A.M. RAWN

SANITARY ENGINEER

Completed under the auspices
of the
Oral History Program

University of California
1969

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INTRODUCTION

In the following narrative, A.M. Rawn, sanitary engineer, discusses his career as an engineer, giving particular attention to his work with the Los Angeles County Sanitation Districts. During his long tenure with this organization, he became intimately acquainted with the sewage disposal problems of Los Angeles and the surrounding areas and, as a member of the State Water Pollution Control Board, he gained considerable knowledge of similar problems throughout the state. In his description of these problems, he gives special attention to the running controversy between those supporting sewage reclamation projects and those favoring disposal at sea. In regard to the southern California area, he provides particular insights into this controversy, linking the development of the sewage disposal system with the development of the Metropolitan Water District, which opposed sewage reclamation schemes. The following survey also provides a summary history of the organization of the Los Angeles County Sanitation Districts, the coordination of disposal systems and, in particular, the crucial decision to dispose of wastes by tunneling under the hills of the Palos Verdes Peninsula.

A.M. Rawn was born November 2, 1888 in Dayton, Ohio. He was educated in public schools and graduated from the University High School in Toledo, Ohio. After graduation, he moved to the state of Washington and, after working for a

short while on a ranch his family purchased, he sought and gained employment with the U.S. Reclamation Service. He worked first as a surveyman and then as a draftsman. His first assignments with the Service involved him in the Yakima-Sunnyvale Project and the Boise Project in Washington, a right-of-way project in Portland, Oregon, and the Salt River Project in Arizona. He was then transferred to the King Hill Project in Idaho.

In 1917, he enlisted in the U.S. Army and served with the 319th and 605th Divisions of Engineers, reaching the rank of second lieutenant. Upon his discharge, he returned to the Reclamation Service and was again transferred to the Columbia Basin Project.

In 1922, he left the Reclamation Service and, with his wife, Edna Louise Robinson, moved to Los Angeles to seek employment. He obtained a position as a draftsman and engineer with the County Surveyor of Los Angeles, and was assigned to a project that prepared the way for the organization of the County Sanitation Districts. When the Districts were organized, he became assistant chief engineer and, in 1941, was promoted to the post of chief engineer and general manager. Prior to the formation of the Districts, he served as one of the chief spokesmen advancing the need for organization of the area, also working to gain public support for financing the necessary construction works.

Shortly after his arrival in Los Angeles, he also became

active in the Los Angeles section of the American Society of Engineers, and served as its president in 1938. He was awarded the James Laurie Prize by the society in 194[illegible]. He also served as president of the Los Angeles Engineering Council Founder's Societies in 1940. Other organizations to which he belonged included the California Sewage Works Association, of which he was president in 1935, the Arizona Sewage and Water Works Association, and Tau Beta Pi.

From 1943 to 1945, he was an ex-officio director of the sewerage and sanitation branch of the War Production Board and was appointed to the Federal Water Pollution Control Board by President Harry S. Truman. In 1950, he was appointed by Governor Earl Warren to the newly created California State Water Pollution Control Board and served as its chairman from 1953 until his retirement in 1961.

In light of his accomplishments and contributions to the community, it was with great sadness that southern California citizens received the news of his death on November 8, 1968.

The tape-recorded interviews represented in this manuscript were conducted under the auspices of the Water Resources Center at UCLA as one of a series dealing with the history of water development in California and the Southwest. Records relating to these interviews are located in the office of the Oral History Program.

INTERVIEW HISTORY

INTERVIEWER: Eric Petersen. Age 25. B.A., U.S. History. M.A., U.S. History, UCLA.

TIME AND SETTING OF INTERVIEW

Place: At the Rawn residence, 301 Crown Drive, West Los Angeles, California

Dates: March 22, 1966 to April 26, 1966.

Time of day and length of sessions, and total number of recording hours: Each session lasted approximately one and a half hours, during which approximately one hour of interviewing was recorded. The interviews took place in the early afternoon and were scheduled weekly. This manuscript represents a total of three and three quarters of recording time.

Persons present during interview: Petersen and Rawn.

CONDUCT OF INTERVIEW: The interviewee was given considerable latitude in choosing and discussing topics regarding his career within a chronological framework. The recorder was stopped only on a few occasions during the interviews.

EDITING: Editor, Bernard L. Galm, Oral History Program, UCLA.

In 1968, a verbatim transcription of the tapes was made. Punctuation was introduced and syntax was slightly emended. Insertions of words not recorded are indicated by bracketing within the manuscript. The material is presented in the order in which it was recorded.

Upon review of the transcipt, the interviewee made only minor changes, inserting a few words for clarification of meaning.

BIBLIOGRAPHICAL NOTES:

Rawn, A.M. Narrative, C.S.D., Directors of the County Sanitation Districts, Los Angeles, June, 1963. 176 pp.

TAPE NUMBER: ONE, SIDE ONE

March 22, 1966

Rawn: My birthdate is November 2, 1888. I was born in Dayton, Ohio, the middle son of five who were born to my parents Able M. Rawn and Emma Leet Rawn. My father was a product of the early days in mid-Ohio. He was born in or near Delaware [Ohio] from which point he enlisted in the Tenth Ohio Volunteer Cavalry for Civil War service at the age of about sixteen. He was badly wounded at Waynesboro, Georgia during Sherman's march to the sea and was presumed--and indeed the records show, although falsely--that he had one of his legs amputated because it was felt [it was] too badly shattered to be curable. He did, however, recover, although during his life he suffered rather intensely from time to time with the pains in his leg during changes of the weather and cold and so forth.

A rather ironic fact in connection with this is that being listed as having lost his leg during action in the Civil War he received every three or four years a very modest allotment from the War Department for the purchase of a new wooden leg. This he considered a fair spoil and never returned it to the War Department. He also received a munificent pension from the War Department of $12 a month, which was continued after his death during the life of my mother, who survived him.

My father, upon his return from Army service, attended Ohio Wesleyan University at Delaware, one of the older schools

in the country, and graduated from that institution--or left it before graduation, I'm not sure which--with a very fair philosophical and humanities education. He was a member of the Phi Gamma Delta fraternity at Ohio Wesleyan, and although none of us ever followed him to that school, we always felt rather proud of the fact that in his class was a future Vice President of the United States, [Charles] Fairbanks, and a gentleman named Gonzalez who became a master at oratory during my father's life.

My father came back to his home in Delaware after the Civil War ended and he received his discharge from the hospital, and after a number of years he entered the contracting fraternity on a small scale and engaged in that pursuit in building bridges throughout some of the central states. He married my mother, the second daughter of the Reverend William Leet, who as a Baptist minister was one of the first graduates from Northwestern University. He preached in a number of churches throughout Ohio and married Lydia Flynn, who was Mrs. Isaac Turner, on the 14th of April, 1851; Mrs. Turner's husband and her first-born son had died in a cholera epidemic in southern Ohio.

My mother was the second daughter, as I have stated, of this union and at a rather tender age married General Slocum, a soldier returned from the Civil War, and of considerable fame in his activities. General Slocum and my mother's first-born child died in an epidemic in Ohio some time after her marriage, her son being about a year old at the time.

She and my father were married on the 12th of June in 1882. She then carried the name of Susan Amaryllis Leet Slocum. Her name resolved itself into Emma Leet Rawn by some alchemy known to the early settlers of the country. She was my mother and the mother of five boys, born between 1884 and 1895.

My mother was a very forceful personality. She indulged in many activities, both before and after my father's death. My father died in 1912, and my mother not until 1928. In particular, after the death of my father, which occurred in Calgary, Alberta, Canada while he and my mother were visiting there, my mother engaged in many activities of a more or less charitable and philanthropic nature without any great funds of her own. She devoted much of her time to the work among the poor and needy and in the Christian Science Church, which she joined after coming to Los Angeles, in about 1917.

My mother's activities extended during the war to almost a chauvinistic stage. She had lived through the Civil War and actually remembered the return of soldiers from the Civil War. The First World War found her in an intensely patriotic freme of mind. I think she would have been very much disappointed if any one of her five sons had failed to join the Armed Forces during that conflict. I was next to the last to enlist and did so only after a transfer from a position which I held with the Reclamation Bureau in Phoenix, Arizona, to a measly little project in Idaho known as the King Hill Project. In Arizona I felt that my patriotic duty was to promote the production of foodstuffs from irrigation projects and, hence, I resisted

attempting to get into the Armed Services while I was in Phoenix. But the transfer to King Hill upon completion of the Arizona work was too much for my conscience to stand, so I asked for induction into the 319th Engineers who were training at Camp Fremont in Palo Alto. I was sent from the 319th Engineers in which I originally enlisted to Officers Training Camp at Petersburg, Virginia, where within a course of a few weeks I received a commission as second lieutenant and was assigned to the 605th Engineers; in such capacity and with that organization comprising the Corps of Engineers I went overseas practically at the end of the war in Europe.

My brothers were in the service also--my oldest brother served in the Aviation Corps; my next older brother in the Ordnance Department; my youngest brother and I were officers in the Engineering Corps; and my brother William next younger than I and the sole survivor excepting for myself of our family of five, was in the Tank Corps. Parenthetically, General George Patton was a first lieutenant or captain in the Corps in which William served. [tape recorder turned off]

My education was rather sketchy. I graduated of course from ward school, which was at that time to the eighth grade, and was, I must say a leader in the athletic department in my class in Washington Ward School in Toledo. I attended Toledo Public High School where I took a course which included as much mathematics as was possible to get in a high school curriculum, and played football and baseball with much of the energy which I probably should have expended on studies of more

importance but which would not be so enjoyable. I captained the football team one year and was president of my class at one time.

Unfortunately I was afflicted badly--and not so much now--with stammering which was a great impediment to me in school and in my social life. Ifound to my amazement as I worked along in life that I never stammered when I was singing a song and that I soon lost the self-conscious feeling when addressing a group of People. Studying this permitted me to escape most of the embarrassing situations which are corollaries of stammering and finally outgrew it to the point where it was no longer a detrimental affliction.

I always had a desire to be a civil engineer, a builder of the various things in which a civil engineer engages. My oldest brother, Ira, attended college at Armour Institute of Technology in Chicago, and I was greatly interested in his mathematical textbooks which he would bring home with him on certain vacation periods and study.

I dropped out of high school in my senior year. I was within six semester credits of graduation when I got a job with the Illinois Central Railroad, which paid me some $75 a month and which in those days was big money for a young man to earn. I hesitated to give up that job but did so to go back to school. I was persuaded to come back to school by my fellows in athletics. They needed a fullback for the football team in University High School which I attended, and since that had been my job before I left, they urged me on one of my short

visits home from Chicago to come on back, which I did. I came back in October in time to play in the more important games that we had, and incidentally I enrolled in the last year in high school with special permission from the principal.

I found myself with the necessity of passing in six subjects, including a couple which I didn't like at all and some which were of the lunch course variety, but I managed to pass all six and received a diploma. The principal of the high school and the superintendent of schools, who was pretty close to the central high school, were both quite sure I would not ever make the grade in my studies at that time, and so they did not prepare a diploma for me; the diploma came along later. The astonishment of the superintendent was so great that he signed it in the wrong place and consequently my high school diploma looks almost like a forgery with the scratching out of certain names and the putting of others. But I did get the diploma and went back to work again, and that ended my formal education. I never attended college, and although I wanted to go and particularly I wanted to go at that time to play football, I'm rather glad in a sense that I didn't go because I probably would have wasted a lot of my time.

Now, I did get a good education, and I ascribe this good fortune on my part to the choice--or to the chance choice to some degree--of my associates and professors and bosses in engineering jobs which I have held. My first was with the

railroads, and I associated closely with some men who were university graduates, whose textbooks were their companions and got to be mine. In particular, I learned mathematics.

