department made a great deal of progress and I think in a way I did quite a few things for our department who requisitioned my work in pushing into thinking more environmentally and getting more information to protect themselves from the environmentalists who occasionally were just about 110% wrong. I talked them into running background studies before they built Scattergood. I spent two years offshore of Scattergood getting information as to water quality in the immediate environs. I also figured that Fish and Game was going to chew them up. Thermal treatments that were developed to keep the mussle and barnacle growths out of the system so that it didn't clog or give them problems with their condenser tubes.

In the process they would recycle the outgoing water and raise the temperature to cook the marine growths that were found inside and in so doing they would kill off maybe 1,000, 2,000 pounds of fish that would be trapped in the forebay. I examined the fish as they went through the screens and in quantitative analysis of how many were game fish and approximately how much of each species was lost in this process and consequently they had information that they could actually use to protect themselves.

Whereas there were many different people in organizations that were claiming all sorts of things that were not true at all.

So I think in one way I did a great deal more to protect the power department than I did for the water department although my duties with the water department were priority, I did spend quite a bit of time working for power in all of their plants that used sea water for condenser cooling.

NELSON: Al?

FORTHAL: Your question was how was the change, what change....

NELSON: What change did you notice, if any.

FORTHAL: I fortunately hired during Derby's administration and changes were not that great as far as water system was considered. We were faced with serving surface water unfiltered. I think that we probably did a damn good job. It's a tough way to serve water and I think that we gained respect by being able to keep our water satisfactory if not better than satisfactory in all those years that spanned my time with the Department.

I know I felt very fulfilled in my job in what I did. I'm sure these people here did as well. But the changes that occurred, occurred after I left any way, the filtration plant and all that which was eventually built should have been the goal whether it was or not when I first came to work, I don't know.

But I do feel fulfilled in what I was doing and I always did from day to day.

NELSON: Didn't mind going to work?

FORTHAL: I loved it.

NELSON: Any other comments? Anyone need to say anything? Then I thank you very much.