When my family moved west to the state of Washington, I came out on a railroad pass to Washington and worked a while on a ranch which they had purchased. I then sought and gained employment with the United States Reclamation Service, first as a surveyman and then as a draftsman. Later I transferred from the Washington office to some railroad reevaluation work between Portland and Spokane, Washington. It was a line called S.P.& S., Spokane, Portland and Seattle Railroad. I worked there for a year or so and then moved down to Idaho to other work in the Reclamation Service, and thence to Arizona, in Phoenix. Finally the transfer to King Hill, Idaho was too much to stand, and I enlisted in the Army.

Again I want to state that my education, my grasp of mathematics, the strength of materials and design, was greatly to be credited to the efforts of my associates in engineering with whom I spent many hours learning what they knew, and they in teaching and polishing up their knowledge of the subject themselves. I learned the calculus pretty well, but in all candor, I must say that in my practice of engineering as a civil engineer, I have seldom had occasion to use that branch of mathematics and have seldom seen it used by any of my mentors and bosses and associates.

In World War I, I served as an enlisted man and a corporal in the 319th Engineers and later as a second and first lieutenant

in the 605th Engineers. I was not in any battles although I served in the AEF; two of my brothers, the two younger ones, served in the AEF also. My youngest brother, Walter, was badly gassed in the Argonne Forest fracas and contracted tuberculosis and died shortly after his return to the States. My next older brother, Paul, was injured badly in loading transports in America with Ordnance, and discharged. My oldest brother, Ira, although he never became a pilot, served out his time in the United States as an instructor in some respects and as a first lieutenant camp officer in others. I came through unscathed, returned to the United States at the request of the Reclamation Service and, of all places in the world, was then assigned to the King Hill project. [tape recorder turned off]

A brief history of my activities during my employment with the United States Reclamation Service may be of some interest. When I moved out to the West where my family had moved, I was employed by the Yakima office of the Yakima-Sunnyside Project, an irrigation project by the way, first as a surveyman, taking topography in the project. It was transit topography, not plane table, and I was in charge of one of approximately eight crews of men who were doing the job. I later was transferred to the office as a topographical draftsman. Drafting was something for which I had a natural bent, somewhat, and the various moves and workings in drafting, and particularly in topographical and map drafting, came quite readily to me.

I served there for a couple of years or so and then was transferred to the Boise Project in Idaho. The Boise Project is a large and very successful Bureau of Reclamation work, known at that time as the United States Reclamation Service. It has since become designated as a bureau. In this job, I was a camp draftsman; I had minor designs to make and head gates and flume outlets, boxes and diversion gates and so forth, and also bills of material and one thing or another of that kind, and occasionally got out over the project to see some of the works which I had designed.

A rather amusing thing occurred at one time--I went out to look at a job which had been completed, a concrete diversion box of considerable proportions, and when I got out there with the engineer who had been in charge of the work, I saw a lot of reinforcing steel lying over in a pile. I asked the engineer why the steel was there and he said he didn't know. But he found out from the foreman that the foreman had never put steel in a concrete box. He didn't know just how to read the plans, and being out there all by himself in the hustings, he had simply neglected to put the steel in. The concrete box was holding up all right and to the best of my knowledge has continued to do so; so perhaps I wasn't as good a designer as I thought. Anyway, the box is still there and they got all the steel back.

From this job I went over to Portland to work on the SP&S Railroad. By that time, I had developed as a draftsman to the point where I was the principal draftsman in the preparation of right-of-way and condemnation and acquisition maps

for the railroad. I did this for a little over a year and finally heard again from the man for whom I had worked in Idaho, Walter Ward, who asked if I wanted to come down to Arizona to work for him. I gladly accepted the offer and went to Arizona and stayed there for about three years.

Petersen: What date was this?

Rawn: It was about 1914. The job in Arizona was very interesting. The Salt River Project in Arizona is one of the largest in the world and certainly one of the most productive. It is watered by water by the Salt and the Verde Rivers and now supplemented, I understand, by wells over the project. It's greatly expanded even since the Reclamation Service left it. The Roosevelt Dam is its principal structure and was the only impounding dam in the project when I worked on the job. Under the guidance of Ward who had employed a number of engineers, who since were quite well thought of in their later lives, we put the new spillway structures in the Roosevelt Dam, a job of considerable magnitude; and later after we left, there were a number of other dams constructed on Salt and on the Verde and on some of the other tributary washes, I understand.

This was a most interesting job and I thought that it was of such importance that it would be better for me to stay on this work and serve there than to join the Armed Forces. However, in about 1916 or '17, the federal government turned the project over to the water users, and I, realizing that the construction of the type of work which would be of benefit to me was over, asked to be transferred and they transferred me

to the King Hill Project in Idaho, where again I was to work for Walter Ward.

The King Hill Project in Idaho was perhaps the most miserable of all of the projects undertaken by the Reclamation Bureau. It was a strung-out affair along the canyon walls of the Snake River between Glenns Ferry and Bliss, Idaho. It had very little irrigable ground. The structures were difficult to build and still more difficult to maintain; they were constantly breaking. But the project had been built by the state under the Carey Act, which had the provision that the state would provide the funds for the construction and then receive its repayment from the water users. Of course, they never got anything back from the water users because the project began to deteriorate so rapidly with the type of structures that were built that the water users themselves were unable to make very much of a living. However, they had a Democratic governor in Idaho at that time (which was normally a Republican state) and we also had a Democratic President and Congress, and the combination of the two was much too strohg. So the United States took over the project and agreed to rebuild it, which they did. And while it proved to be a most interesting job to build and rebuild the structures which had been originally planned and to supplement them with other structures which would let in a little bit more land, in my opinion the project never should have been built and, having been built and failed by the state, should have been written off as a failure. But it did provide some pretty good engineering, and I returned to it after my service in World War I.

At the close of the war they asked for my return to this project which was granted, and I went back there and with Ward and his associates finished the job which we had begun. Ward then moved to another job in Idaho; I stayed on as project manager, finished the work that we had been engaged on, and then was transferred to the Columbia Basin Project, a reconnaissance and preliminary survey of what it might cost and take to irrigate the area in vicinity of Pasco and Walla Walla and south and west of Spokane (which is now being irrigated from the Grand Coulee Project). We finished the report on that project in about twelve months and reported on a job which was not built. We could not, in our opinion, justify a job which was built. And in this, we were probably about as wrong as a group of engineers could be. Parenthetically, I was not in charge of this work but was merely there to design and estimate the cost of canals, laterals, large pipelines, structures, diversion works and so forth for a project which was going to cost millions of dollars.

The project which we recommended as a result of our preliminary work was the diversion of water from Lake Coeur d'Alene, carrying it through a canal which would have resembled a river in size, and then distributed onto the land. This project had been investigated many years before by General [George W.] Goethals. He's the man who did the work on the Panama Canal. We did not agree with him in cost price nor in the cost of operation and maintenance, ours being very much greater than his. But the combination of the two reports

influenced the group to which I belonged in the Reclamation Service to recommend the project which did not include the Grand Coulee Dam or the Grand Coulee diversion works.

From this job I resigned from the Reclamation Service, feeling that there was little if any opportunity for future development in the Reclamation Department of the United States. I thought the work was pretty well over, and I was given[to believe] that that was the case by many who were considerably wiser than I on these matters. So I left the Service.

Petersen: Why did these people believe that the work was just about terminated?

Rawn: Well, actually the cost of development of water for irrigation projects was getting too high. The easy projects were built and the ones which were in contemplation then were so expensive that it was felt that they simply couldn't afford to be built, that agricultural land could never afford to pay that much money or as much as these projects would cost per acre. It was just not an economical venture which, of course, it was and has since proven to be because the federal government and other departments have assumed a large proportion of the share and the power has paid a tremendous part of the projects' cost. I don't keep up with those things as I used to, but I think that the federal government stands a little bit more than its share--which is all right, I think that's good business. But we just felt, the older men in the Reclamation Bureau, that the time had come when perhaps it wasn't going to be as it

had been. And indeed it was not and has not been since.

There have been some magnificent projects built, there's no question about that, and the Reclamation Bureau as it now exists has designed and supervised the construction of some magnificent dams. For instance the great Hoover Dam on the Colorado River was designed and constructed under the supervision of the Bureau of Reclamation, Denver Office. There's the new dam upstream from that and there are two downstream from that on the Colorado. But I concluded that maybe I'd better get out of the Reclamtion Service and seek something else.

So late in 1922, I came down to Los Angeles to try and find a job. That was the beginning of my association with the County Sanitation Districts. [tape recorder turned off] Times were pretty hard in 1921, '22, '23. The men were returning from the service and there were more engineers than seemed to be needed. I was quite discouraged in the reception which I got from various plants and institutions which I called upon seeking to find something to do. But through the kind offices of some of my friends, it was pointed out to me that the County Surveyor of Los Angeles County was organizing at that time a group, under the direction of an engineer in his department named A.K. [Albert Kendall] Warren, who were looking forward to the complete drainage problems of the county, not flood control but surface street drainage and municipal drainage and some measure of upstream flood control, and also had in mind a project which would provide the sanitary sewerage facilities for a number of cities in a rather large area in

the county south and east of the City of Los Angeles.

One of my friends, and a close associate during the Reclamation Service who was established here, a gentleman named Walter E. Jessup, introduced me to the County Engineer and Surveyor, Mr. John Rockhold and his associate, Mr. Alfred Jones, and they employed me as a draftsman and engineer outside of Civil Service, not as a Civil Service employee but as a registered employee. I proceeded to design bridges and to make estimates and work quite largely upon the preliminary work of developing the area into one large operating sewerage district. This type of endeavor, except for the hydraulics involved and the structures, was quite new to me. I speedily began to learn the vast difference that can be between the conveyance of water and handling of putrescible wastes such as sewage and industrial waste.

I looked the job over and it paid I think $250 a month; in the Reclamation Bureau I had been getting $350 a month at that time. I took the job gladly because there wasn't very much choice in the matter, and I expected that it would last about two years. This was in early 1924, and I thought certainly that by 1926 or early '27 the job would be finished and that in the meantime I would look around and get some better and more permanent location so that I could grow up with and stay in southern California.

In this connection I have neglected to state that while in King Hill, Idaho, I met a young woman who was sent over to King Hill from a Reclamation project in Montana to serve as

secretary to the project manager, who was Walter Ward at the time. Her name was Edna Louise Robinson, and she appealed to me as being just about the kind of woman whom I would like as a wife in my profession. I sold myself to her, and we were married at my brother's home in Seattle, Washington on June 8, 1920.

We went back to King Hill and stayed there in one of the government cottages until we transferred to Spokane to serve in the Columbia Basin Project, and then when that work was pretty well completed and the report had been submitted, we moved what little furniture we had and came down to southern California. My mother was here at the time; she had lived here for many years and was pretty well known. And I liked the country. I felt that certainly the way California had grown and the manner in which it was growing at the time and the beauty of it, which I had known something about from former visits, everything here appealed to me as being the place where I would like to spend the rest of my days if I was going to remain an American citizen.

TAPE NUMBER: ONE, SIDE TWO

March 30, 1966

Rawn: As I have stated before, I took the job with the county for the development of what later became the County Sanitation Districts, anticipating that the job might last for a couple of years, following which I could possibly engage in some other more lucrative activity, either in private engineering or associated with one of the larger companies. Again I proved to be completely wrong in my conjecture because actually the most successful part of my career as an engineer occurred during my tenure in office as an employee first, with the County of Los Angeles, and the County Engineers and Surveyor's office and secondly, with the staff of the County Sanitation District of Los Angeles County.

I had joined the American Society of Civil Engineers in Idaho, my references being employers there and in Washington in the Reclamation Service. I immediately joined the local section of the American Society of Civil Engineers in Los Angeles, and as a means of introducing myself to them and at the request of the chairman of the program committee, I developed some slides which were illustrative of the very interesting engineering work which we had been doing on the King Hill Project in Idaho, which really was quite unique and unusual in its concept of irrigation, and also completed a paper and talk so that I could appear before that section as a program feature. From that association in the local

section of the American Society, I became acquainted with a large number of engineers, and they with me, in a very short space of time after arriving in Los Angeles. This was of inestimable help to me, just as the society's activities and the society itself has been throughout all of my professional life.

I found that the pursuit or the development of water for southern California was by far the most interesting topic to bring before the American Society of Civil Engineers; a program which related to water and water supplies or water development would bring out a far greater group of the association than any other. We had in our organization our so-called local section at that time some of the really greats in water development in the United States who were very much interested in anyone who understood the development of water supplies for arid areas, in which certainly southern California may be classified.

Petersen: Who were these men?

Rawn: J.B.[Joseph B.] Lippincott, William Mulholland, [Harvey A.] Van Norman, [C.T.] Leeds, [Arthur] Sonderegger, [James H.] Hill and many others--men who really had worked in the development of water here and elsewhere. From my association with these men I realized that the wasting of large quantities of water as in sewage and industrial waste, if it could possibly be reclaimed and reused, was an extremely important thought and idea in the development of southern California. The water had been brought to this area from the Owens River by such men as

Mulholland and Lippincott and others, and engineers were now looking toward the Colorado for a supplemental supply, realizing that the growth of the country was so rapid that soon there would be a shortage of water in the area if it were not supplemented by other sources.

After I had been with the County Sanitation Districts for two or three years, it was quite apparent to me that sooner or later, even with the Colorado coming into the picture, there might again be a shortage of water, but that until there was, the idea of reclaiming water directly from sewage for unrestricted use was not at all practical. Therefore, all of my efforts in connection with the early days of the Sanitation Districts were aimed at influencing those who were in charge of the project to waste the primary effluent from a very simple subsidence plant into the ocean for final disposal. And then if that proved successful and it could be done without the contamination and pollution to the adjacent shores, that thought be given--if required--to the reclamation of water from the accumulated wastes or any part of them that were amenable to treatment for the purpose. [tape recorder turned off]

As I contemplated the potentialities of the job which I was on and before the organization of the Sanitation Districts staff had been completed, I realized that one of the most important and valuable services which any man could perform would be to supplement or assist the Chief Engineer, or the man who became Chief Engineer, and his Associates in

spreading the word about the Sanitation Districts and their potentialities throughout the area which it was proposed that they serve. And to this end, I devoted a large part of my time. The man in charge of the work, A.K. Warren, finally passed over to me the job of going about among the various organizations which held meetings periodically throughout southern California, detailing for them in such time as was alloted what the Sanitation Districts actually stood for and what they could achieve if they had the support of the area.

This type of enlightenment or instruction was so effective that some of the Sanitation Districts came into the picture very rapidly, our principal concern being the manner in which the citizens of a district would vote for or against the bond issue which might be proposed should the district be successfully formed. It was not difficult to form the district; the Board of Supervisors did that without elections in most instances and then turned the matter over to those of us who were engaged in perfecting the plan for sewage treatment and disposal to inform the public what it was all about and to gain their support in a bond election for furnishing funds to complete the works.

Petersen: If the people rejected the bond issue, would this then mean an end to the local district?

Rawn: If the bond issue were rejected at the bond election, it could not again be brought before the publice for a subsequent election for six months; but it did not necessarily mean the abandonment of the district. In order to abandon the district and to abandon all proceedings in connection with

it, an election had to be held in the district for that purpose. Because once the district was formed, it was formed until abandoned by the citizens in the area, so that so long as the district existed, every six months the matter could again be brought to their attention. But six months is a long time, and time was of the essence. It was very important in the development of the sewage system itself.

It was our job and we did it--and I think, did it pretty well--in developing a system which was subject to expansion without greatly altering the shape and design of the project as a whole--that is, new districts could be added, the old districts supplemented, and so forth. For my efforts in this matter in public speaking--and certainly in my very youthful days public speaking was the last thing I ever anticipated doing--the Chief Engineer, Warren, when he was appointed, appointed me as his Assistant Chief Engineer and together we proceeded to develop a plan which was very sound.

At the start of the work when I was first engaged, the plan which had been tentatively proposed for the disposal of the collected sewage was to convey it over into Orange County and dispose of it through an outfall off the coast of Orange County and into the littoral waters along that shore. This I couldn't see at all. Putting myself into the position of a supervisor in Orange County, and any representatives in the State Legislature from that county, I could imagine how definitely I would resist any such thing as the sewage of one county being

discharged on the shores of another.

Petersen: Who had originated that plan?

Rawn: The original plan was proposed tentatively by the Chief Engineer, Mr. Warren. I don't know how serious he was in the matter, but evidently the thought of getting to the south shore of Palos Verdes or emptying the sewage into the harbor waters of Long Beach or off the shores of the Ballona Creek or to the west rather appalled him, whereas there was a good surface outlet if he just took the land right straight down across Orange County and took it out to sea. But I don't think that this would ever have succeeded, and I didn't think it would at the time. We had a number of arguments about it.

Fortunately for me, I had been engaged on just the type of work which it might take to reach the ocean on the south shore of the Palos Verdes Hills. Together with another of the associates in there, Harry Bolton, we conceived the idea and plan of tunneling under and through the Palos Verdes Hills and finally getting to the shore, the rocky south shore of which was completely uninhabited at that time excepting for some Japanese farmers who farmed the south slope of the hills. There were no residences; there were no towns, no settlements of any kind. In fact the road was merely an ordinary dirt road that was used as a farm road. Where the road is now was then just a farm road. In any event, the plan of sewerage here which was developed was a completely coordinated plan in which all of those who were tributary to it would parti-

cipate. The scheme in its entirety depended upon getting a good outlet to the ocean, which we felt could be developed if the districts had the courage and the finances to tunnel a six-and-a-half or a seven-mile tunnel under the Palos Verdes Hills and reach the south shore in the vicinity of White Point and go thence out to the ocean on a good firm bottom which was there and discharge the sewage effluent offshore far enough so that it could not again reach the shore. This plan was presented to the staff members and to the Chief Engineer, who felt that it was a very satisfactory solution to a very perplexing problem and who adopted it almost immediately as the Districts' number one plan for the disposal of sewage.

Now this gave us another excellent argument--in addition to the fact the disposal of sewage was going to be offshore, well out to sea at a point where there was no development of any kind, where there could be no bathing, no swimming, no water sports except perhaps way offshore boating or fishing, where the whole thing would be out of sight and away from the recreational beaches, it also provided a plan which was in the backs of our minds constantly: that once we had this sewage system completed and the outlet at a point where it would do no harm and where the sewage could be discharged constantly, not depending upon any shore process for its disposal in the end but could be disposed at any time, <u>then</u> we could undertake any sewage reclamation that might be in the offing and develop a plan for water reclamation which could provide irrigation and

perhaps industrial water in the area above the point of discharge.

It would seem that one of the most perplexing items in the minds of those with whom I was associated on this project was the matter of getting a tunnel under the Palos Verdes Hills. To me this did not appear to be a particularly difficult thing because it was the type of work in which I had been engaged, in designing and construction, in the Reclamation projects for a number of years. A tunnel after all is just a tunnel, and although the Palos Verdes Hills were a very complex structure and would probably give some difficulty in the tunneling--as they did--they certainly were not formidable enough to stop the ordinary course of development which depended upon a tunnel under them for its success. So the tunnel project of the Palos Verdes satisfied the equation perfectly <u>if</u> it could be built. And the fact that it could be built was something of which I was very definitely sure, and that it could be built for possibly less money than getting any other place to the south, and particularly through the Los Angeles and Long Beach Harbor where a pipeline of any magnitude would have been a white elephant--if there had been any trouble with it, it would have fouled up the harbor in very bad shape.

So once the idea was accepted that a tunnel could be built under the hill and a pipeline offshore to deep water safely constructed, the matter so far as the final plan for sewage disposal was concerned was to all intents and purposes settled as far as I was concerned. Fortunately the Chief Engineer felt the same way, and all of the bond issues and all of the

work which we did for those districts which were tributary were based on the idea that we would go to a central disposal plant someplace in the south part of the county and from there run a line down through and under the hills rather than over them and from the shore go out to sea far enough so as to prevent shore pollution from the discharged effluent.

You asked the question why I would not go over the hills; well, the hills are 400 or 500 feet high at that point, and to pump the quantity of sewage which would be developed in the district up 400 or 500 feet and then run it downhill again was just simply out of the question so far as power and cost of power was concerned. It speedily eliminated itself as a possibility; it was eliminated as far as my thinking was concerned the first time it was even considered. We might have gone around the end of the hills, but that would have thrown us into San Pedro which was part of the City of Los Angeles and which would absolutely not permit the sewer to run through its territory at all. We had that political angle of the equation to satisfy. Certainly to go directly south from the south side of the City of Los Angeles and try to go out through Long Beach was impossible because the City Council of Long Beach would stop us, and to go through San Pedro and the San Pedro Harbor was just equally impossible because the Los Angeles City Council would have stopped us. To go to the west and go through the southwest coast cities of Redondo or Hermosa or Manhattan or any of those would have been resisted by those people; the right-of-way lines would have been

denied; even if they were not, it would have meant the discharge of sewage effluent at or near the most valuable shore and recreational waters that exist in this county.

There was already one sewer line out of Hyperion for the City of Los Angeles which was creating havoc in throwing the city into very serious trouble with the shore cities, and actually imperiling the value of the whole Santa Monica Bay for recreational purposes and continued to do so for many, many years until finally the city, through the efforts of its present engineering staff adopted the plan which got the sewage out of the area completely.

Now the idea of taking the sewage effluent haul to the ocean and wasting it there was sturdily resisted by many citizens in the metropolitan area who believed that it was possible to reclaim water from sewage and to develop it into such a condition as to reuse it in agriculture and industry and indeed, if necessary, for unrestricted purposes. They pointed--and quite logically and correctly--to the fact that there were thousands of cesspools serving the area's cities and towns surrounding Los Angeles, and indeed in Los Angeles itself, the contents of which were drained directly into underground waters in which well supplies were drawn and distributed for unrestricted purposes by some 500 water companies in the metropolitan area.

That a considerable portion of this water came from sewage and industrial waste and the treatment plant effluents percolating through the ground to reach the underground aquifers

was a foregone conclusion and indeed was a fact. But it seemed to us--as it did to, I believe, the majority of citizens in the area--that the sewerage system should have as its principal objective the safe and sanitary and continuous disposal of sewage, and not be dependent on water reclamation processes, which at best were somewhat sketchy, for the disposal of this noxious waste; that once the sewage system per se had been developed and had been completed to the point where it was infallible, then, and then only, the time had come when water might be abstracted from the sewers as a raw water supply and put through a process which we as sanitary engineers at that time, and which many of the citizens of the area, knew could be developed from the water, provided the sewage did not depend on it for disposal of the sewage.

This was not an easy point to put over, partly because there were a number of individuals in the area who were interested in taking over the control of the Sanitation Districts, using it for political purposes and for their personal accomplishments of various kinds. Fortunately, we had at that time some very able men on the Board of Supervisors and some very intelligent fine men as the mayors of the cities which comprised the boards of directors of the several districts which were then in existence.

Petersen: These people who were interested in the reclamation aspects of the program, did they represent any special interests? Were they farmers or land speculators or anything along these lines?

Rawn: No, they were mostly engineers and politicians. There were certain engineering firms in the area which believed that local disposal plants for the individual cities were by far the best means of disposal, and there were certain politicians who saw in the job as Chief Engineer, or Director of the Public Works, a fine political plum for themselves and a career. And these men resisted the efforts of the Sanitation Districts to do what they felt was the thing to do. There were a great many--perhaps the majority of those who resisted it--who did so honestly and conscientiously, believing that it was a waste to spill all of this water into the sea when it could be reclaimed by biological processes, put back into the ground if necessary, or directly reused for agriculture and industry.

The fact is that the balance of power rested with those who wanted to get the sewage disposed of. They wanted the water works engineers or the water engineers in the area, of which there have always been legim and some very powerful and excellent examples of the profession in this area, they felt that the water supply problems should be turned over to these men and not rest with those whose job was the collection and disposal of the sewage. And in this I believe they were right. We belived theywere right in our organization and we worked with that end in view.

The Districts once organized, and to a degree financed, were able to proceed with their plans for construction and the construction itself. A district engineer was assigned to

each of the districts organized, with some supplemental work for each also. The plan developed, so far as the southern and large districts were concerned, into a rather harmonious whole. It all joined up into a pattern where the different districts would build many of the sewers within the districts and would then join in the construction of a treatment and disposal works in which each would have a share. This was not true of some of the smaller districts which had minor problems and which might be disposed of into the City of Los Angeles.

The first flow of sewage came from the City of Compton which had a very inferior type of disposal bordering the eastern line of its city and discharged the effluent from a very incomplete treatment works into a slough which carried it down to the south and where it either dissipated into the natural storm drainage or into the ground. The temporary treatment disposal works which the Districts had built in anticipation of expanding it into a much larger type of disposal or treatment works when the line to the sea would be available was one which purified the sewage to the extent that the effluent from the plant was in pretty good shape to use as irrigation water or for industrial water. The plant operated very successfully on the first minor flows which reached it. It soon, however, became overloaded as we knew it would. The whole scheme for tunnel and outfall construction was not crystallized for a number of years after the project was in operation.

For about ten years we mulled over the idea of the location of the main outfall to the sea, and during this time operated a temporary high-class treatment plant at the site where it was confidently anticipated we would build a larger works as the flow increased. We could anticipate at that time that the flow of sewage, by the time we felt we could get the finances and the rights-of-way and the location and the detailed plans out for the ocean disposal, would be around seventy million gallons a day. To start with, it was about two million gallons a day, and over the period of ten years which the temporary plant operated, it increased to about eighteen or twenty million gallons a day.

By that time, however, the doldrums had settled onto the United States to the extent that the federal government was handing out a considerable amount of money for make-work projects, and the plan which the Districts had fitted so beautifully into this that the federal government offered a million dollars as its part of the construction funds, provided the Districts would do it in the manner in which the federal government proposed, utilizing local labor in so far as possible and paying minimum wages of so much here and there. We gladly agreed to that, and the Chief Engineer returned from Washington on his last trip with the assurance that the million dollars would be forthcoming. We advertised the work, received successful and adequate and good bids from reponsible contractors, both for the tunnel and for the ocean outfall, and by 1938, we had completed a tunnel under the hills and an ocean

outfall leading from the temporary plant to the sea. The temporary plant was converted from the high degree treatment, which it formerly had used, to a very modest treatment which simply allowed the suspended solids to settle out before the effluent was disposed of through the tunnel to the ocean.

This then was the situation in which the Districts found themselves at about the beginning of World War II. The European nations were hot at it, and the United States was teetering on the brink of war. The President and his associates were trying to find work for men who were unemployed, and we out here had successfully floated certain bond issues; we had the money to proceed and we did proceed to fulfill the planned scheme that we had for sewage. About this time the Chief Engineer of the Sanitation Districts died, and the Districts appointed me as Chief Engineer and General Manager in his stead.

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April 13, 1966

Rawn: Along about 1949, the situation with respect to water pollution in California became quite acute. There were a great many places where streams were grossly polluted, or being polluted, and in particular there were areas along the ocean beaches where the pollution was very bad. Among these, some of the most notable were: in San Francisco Bay, and along Santa Monica Bay from the discharge of the outfall of the City of Los Angeles. The Legislature in 1949 enacted a water pollution control bill, which had approximately that title. The bill was signed into law by Governor Warren, and in 1950, he appointed or organized the State Water Pollution Control Board by appointing its members. The bill actually provided for a state water pollution control board and nine regional boards, the membership in the state board comprising five state department heads--Playgrounds and Recreation, Public Health, Agriculture, Water Resources, and Fish and Game--and in addition, eight members at large representing the various activities which would be directly interested in or vitally essential to the control of pollution in the state. On the regional boards there were, I believe, seven members selected at large from the area and representing water resources, public sewerage, public water supply and the like. The regional boards were more or less autonomous in their own regions, each region being practically a watershed within the state; and the state board was more or less the appellate board and the board which set the policies for water pollution

control which were to be followed by it and by the nine regional boards.

The initial chairman of this group was General Hannum, who was selected at the request of Governor Warren to be the charter chairman--a very good choice and a very fine and capable administrator. General Hannum died some three years after appointment, and I was elected chairman of the state board at that time and served until 1961, when I was retired from the board, and a gentleman named Goldfedder, a member of the staff of the Hunt Vegetable or Packing Company was elected as the chairman. [tape recorder turned off]

The business of the several boards, regional and state, was to establish criteria for the control of pollution both in saline waters along shore, for lake and pond waters, for recreational waters and for fish culture and for diversion to public domestic water supplies and irrigation supplies. The problems varied widely from the north to the south. The personnel of the several boards changed from time to time. Each board appointed a staff for investigation, and the boards themselves were policy determining and were boards before which appeals against or for the rulings of the staff and the insistence of the staff upon certain measures of protection could be reviewed and the final determinations made.

The charter exective secretary of the state board was Mr. Vinton Bacon. Bacon was a man whom I had employed in Orange County on a sewerage survey for that subdividion and of the state, and who had subsequently joined the staff of the

Sanitation Districts and thence had moved to Berkeley where he was a professor in the college and also conducted a number of experiments in sewerage treatment and disposal for the state. He joined the Water Pollution Control Board in 1960 and served for three or four years before moving to Tacoma, Washington to conduct works and investigations for the pulp mills, and subsequently was employed by the Chicago Sanitary District as its Chief Engineer and General Manager. In his latter post, which is an extremely difficult one in a city and area where management is far more difficult than in most places, his success has been very great and he has made a fine reputation for himself. I recount a little bit about his experience to indicate the quality of the man whom we initially employed. I also was very proud of his activities and his progress since his first work out of school was done for an engineering board of which I was a member in the San Francisco Bay, and he then moved to the work in Orange County and thence to Los Angeles and finally to Chicago.

The procedure in the Water Pollution Control Board was to set standards for limiting the discharge or the quality of the discharge of wastes to public water supplies or to the ground or to salt water along the beaches, and the board prescribed the standards which were to be met and which standards were followed with reasonable accuracy by the regional Water Pollution Control Boards who actually put the scheme into effect in the nine regions.

It is not difficult to imagine the wide diversity of opinion regarding purity of water or the necessity for controlling discharge as existed between the ideals of the Public Health Service, for instance, and the Department of Agriculture or the Fish and Game Department or the Water Resources. These five representatives of the state departments on the board presented sometimes widely diverse thoughts and ideas about what was needed to be protected. Fish and Game, of course, was interested in the breeding areas and streams, and the Department of Recreation was interested in sport fishing and in particular that department was interested in keeping contamination and pollution off of the bathing areas along the California coast. They also had a feeling which was quite definitely expressed by some of them that the eight members of the board who were chosen from public at large were more or less interlopers in their field.

Actually, the water pollution control in the State of California had been a function, in part at least, of twenty or thirty state and local departments, and in order to control the discharge of contaminated water into public waters it was necessary that the discharger should secure the permission or authority from all of these agencies lest one of them subsequently come in and upset the apple cart. The fact is that the water pollution control bill, which was known as the Dickey Bill in the Legislature, was enacted to permit a prospective discharger to go to a single agency and make his application. This agency then had a public hearing to which all and sundry were invited to express their views. The views

and opinions and ideas of each one present at the hearing were fed into the general proceedings, and subsequently the Pollution Control Board came up with a final determination which, when given to the discharger, covered the objections and the authorities of all of those who were present and all who were interested in the discharge and was a generalization of all of the complaints and all of the permissive actions. It was a case of one request and one action, the action of the Water Pollution Control Board being final and binding upon the prospective discharger.

The principal agency involved in water pollution control prior to the enactment of the Water Pollution Control Law or Dickey Law was the Department of Public Health, as it is in many or most of the states in the Union. Mr. [Randal] Dickey and his associates in the Legislature felt that this was not a function of the State Department of Public Health, that public health was their business and that public health did not involve the engineering and technical features that were involved in the control of pollution in the several streams. In water pollution control prior to the enactment of the Dickey Act, the State Department of Public Health would prescribe rules and regulations regarding the permissive pollution of beaches and playground areas. They did this by posting quarantine signs from time to time along the beach at various locations where there was contamination of the shores. There were a number of places where this was occurring and one of the

principal offenders and one which affected more people in the State of California than any other was the discharge from the City of Los Angeles plant at Hyperion. The posting of quarantine signs in such a position was of little value.

Petersen: What was the function of the quarantine signs?

Rawn: The function of the quarantine signs was to state to the public that this water was dangerous in which to bathe; it was contaminated by domestic sewage and industrial wastes and should not be used and, therefore, bathing was prohibited here. But it didn't mean anything.

Petersen: Then as far as the State Board of Health went, all they did was to warn the people against use of the water?

Rawn: Yes, that was substantially as far as they ever got except by persuasion and threatening and so forth, but they never were able to make their threats stick perceptibly. One of the greatest offenders in the situation, the City of Los Angeles, was brought to task before the local water pollution control board. The state board after reviewing the findings of the local board and its action in the matter was dissatisfied, and the state board stepped into the picture and decided to restate the action of the Water Pollution Control Authority and to lay down and prescribe the limitations of pollution, the manner in which it should be avoided and how this matter should be shown. It also stated that the rules and regulations should be effective in all water pollution control considerations along the beaches. [tape recorder turned off]

The principal offender in the matter of beach pollution along the California coast was the City of Los Angeles, discharging a very noxious and illy purified effluent from their plant at Hyperion. This was being very poorly treated on shore; it was being discharged through a leaky outfall which had been built in 1924 and which was ruptured in a number of places. The shore was being grossly contaminated; signs were evident along there stating that the Board of Public Health considered the beach unsafe and that bathing should not be indulged in between the limits of these signs which spread up and down the beach for miles almost and out to sea for a very great distance. [tape recorder turned off]

Almost immediately after the cessation of World War II, the City of Los Angeles undertook to correct the situation at Hyperion, and for the purpose of determining what sort of sewage treatment should be invoked at Hyperion, they employed the firm of Metcalf and Eddy of Boston. The plan which Metclaf and Eddy proposed was to completely purify all of the sewage of the City of Los Angeles by the activated sludge method: to discharge the effluent from this plant, which it was presumed would be in a highly purified condition, through a short outfall into the ocean and to chlorinate it prior to discharge so as to effectively protect the beach. The question of sludge disposal was not so carefully gone into apparently. The firm of Metcalf and Eddy had designed the plant on the basis of the activated sludge process and the digestion of the sewage solids, and their subsequent drying and pulverizinf onshore

and their sale as fertilizer. The City Engineer was authorized to proceed with it on the basis of a grant from a $90 million fund which the state had accumulated during the war and which was considered excess money and which was to be allocated throughout the state for the purpose of furthering the sanitation and sewerage and public health of the entire area.

The City Engineer was ready to proceed with the work of construction at Hyperion, but at this point the Board of Public Works under Mr. [Frank] Gillelan appointed a Board of Engineers, comprising Dr. [Franklin] Thomas of Cal Tech, Colonel Leeds of the firm of Leeds and Hill, and myself as a board to review the situation and determine whether or not this type of construction should proceed or that some other more efficient method be imposed. Our board--Leeds, Thomas and myself--recommended that an outfall be built two-and-a-half or three miles out to sea instead of a 5,000-foot outfall which was proposed, and that the construction on-shore be such as to limit the purification process to the removal of the grosser solids, and that the water then be conveyed through the outfall line and be dispersed widely some three miles offshore. We felt that if this were done, there would be no beach contamination; the process would be far more satisfactory and more certain to achieve the results and far less expensive, both in construction and in operation and maintenance.

At the time we were writing our report (copies of which

are on file in the city and county offices), the City Engineer urged the City Council to award the contract for the outfall to a local contracting firm, and they did. The outfall, which the City Engineer had estimated the cost at $2 million, was finally built at the cost of $5 or $6 million by the Atkinson Construction Company.

This process almost immediately broke down. The coming on of detergents so interfered with the operation of the activated sludge process as to present very confusing problems to those who were in charge of operations. Anyone who is familiar with sewage treatment can well remember the tremendous volumes offoam which accumulated on the tanks and which blew away in large clouds for miles across the country, dirtying things up. They also found that their sludge disposal processes onshore, of heating and filtration and drying, were not in good shape. And, finally, the operation of this plant comprised the discharging of the effluents through the outfall but discharging most of the digested sludge with it. The outfall end was so close to shore that much--if not most--of this adjusted sludge came back and settled on the ocean floor between the end of the outfall and the shore and was an extremely messy situation. They then brought the matter up still further and finally determined to submit the disposal problem. [tape recorder turned off]

I should have stated at this point that the State Water Pollution Control Board had stepped into the picture because

of the delay on the part of the City of Los Angeles to do anything about the shore contamination which resulted after the plant designed by Metcalf and Eddy had been built. To do this, they imposed their authority on the local board and held a public hearing in the State Building in Los Angeles at which appeared all of those in favor of doing something else and those opposed to it.

Prior to this, and because of the situation which I felt was developing at Hyperion, I recommended--and my recommendation was followed--to the Board of Directors of the South Bay Cities Sanitation District, which bordered Santa Monica Bay and which was one of the districts of which I was in charge, that they disconnect their sewage disposal lines from those of the City of Los Angeles and pump the sewage under the hills and over some of them through a tunnel line to connect to the County Sanitation Districts main trunk sewers in District 5 and flow the sewage to the outfall at Harbor City and thence to White's Point, which they did. So that we were, as a sanitation district, safely out of the contamination picture.

The Mayor of Manhattan Beach protested the idea of building a long outfall and reducing the process of treatment to primary subsidence instead of the activated sludge. He insisted that the shore would be contaminated, and also he insisted that the Sanitation Districts in which he was the director were contaminating the beach at White's Point; and that as long as the

Sanitation Districts were doing so, they had little reason to expect that the city lines would cure the situation as soon as the long outfall was built, and he protested against this.

So when the Public hearing came up, the matter of the public hearing before the State Water Pollution Control Board came to the head. I disqualified myself and the vice-chairman, Mr. [DeWitt] Nelson, took over at this hearing. Mr.Foye, who was Mayor of Manhattan, expressed himself loudly as did many of the citizens of the Santa Monica Bay cities, and in particular the City of Manhattan Beach which was the most affected of all of them. The State Water Pollution Control Board had felt that the action of the local board was not prompt or severe enough. And they, at the request of some of the citizens in the area, agreed to assume jurisdiction of the matter and to hear it; this was not a very pleasant thing for the local board to have to endure, but we felt on the state board that it was necessary. The state board concluded that building of a proper ocean outfall at a sufficient distance from shore and the primary treatment would be sufficient but imposed the obligation on the City of Los Angeles, and on all like dischargers, that the monitoring of the outfall and the disposal of sewage would have to be done by the City at the expense of the City and in a manner which would be prescribed by the state board.

Suffice it to say at this point that the City of Los

Angeles turned the matter of disposal over to their Board of Public Works engineers, the principal of whom was Mr. Norman Hume at the time. An outfall was designed some five miles in length, taking primary effluent offshore that distance, and a sludge line was built seven and a half miles to discharge the final sludge underwater some 500 or 600 feet. Both of these have been in operation for a number of years and have operated with great satisfaction. I determined this just the other day by calling the Chief Engineer, William Garber, of the City of Los Angeles Hyperion Plant and asking his opinion on how the matter was working, and he told me that they had no complaints, that they had had no shore contamination and no difficulties.

The state board did not hold all of its meetings in their headquarters in Sacramento; they would have their regular meetings at different locations. There was one that I remember very well that was held at Brawley, down near the Mexican border, in which the matter of the drainage from Tijuana into Agua Prieta and from that into other Mexican cities, or vice versa from Mexico, were dicussed and the matters settled as best they could be without infringing upon international relations. These matters were presumed to be regulated and judged by the International Boundary Commission, and as a matter of fact, some work had been done and some recommendations made. But the accomplishment of these matters was very slow, and the local boards felt that a little reinforcement of opinion

from the state board might be beneficial.

There also was a situation which had developed in San Diego where there was gross pollution of San Diego Bay, and it was felt that the state board meeting at that point might be of interest to the citizens and might stimulate the construction of more adequate sewers. The same thing was true in Ventura County. It also was brought to the state's attention that San Francisco Bay was in need of a very considerable amount of sewerage or sewage treatment and proper disposal from cities surrounding the bay, particularly those up around Carquinez Strait and through that area, as well as up through Stockton, Sacramento and those areas bordering upon the Sacramento River and its outlets. The state board met at a number of these places, a good many of them as a matter of fact, in order to acquaint the citizens in each of the areas with the chain of command and the chain of enforcement that existed between the State Water Pollution Control Board and the subsidiary or regional boards in the nine watersheds. [tape recorder turned off]

In about 1955 or so, the federal government enacted a law which provided for a grant of $50 million a year as matching funds for the construction of sewerage works throughout the United States. This had been inspired by the Ohio River Conservancy District for which there was to have been a considerable amount of money donated by the federal government in order to get the clean-up of the Ohio River and its

tributaries underway. The river was grossly polluted and very foul from industry and sewerage works. Instead of giving the entire $50 million to the Ohio Consevancy District, which in my opinion was the proper thing to do, the several state representatives in Congress insisted that the money be divided up among all of the states as matching funds so that on the basis of population some of the states got a little bit and some didn't get quite so much--the State of California got 2 or 3 million dollars but was one of the states with a high population. The Conservancy District got practically nothing excepting what might be donated by the state's tributary from their matching funds provided by the federal government.

To my mind, this matter of allocation was wrong; it didn't give anybody enough to really do the job correctly, and I opposed it when I had been appointed to the Federal Water Pollution Control Board by President Truman, along with one other member from Kansas City, Mr. Tom Veatch. I opposed this entire scheme, stateing that I knew of the origin of the need and that it had started as something to be used by the Conservancy District to clean up a grossly polluted stream and that I didn't believe in federal allocations very much anyway, but it went on just as the senators and representatives in Congress decided. Our words fell on deaf ears, and they went ahead with this plan anyway.

To be perfectly honest, I believe that the allocation of matching funds in a modest sort of a way has great stimulated

the construction of sewerage works throughout the United States, and in particularly in the State of California. These matching funds in the State of California were allocated in compliance with the recommendations of the State Water Pollution Control Board. This became one of its principal functions, and it always was oversubscribed by those who wished to use it, which was exactly why it was intended. It did an amazing amount of good by stimulating the construction of an impressive number of water pollution control plants, which then were called sewage treatment plants. [tape recorder turned off]

There also was a state subsidy which was given to the various counties and cities for the construction of sewerage works. It was known as the Christmas Tree Fund. It consisted of $90 million which somebody decided in the Legislature was excess funds and that sewerage and sanitation was one of the principal needs of the State of California, and that this money should be allocated on the basis of population of the several cities as modified by the population of the county. This money or $10 million of it, went to the City of Los Angeles to help construct the Hyperion Works, that portion of the Hyperion Works which fell into disuse quite promptly after the plant went into operation. But it also was allocated to the cities within the Sanitation Districts and these cities were prevailed upon--and in most instances did--to reallocate this money to the Sanitation Districts to construct trunk

sewerage systems and extend the treatment works of the Sanitation Districts.

This fund of $90 million was administered in a manner which would have done credit to the federal government had they had the initiative and the disposition to make the allocations in the manner in which the state did. There was very little fanfare to it; there were very simple rules with which to comply and very few men were involved in the allocation of this fund. The population was counted as of a certain time and that money was devoted to the Sanitation District.

In a number of instances where the cities were loath to give the money to the Sanitation Districts, as in the case of Pasadena whose City Manager was opposed to turning loose any money which came the way of the City, I made a deal with him, with the full knowledge of the state, that if he would donate the money to the district, I would prevail upon our board to use it to buy certain trunk lines within the City of Pasadena, which had already been built at the City's expense, and which would be of use to the Sanitation Districts. So the transaction was merely a paper transaction. They agreed to donate the money to us and we paid it right back to them. So under those circumstances, they were allowed to use the money for any purpose that they pleased. It did some credit to the Sanitation Districts, although it was frankly a subterfuge, because it would not have hurt the City of Pasadena to donate the trunk sewers to the Sanitation Districts anyway; it merely relieved them of the necessity of maintaining them themselves.

In two notable instances, the cities refused point-blank to give any of their money to the Sanitation Districts. These two were the City of Los Angeles and the City of Long Beach. The Engineering Department and the Sewerage Department and a number of the appointed city officals of Long Beach were opposed to the Sanitation Districts from the start and made no bones about it.

TAPE NUMBER: II, SIDE TWO

April 20, 1966

Rawn: I joined the Los Angeles Section of the American Society of Civil Engineers, and in attendance at one of the meetings, within a very short time I gained a picture of the situation with respect to water supply and to water supply and sanitation as it affected the City and County of Los Angeles. Three subjects occupied much of the attention of the society at its regular monthly meetings. One, and the most important, was just where was the next supply of water to come from after that which had been imported from the Owens River was exhausted. The second was the matter of sewerage and sanitation for the City of Los Angeles which was creating a most deplorable condition in Santa Monica Bay. And a third, oddly enough, was the subject of rapid transit for the City of Los Angeles upon which a study was being made or had been ordered and was being undertaken by I believe, a firm known as Koelker DeLau.

Since in my employment with the county I had been engaged to pursue the matter of storm drainage for the entire county outside of the City of Los Angeles under the direction of A.K. Warren and had just come from a project on which massive quantities of water were supposed to be moved sometime in the future, I felt right at home in the society's meetings and plunged into them with what vigor I could command. The quantities of water which had been handled in the King Hill Project were something on the order of that which flowed into the City

of Los Angeles from the Owens River, and I was asked to address the society group on how this job was done and how the various flumes, siphons, canals and laterals were built and, in general, what the situation was in that area when it became necessary to transport such large volumes of water over such terrain as existed.

Thinking back over the matter from the vantage point of 1966, it seems to me that the King Hill irrigation system--the long single canal, like an umbilical cord, winding along the sides of the mountains and finally delivering a relatively small amount of water a long distance from the source--was not unlike the situation which existed in the Owens River Aqueduct, which had been built to convey water to the City of Los Angeles, traversing rough country for a long distance and finally delivering its water to the City in the San Fernando Valley. Quantities of each of these systems escape me at the moment, but it would appear to me that they were about equal, or very nearly so except that one was to be used in vast assignments for the irrigation of land while that for the City of Los Angeles was to be parcelled out in a metropolitan water system, which provided a small amount of water for each user.

By delivering this paper to the American Society of Civil Engineers' local section, I became acquainted, or at least identified, with practically all of the responsible water drainage, sewage, road and highway engineers in the metropolitan area of Los Angeles, a fact which stood me in

good stead for all of the time that I worked in the Area. Again I would emphasize that any engineer, at least civil engineer, who comes into the metropolitan area of Los Angeles--or any other for that matter--and fails to identify himself with and attend the meetings of the society which represents his branch of the profession is doing himself a great disservice, because it is at these meetings that those problems which are pressing in the area, and particularly those of the nature for which the man's professional background qualifies him, are being discussed in detail and in the language which he understands.

During the year or year and a half in which I was identified with storm drainage in the Los Angeles County Surveyor's Office, I learned a great deal about the situation with respect to sewerage. Indeed, all of the preliminary work on the Sanitation Districts ran concurrently with the work on storm drainage. [The way to consummate] the work, preliminary to the organization of the Sanitation Districts, was to do it in connection or in conjunction with the work which they were performing for the county in storm drainage and the like.

Consulting a diary which I kept from the first day of my employment with the county, I find that within a month or so I had submitted, as the engineer assigned to that work, a plan for the sewerage of County Sanitation District No. 4, which was a small area in the West Hollywood section, the area being surrounded by the cities of Los Angeles and Beverly Hills and being entirely unincorporated. It was not a very

difficult task nor did it take a great deal of time, perhaps a week or ten days at the most, and it was merely to provide the trunk sewerage for the area and a connecting line to connect it to the existing sewerage system of the City of Los Angeles.

My notes in the diary further indicate that after presenting the plan for sewerage of District No. 4 to the engineer in charge, A. K. Warren, I was assigned to do the same sort of a job for a Sanitation District No. 5. This district was a huge affair, extending from the north boundaries of Inglewood and including all of the land west of the "Shoestring" strip, down to and including the Palos Verdes Estates, with the exception of a narrow strip along the seacoast in Santa Monica Bay which later became known as the South Bay Cities Sanitation District (in which I also had a hand in the design and tried out a number of possibilities for purification and disposal of the sewage into the sea in much the same manner as was being done by the City of Los Angeles, or was proposed to be done by the City of Los Angeles). This small district by the way was directly assigned to an engineer named Carl Reeves who died recently at the age of 83 or 84 and who went on to be the construction engineer of the South Bay Cities Sanitation District which included: part of the City of El Segundo; the three coast cities of Manhattan, Hermosa, and Redondo; and a small portion of the Palos Verdes Estates and some unincorporated territory.

With the exception of this small area along the seacoast, Sanitation District No. 5.included all of the territory excepting as noted for the South Bay Cities Sanitation District and excepting that which was included in the City of Wilmington and any other part of the City of Los Angeles in that area. The plan which was evolved for District No. 5 contemplated moving all of the sewage in the northerly part of the district to the south and bringing that from the north slope of the Palos Verdes Hills to join it in the vicinity of Torrance. It was presumed at the time that the south slope of the Palos Verdes Hills would be drained to some central point, treated and joined with the rest of the Sewage District No. 5 and all of it ultimately discharged or disposed of in the ocean off the Palos Verdes slope.

Concurrently with the preparation of the plant for District No. 5, other engineers and staff were engaged in working out plans for the Districts 1, 2, 3, and 8, which lay to the east of the "Shoestring" strip. As originally proposed by Warren, the sewage of this area, together with any other that might be collected to the north of the Whittier Narrows, was to be disposed of through an outfall which led in and across Orange County and discharged its contents off of the south border of that county into the sea--a plan with which I was never in sympathy because I felt sure that once it were proposed, Orange County would resist it with everything possible because of the condition of outfalls and sewage disposal at sea along the

California coast at that time.

One must realize at this point that the Colorado River Aqueduct had not been definitely decided upon and neither, for that matter, had the location or construction of the Hoover Dam. These matters were still in the future, and the water situation of Los Angeles and its vicinity was being viewed with some alarm on the part of water users because of the rapidly lowering wells in the various valleys which were underlain with water. The masterful intervention into the scene of Mr. Hoover, who later became President, and his sucœssful efforts at organizing the various states in the construction of the Hoover Dam and its accompanying water to Los Angeles, power generation, and so forth was yet to come, and there was still uncertainty as to whether or not the city would or could go to the Colorado River for water, although engineers in the area insisted that it was the logical thing to do.

One of the uncertainties concerning this source of future water was the reason for considerable criticism of the plan of the Sanitation Districts to dispose of the sewage from the area outside of the City of Los Angeles into the ocean instead of purifying it in the small increments and using it in agriculture and industry or anyother means which might be appropriate. From the vantage point of 1966, it seems a little bit ridiculous to think that the reclamation of water from sewage could have been a factor in whether or not the area should go to the Colorado River for water instead of reclaiming it from sewage which was being wasted to the sea. But it did have this

effect; and there was some, in fact a considerable opposition to the plans proposed by the Sanitation District to get the sewage together at some point in the south and, at that point, partially purify it by removing the grosser suspended solids from it and then dispose of the residue in the sea.

Such ideas were greatly encouraged by engineers in private practice who saw in the Sanitation Districts the solution of the sewage problem for the area on a massive scale and not by individual plants which undoubtedly, were the latter to be used, would be designed by engineers in private practice. One can scarcely blame them for this because it did interfere with what might otherwise have been a very lucrative practice.

For my part, I was wholly in sympathy with the project involving ocean disposal of primary effluent from a sewage treatment plant owned and operated by the Sanitation Districts, but from my study of the situation I could see no possibility of building a sewer to drain the sewage from the County of Los Angeles into and across the County of Orange and discharge such sewage off the south shore and the beaches of Orange County. This seemed so utterly impossible to me, both from the standpoint of law and equity, that I discussed the matter with A.K. Warren and others who were in superior positions in the county and had something to do with the project, and urged them to dismiss from their minds such a possibility and to confine their inspection to sewage disposal within the county itself or off of the county's southerly or westerly shore.

As I have said, A. K. Warren was in charge of this branch of the investigation and I feel quite sure looking at it from the current standpoint that he himself was only moderately in sympathy with any effort to try to get the sewage of this county over into and through Orange County. I was equally opposed--and expressed myself to Warren in the matter--on attempting to build a complete purification plant for sewage in Los Angeles County at the time the original ivestigation was being made or whenever funds might be provided for doing it. I felt reasonably sure that sewage effluent from a primary treatment plant could be disposed of in the ocean without nuisance or menace to anyone or without interfering with playground and recreational areas if a spot could be found where this could be done. And I so expressed myself in this matter to Warren, who was quite sympathetic to the idea.

These convictions on my part led me at least to a consideration of the only remaining possibility for ocean disposal that existed in the county, namely, off the south shore of Palos Verdes Hills. The difficulty here lay in the fact that a barrier existed between the south county and the Palos Verdes Hills in the form of the San Pedro Hills, which were practically mountainous in their extent and would require a line around them on the easterly end and which would have to go through the City of Wilmington or over the top of them through a pumping station or through a tunnel which might be cut directly under the hills at any convenient point.

In this plan, I had the backing of one of the most influential of the District Engineers, H. R. Bolton, who now lives in the area but is retired, and together we presented a plan to Chief Engineer Warren to the effect that we collect all the sewage in the southerly part of the county, including that from District 5 which would necessarily have to cross the "Shoestring" strip--a matter about which there was considerable debate in the city offices--and thence [through] a tunnel under the Palos Verdes to a spot known as White's Point, build an outfall to the sea and discharge the effluent from the entire Sanitation District area--excepting that which was naturally tributary to the Los Angeles City System--into it for disposal to the sea.

The plan looked so favorable to the powers in control that they immediately gave it their wholehearted support. I embarked upon a scheme for disclosing the phenomenon of ocean diposal sewage in relation between the effect of the depth, direction and velocity of the discharge upon the dispersal of the sewage in the seawater, and hence its rate of purification and oxidation. The conclusions with respect to the treatment and disposal of the sewage, that is, the conclusions which were reached by the staff as the proper modus operandi, were not shared unanimously by the directors of the district or a number of engineers who resided and had their offices and their engineering activities in this area.

The alternative to ocean disposal, of course, was complete

rectification, or as near as possible, complete purification of the water, which was the sewage character in small plants or large ones in the area, and its return to useful purposes in industry or agriculture or for whatever purpose it was suitable. It must be remembered in this connection that the water from industry and from domestic sewage which flows to waste in the sewers is about one-half of the water which is delivered through the water supply system in a city or a metropolitan area, such as Los Angeles County was rapidly becoming, and if this water could be saved by purification at a cost considerably less than the importation of additional water, it might be appropriate to attempt to save it by means which were then known and return it either to ground waters or to use in agriculture or industry as suitable.

I don't know whether this had any great effect upon the activities of those engaged in furthering the Metropolitan Water District plan, but it's my impression that it did because there was at least an alternate to going to the Colorado River for water at that particular time, if it were possible to rectify the sewage of the City of Los Angeles and that which might be collected or gathered together in the County Sanitation Districts. And while this would not settle the matter and provide for all of the future needs of the metropolitan area, it would at least be a stopgap and a partial plan of supply which might be used to stave off the necessity for the very expensive construction involved in the Colorado River Aqueduct and plan.

As for our part in the county office under the direction of Warren, we made it perfectly clear that every possibility for water purification from sewage was being studied and investigated, and that if it were considered feasible to do the job, rather than dispose of it in the sea, we would so report to the public. I think one of the principal reasons why many people opposed ocean disposal of sewage was because of the condition of the ocean in the vicinity of the ocean outfalls along the California coast and, in particular, the shocking conditions that prevailed at the outlet of a 2,000-foot outfall which the City of Los Angeles had built in Hyperion. But the City of Los Angeles was at about that time contemplating the construction of a new sewage treatment plant at Hyperion so as to supplant the old one which, while not in a state of disrepair, was quite antiquated, and a new outfall which was to extend 5,000 feet to the sea and discharge its contents through a wye in fairly deep waters so as to keep it offshore.

We in the Sanitation Districts had the experience of the City of Los Angeles before us in practically everything that we undertook in connection with ocean disposal of sewage. And in particular after the new Hyperion plant was in operation in, I believe, 1924, we had an opportunity to see a number of things which were not appropriate in that type of construction and which would not tend to dispose of the sewage in a satisfactory manner. One of the first and most important investigations which we made, that is, with repect to the disposal

of sewage, was a study of sewage diffusion in salt water. In this, I undertook to make some investigations in company with Dr. H.K. Palmer who was serving as a hydraulic designer for the Sanitation Districts, and together we worked off and on for a matter of two years in attempting to discover how best to design an outfall to promote wide and rapid dispersion and diffusion and thus get the sewage purified as promptly as possible after it had reached the ocean. Suffice it to say, there appeared to be ample evidence for us to proceed at the time we did in constructing the ocean outfall rather than to attempt shore purification, although it cannot be said that the complete rectification of sewage on shore and its return to agriculture and industry was overlooked or was not investigated.

It was a very pressing question at the time and I feel--and will always feel--that it had its effect upon speeding up and stimulating the desire of the Metropolitan Water District to be organized and to develop the Colorado River water with the end of building an aqueduct to the Los Angeles metropolitan area and to southern California generally. It would be gratifying to know if this were actually so; however, I was insufficiently associated with the water development people in the area to know just what their feelings were regarding it. Judging by their resistance to any effort on the part of the Sanitation Districts or the City of Los Angeles to attempt any type of water reclamation from sewage in later years, I cannot help but feel that there was a feeling on their

part that the alternative to Colorado River water was the purification rectification of water from sewage and its return to the useful purposes in the area, and that this stimulated their efforts to get the Metropolitan Water District law enacted and to put the thing in motion.

If the Sanitation Districts efforts had this effect upon it, I am very happy because I would never advocate the use of sewage as a raw water supply if any other better source were available, particularly if that from a river such as the Colorado could be diverted to southern California. It would seem rather ridiculous for the city or the area to attempt to supplant it with water derived from a source such as domestic sewage and industrial waste, and I would be the first to advocate the use of the better water, even at a much greater initial cost.

The Sanitation Districts were not alone in their efforts to investigate the possibilities of using sewage as a raw water supply. In the City of Los Angeles' Water Department, there was a chap named R.F. Goudy, Ray Goudy, who was an MIT graduate, I believe, and who had served in the State Department of Public Health. He was hired by the Los Angeles Water Department as a chemical engineer in charge of water quality for the department. Goudy's interest in water for the Water Department prompted him to persuade his principals that it would be an appropriate thing to build an experimental plant, which might be done using sewage as a raw water supply, and

this he did by building a plant out in Griffith Park. It was of modest proportions but was built on the principle of the activated sludge process, followed by a further refinement of slow sand filtration and final chlorination. Actually, the water which finally resulted from this was of sufficient quality so that it could be used for domestic purposes if that was desired. The water was discharged from the little pilot plant which he had built and drained into the underground aquifers by discharging it onto sand beds adjacent to the river.

The project was not very widely advertised; very little was said about it and still less was written about it. Had Goudy been of the frame of mind to publicize the matter more and to get a better and more critical and perhaps more competent group of people interested in it, it might have made a great impression on the public at large. But he said very little about it and the records which he left are, so far as I know, quite incomplete. I visited the plant on many occasions and watched the entire method by means of which he took the solids from the sewage and rendered the sewage water reasonably pure by the activated sludge process, with secondary sedimentation and removal of the activated sludge, and finally by filtration through a slow sand filter and final chlorination. The water which was produced was clear and crystalline in appearance but had, as might be expected, a slightly alkaline taste due to the dissolved solids picked up by virtue of its use in sanitary conveniences.

There has never been very much said or written about the

plant, but I feel thatthis demonstration on his part tended to convince the unduly skeptical in various water plans that water could be reclaimed from sewage and rendered quite usable. I think the advent of this Goudy plant had quite an effect on those who were in pursuit of more water for southern California. They could hardly fail to be impressed by the fact it had been built by the Water Department of the City of Los Angeles and that it was not proposed as a means for the disposal of the sewage of the city in any sense of the word. In fact, its use could only be for that of reclaiming water from sewage for use in the city area.

I did not think very much about it at the time, but looking back on this standpoint of 1966 to those days, I realize that it could not fail to impress the citizens and public officials in the area who were striving so diligently to bring the Colorado River water into the area. That thought is fortified to some extent by the fact that the City of Los Angeles was not ready and would not take or accept any of the Colorado River water--that is, not any considerable quantity of it--for some time in the future. I think that Goudy's little plant for the Bureau of Water and Power of the City of Los Angeles was the first rather strong jolt that the Metropolitan Water District people felt in opposition to their efforts. This may have been, probably was the reason why the virtues of the little plant were not widely circulted.

I recall also that at the time the Metropolitan Water

District had completed its canal to serve the area to which the canal led, and the cities and towns and so forth that were going to profit from it. The total amount of water that was to be conveyed at that time and subsequently for a number of years was but a small fraction of the actual amount of water which the treaty had provided for the City of Los Angeles. I well remember that a number of very prominent engineers, especially Raymond A. Hill, the son of Louis Hill, were opposed to building the canal of full dimension for transportation of the maximum capacity provided for in the treaty.

The Metropolitan Water District was a noble concept, but it did not have easy sledding in its early years. But as I now contemplate the situation as it then existed, I rather have the opinion that the financing of the project and its plans were assisted to a considerable extent by the fact that the citizens of the area were told in some detail that without additional water supply from some other source it would be necessary for water to be reclaimed from sewage for certain purposes and possibly for unlimited use in the area, and that this idea was quite repugnant to citizens who learned about it; and therefore, while the public display of a plant which could reclaim water from sewage and the display fostered by a large water authority in the area may have been sort of a gadfly to the Metropolitan Water District officials or those who were attempting to promote it, it possibly in many cases worked just in reverse and helped the

financing and the sale of the bonds. These are merely speculations after the fact.

This discussion of the reclamation of water from sewage, or rather using sewage as a raw water supply, prompts me to comment that in my rather long experience in sanitary engineering, related almost exclusively to the matter of sewage collection, treatment and disposal, and in a statewide and nationwide association with engineers engaged in the same general objectives, I have yet to discover one of them who would advocate the use of reclaimed water from sewage in preference to using that diverted from a flowing stream or lake of fresh water--and this even though the lake or stream were badly polluted or contaminated by the discharge of raw sewage or sewage effluent upstream. The factors that prompt the use of reclaimed water are quite simply an inability to get water from any other source or from a source which is so costly as to be prohibitive.

I am, of course, speaking here of water to be used for unrestricted purposes and not merely for agriculture or industry where the use of effluents derived from sewage purification plants would be perfectly appropriate. Of course, it is a fact--although not discussed in the better circles--that much of the water that was used before the sewage system of the City of Los Angeles was built and before the sewerage system for the surrounding areas was built by the Sanitation Districts was derived from the drainage of cesspools and septic tanks,

and the effluents from some of the small treatment plants that were constructed in the area which discharged the water from these plants directly into water courses from which it reached the underground water pools and from which latter, some 500 water production or distribution organizations furnished water to the population of the area.

Now, whether or not the metropolitan area of the City of Los Angeles and its surrounding areas of Orange and Ventura and Riverside and San Diego Counties will ever reach the point where the importation of water is so costly as to actively promote the use and development of a domestic water supply in part from purified sewage, remains to be seen. But based on past analysis, I think it is quite unlikely until the area becomes so saturated with population that there simply isn't enough water in sight to supply the development. The venture of Los Angeles City to the Owens River Valley and the importation of water from that source was at one time considered a real masterpiece of water works engineering. And it certainly was. When citizens in the area began to promote the idea of going to the Colorado, there were many who felt that they were undertaking a task so Herculean in concept and extent that it would never be done. Actual flow which has been imported from the Colorado River has all been apportioned, and currently the state is building a massive water system, extending from central California to the southwestern portion, and will deliver its contents to the great metropolitan areas

in southern California by reaching here despite the formidable Tehachapi Mountains which stand as a barrier between northern and southern California.

A very grandiose scheme has also been projected but not, I believe, by public officials--to so conserve the fresh water flow of the rivers and lakes of North America as to supply the entire area of Canada, the United States and Mexico, and possibly Central America, with an abundance of water for all future needs. Going outside of its continental borders for more water will present problems to the federal government that will transcend any which have been encountered, or will be encountered, in developing the nation's own supply. I honestly believe that the use of reclaimed sewage water for any but limited purposes in southern California lies a long way in the future if it ever is invoked. But it is not to be ruled out as a potent factor in agriculture and limited industry if the water which is imported to the area ever becomes so expensive as to be prohibitive for those purposes.

With other engineers of my ilk and breed, I kept the matter before the public and before public officials by demonstrating that it could be done and that it would probably be more economical in the long run to develop reclaimed water from sewage for industrial and agricultural use and for limited use in replenishing underground aquifers than to use the strictly imported fresh water for these purposes. For some reason or other, the officials of the Metropolitan Water District, and

particularly the officials on the Board of Directors of the Metropolitan Water District, have refused to recognize this as the objective of engineers who promote the salvage of good water from sewage, or rather using sewage as a raw water supply. They have been so fearful of the outcome of any new development in water reclamation in the area that they have been most critical of the Sanitation Districts' efforts to demonstrate what might be accomplished by the processes of reclamation.

Shortly after World War I, I attempted to get the past County Sanitation District Act amended in such a manner as would permit the Sanitation Districts to go into this activity on their own accord. The existing law allowed the Sanitation Districts to dispose of any byproducts from the treatment process but did not allow them to enter into the water reclamation plan as a project financed and operated by the Sanitation Districts. I was in Sacramento at the time that the assemblyman introduced the bill for the revision or modification of the Sanitation District Act to allow the water reclamation idea to go forward, and I was in his office when he called certain officials in the Metropolitan Water District and asked their opinion. Without exception, they followed the general impression which I had already been given by Joseph Jensen, the chairman of the Board of Directors of the Metropolitan Water District, that the modification of the bill was a bad thing to do and that it might interfere with the

activities of the Metropolitan Water District in furthering their plans and that the sponsor of the bill should discourage its passage, wich he did.

The opposition by the Metropolitan Water District to any measure in the Sanitation District Law or any move on the part of the Sanitation Districts to provide sewage treatment and disposal which will produce as one of its end products water which may be used in agriculture or limited industry or be used to percolate through the sands into the underground waters is resisted. But I also believe that the activities of the MWD officials is spurred on by the fact that there is an alternative water supply for a good many purposes and that it is being demonstrated quite clearly that this water may be produced and at a cost considerably less from any readily foreseeable other source. But the MWD's resistance to the Sanitation Districts' production of a readily reusable source of water from the disposal of sewage is a foregone conclusion in the plan of the Sanitation Districts to dispose of the sewage, and that the water so produced may be used in any manner which the citizens of the area desire to use it does not seem to be apparent to the district officials. But, actually, it certainly is a fact that theyhave a far better product to sell for domestic and industrial water, or any other types of water which may be in general use, than any sewerage agency which is producing this water or by using raw sewage as a raw water supply.

The original concept of the Sanitation Districts was based on the selection of one of two alternatives: either disposal of a partially purified effluent to the ocean for final waste; or the construction of sewage purification plants which would produce as an end product in the way of water one that might run in the drainage courses or percolate underground. And the original Sanitation Districts' choice of one of these two alternatives was to perfect a sound and solid system which would convey primary effluent from sewage treatment plant to the ocean for final disposal, and once this was established in such a manner as to preclude the possibility of sewerage failure in the area in which the districts were building, they could proceed with smaller oxidation plants throughout the area, which not only would supplement the capacity of the ocean disposal process but, by the very nature of the wide dispersion of these oxidation plants throughout the entire area, would provide a substantial bulwark against the failure of the entire system because of the failure of one of the oxidation plants. It certainly is a fact that the best constructed oxidation plants or activated sludge plants or other types of complete puification processes do fail to operate satisfactorily under certain conditions.

The point here is that the construction of a considerable number of small oxidation plants which will produce a rather impressive amount of well-oxidized plant effluent which is adaptable for use in industry, agriculture and in some cases

for the recharge of underground aquifers is inevitable, and that one of the important reasons why such plants were not built many years ago was because of a meeting of the minds between sanitary engineers and water supply engineers that the importation of water from either the Owens River Valley or the Colorado River, or both, was far more desirable than had been the attempted use or dependence upon a water supply derived from the treatment of sewage. The fact of the matter is that the only thing which can defeat the bonds for bringing in additional water from the north, or from the Columbia, or from any other sources from which it is available, will be errors in judgment and mistakes in construction by the MWD itself, and I find it difficult to believe that with so astute and capable an engineering organization as that department possesses that such mistakes will ever be made.

I have never been favorably impressed by the governmental policies of the Metropolitan Water District. It is my impression that despite the agonizing of many of the members of its Board of Directors, and particularly the chairman, the success of the entire venture has been and will continue to be in the hands of the administrative staff and not what should be the policy—determining body. I believe that the members of the Board of Directors of such a district as that should not be men appointed or selected by the governing board of any city or district which is a party to the whole general plan, but should be selected from elected public officials in that city.

In my direct contacts with the Board of Directors of the MWD and appearing before that board on occasion, I recognized in its membership a half dozen engineers who were representing the several cities and districts in the metropolitan area. If there is anything that the Metropolitan Water District does not need, it is engineers on the policy-determining body. They have now, and they have always had in my recollection and in my knowledge, one of the best and most capable groups of engineers that has ever been gotten together under the leadership of, so far, four men of great national and international reputation.

I think that the very framing of the act missed a vital point when it failed to provide that members or representatives for any city or district on the MWD Board of Directors should be elected public officials, familiar with policy determinations from the standpoint of its advantages to the public, and not watchdogs to determine whether or not the great engineering and management staff of MWD was performing adequately. In these comments, I have no ax to grind with the engineering members of the board, many of whom I know and admire; it simply is that I believe that there should be a clear line of demarcation between a policy-determining body and an administrative organization, which latter might be termed as an engineering and management group.

TAPE NUMBER: III, SIDE ONE

April 26, 1966

Rawn: There was little doubt in my mind that water reclamation from sewage will be resorted to only when other available supplies have been exhausted. The most potent reason for this is the source of the raw water supply. It certainly is a fact that instinctively one cringes from the thought of having water for unrestricted use supplied from a source which just a short time previously had been thoroughly and grossly contaminated with sewage, industrial wastes and the various types of human excrement and all of the filthy things that go into the waste and wash water of a large community. It is equally probable that all of these matters may be removed and that the water may be rendered sufficiently pure for unrestricted use if properly treated.

And indeed that is what happens in nature. But unfortunately in nature, the course which is traveled is a roundabout one, and many days, weeks, years and eons elapse before the next use [can be made] of certain waters which are wasted. The structure of the water molecule is not changed by use and by contamination as sewage or industrial waste or anything of the kind. It simply picks up these obnoxious materials and matters as it is being used in nature or by man in his environment. There is an old saying among water works engineers that the water which one pulls out of the tap today may be in part that which Cleopatra's barge floated on in the Nile many years ago.

The natural process in nature usually amounting to evaporation and reprecipitation as rain or snow is not only the oldest process known but certainly is the most thorough, the water being extracted as water vapor and precipitated again as snow or rain. Its purity when it comes from this natural source is unchallenged, and as rain water or melted snow, it is probably in its purest form obtainable through natural processes. The fact remains, however, that man in his inventiveness has copied some of the natural processes, particularly those which are biological in character, and is able to do in small quantities in a very short time what it takes the natural processes eons of time to accomplish.

To be sure what man accomplishes biologically does not produce a water which is as pure and as free of all contaminants as the evaporative process as used by nature, but it does get the water into a usable form and, followed by sand filtration through the ground, will produce a clear, sterile water from which all harmful bacteria have been removed but which still contains many of the salts which the original sewage picked up on enroute to the sewage treatment plant. Unfortunately, all of the nitrates are not removed by the process, either in the sewage treatment plant or by travel through the grounds, and this does pose some objection to unrestricted domestic use, although it is obviously a benefit to crops if the water is used for irrigation purposes. It should be obvious, therefore, that so long as a flow of sewage

exists in an area, man in his wisdom has the ability to create a supply of water in addition to that which is brought pure into the locality.

And this ability and operation has been the subject of much discussion, much investigation and considerable promotion in the southern California area. As I have heretofore stated, I arrived in southern California, Los Angeles to be exact, early in 1924, having left the United States Reclamation Service upon completion of the King Hill Project and the Columbia Basin Survey in Spokane, and without going into any attempt at history of the water situation in southern California, I am correct, I'm sure, in saying that the subject of reclamation of water from sewage has been looked upon as an alternative to importation of water ever since that time.

The most promising type of water reclamation facility considered in water reclamation in those early years was the activated sludge process, which having been perfected in England by English engineers, was imported into this country and was in use in a number of the eastern cities, notably along the seaboard and in Chicago and Milwaukee, and [the process] also was the basic pattern of the first successful sewage treatment plant in the Los Angeles area, being built for the City of Pasadena and some associate cities, as well as the small plant being built for Pomona and La Verne. As I have stated, the Bureau of Water and Power experimented with a pilot plant at Griffith Park in an effort to possibly demon-

strate that there was an alternative to going to the Colorado or to other sources.

There could have been a number of reasons why the Bureau of Water and Power did this; they may have had in mind that it was necessary to demonstrate that they were not unaware of the possibilities in the reclamation of water, using sewage as a raw water supply. To the contrary, it may have been built and operated as a demonstration to the Metropolitan Water District that the City of Los Angeles was not completely dependent upon the MWD for future water--or at least for all of their future water supply or their more immediate water supply. I was not sufficiently in the confidence of those who were promoting the MWD in getting ready to import water from the Colorado River to know exactly what their feelings were about this matter. But from the suspicions which they have evidenced each time the subject of water reclamation from sewage has come to the fore since the construction of the little plant at Griffith Park, I feel that both they and the MWD felt that the city was in a better bargaining position by having made the demonstration; and I therefore personally credit the plant which the Water Department built in Griffith Park as intensifying the promoters of the MWD in their efforts.

Nothing ever came of the little plant at Griffith Park. It was built; it operated successfully. It demonstrated that good water could be reclaimed from and that that water could be put back into the underground aquifers and be reused without

nuisance, menace to health or other inconvenience. But with the advent of the MWD water, it was torn down and forgotten.

The influence of this little plant might have been much greater if it had been more widely publicized. But it was not, and I venture to say that there are very few people in the area today who ever knew anything about it. I spent many hours at this plant with Goudy, the sanitary engineer for the City of Los Angeles who built it and superintended its operation from time to time, and with others whom I took to look at the work and to verify my statements that a good clear water could be developed at such a plant from such a source.

In the late 1940's following the surrender of our enemies in World War II, and in view of the tremendous influx of citizens into southern California and the possible increase in population and in industry in this area, public officials again began to examine the horizon to see what appeared in the way of new water supplies when the limits of the Colorado River use were in view. As a result of conferences between their employees and the Board of Supervisors itself, the Chief Engineer of the Flood Control and the County Engineer were instructed to collaborate with the Chief Engineer of the Los Angeles County Sanitation Districts in the preparation of a report which might indicate what the potentials were in water reclamation from sewage, what it would take to do it, and as to whether or not it was feasible and a practical operation.

With the permission of the directors of the Sanitation

Districts, I assured Messrs. [Carl] Arnold and [Harold] Hedger, respectively County Engineer and Chief Engineer of the Flood Control, that we would collaborate with them in the preparation of a report in which the Chief Engineer of the Flood Control and his staff would examine the percolation of water into the underground so as to prepare it for unrestricted use, while the County Engineer would supply such information as his office had with repect to this matter and others, and the Sanitation Districts would prepare a plan which they deemed feasible using sewage from the Sanitation Districts and getting into shape for acceptance by the Flood Control for underground replenishment.

This report, authored by Hedger, Arnold and Rawn, was submitted to the Board of Supervisors of the county and to the directors of the County Sanitation Districts in April, 1949. As finally prepared, the report dealt largely with the area embraced within the Sanitation Districts themselves and did not dwell upon the potentialities of the San Fernando Valley or the residential areas of the City of Los Angeles which flowed sewage equally susceptible to treatment. The report was given wide publicity, and sufficient copies were printed so that the report itself is in the files of many public institutions here and elsewhere and certainly in the archives of the various universities.

While the report did not form any sort of a hindrance to to the progress of the Metropolitan Water District or other

water developments in the area, it did stimulate their interest in getting the project completed and completely equipped with the necessary lines and reservoirs in the metropolitan area so that no shortage would or could exist in the immediate future. It also had a considerable effect on the price which would be charged by the MWD for water imported solely for the purpose of replenishing ground water and for agricultural purposes. It's my recollection that the MWD imported and sold water for underground replenishment at about $8 an acre foot.

This report of 1949 went far beyond any which had been previously prepared for this area. It disclosed the immense volumes of water which were being wasted into the ocean and which of themselves, not being contaminated with industrial wastes, were susceptible of purification and reuse. It discussed the laws and the needed laws which were necessary if the reclamation of water were to be invoked, and disclosed where and how the water could be percolated into the underground basins and what probably would occur to it during this process of percolation. This report by the three agencies involved--to wit, the county, the Flood Control and the County Sanitation Districts--prepared the foundation upon which all other reports and methods imposed, or proposed, for the reclamation of water in the area have rested.

In particular, the Flood Control District engineers carefully examined and enlarged upon all known processes of percolating water into the underground basins and testing it enroute. Their conclusions have been drawn upon widely

throughout the United States in this process. From the report, it was possible to conclude upon the limits which were involved and upon the methods and means of doing the job and approximately what it might be expected to cost.

The principal deterrent to going forward with some type of demonstration-project at the time was involved in the lack of authority of certain of the agencies to proceed and the lack of a sponsor which would take the water once it was reclaimed. It became evident that certain factors were lacking; laws and regulations had to be changed or modified, and the activities of a number of agencies coordinated in order to finance a demonstration plant in the first place and to provide for purchase of the water in the end. It also seemed at the time that the Sanitation District Law would need to be amended to permit them to engage in such an enterprise, but this was found not to be necessary in view of the fact that actual reclamation of the water constituted a disposal of the sewage, which was the job upon which the Sanitation Districts were primarily engaged.

Early in 1957, and in view of the rapidly increasing population of southern California and increasing demands made upon the MWD for water supplies outside of the City of Los Angeles, and indeed outside of the County of Los Angeles, the Board of Supervisors of the county adopted an order instructing the Chief Engineer of the Flood Control and requesting the Chief Engineer and General Manager of the County Sanitation

Districts to report upon the plan, which would disclose a method of reclaiming water from sewage in the area and its restoration to beneficial use. Such a report was prepared by Hedger and Rawn and was submitted to the directors of the Sanitation Districts and the County Board of Supervisors in November, 1958. This was a year or so after the resignation of Mr. Hedger as Chief Engineer of the Flood Control and was almost exactly the date of my retirement from the Sanitation Districts.

The 1958 report had in it all of the elements of a successful venture. The County of Los Angeles was to supply the money to build a plant at the Whittier Narrows which the County Sanitation Districts would design, build and operate. The end water product of the plant was to be turned over to Flood Control Districts, which organization was to percolate the water underground in the spreading basins below the Whittier Narrows, from which it could be pumped for unrestricted use by a replenishment district formed in the area by the West Basin Replenishment Organization. The price to be paid for the water which was so withdrawn from the underground by the replenishment group who would distribute it to users was to be sufficient to retire the obligation, including the cost of the plant itself, the cost of operation and maintenance, and the cost of spreading. All of the factors were present in this plan to make it successful, if indeed the reclamation of water from sewage could be made successful.

All the difficulties of planning and financing were overcome, the money was forthcoming, the districts prepared the plans, let the contract and in its operation produced a water which was perfectly satisfactory for percolation into the underground pools, which latter was done below the Whittier Narrows by the Flood Control District. The plant built by the Sanitation Districts with county funds was placed in operation in July, 1962 and has been in continuous operation since that time. It has been most successful in doing the job for which it was intended, and its operation and story are the subject of a very comprehensive report by the present Chief Engineer of the Sanitation Districts, Mr. John Parkhurst, and it has been noted by the American Society of Civil Engineers as one of the outstanding engineering achievements for the year in which it was built.

It is my recollection that the plant at the Whittier Narrows was built without much opposition from the Metropolitan Water District or from any other water authority in this area. The reason for this is probably because the West Basin Replenishment Organizations (its legal name is something other than that, but I don't recall what it is) were not in a position and could not purchase water at a reasonable cost from any agency then in existence which was producing water or importing it. And so criticism was not particularly evident.

There exists today, however, some fear on the part of Public Health people that the water will never be thoroughly

satisfactory in its present method of reclamation because of the nitrates which it contains and which appear in the water which is drawn from the underground, where the underground pool has been replenished from a source in which the production of nitrates is a corollary of its operation.

The situation is now entering another phase. Water from the Sacramento and San Joaquin area is being distributed through the central basin and is proposed to be moved into the Los Angeles area within the nextfew years. All of the water from the Colorado River has been allocated to the various constituent cities, and the Metropolitan Water District is now attempting to float a tremendous bond issue for a distribution of the Colorado River water but which will be of sufficient capacity and size to take care of the flow from the northern area of California when it arrives.

Within the past few weeks, the $850 million bond issue which has been proposed by the Board of Directors of MWD is running into some heavy weather, and in a measure, this heavy weather seems to have been anticipated a little by the MWD officials because they are allied to a man against a proposal which must be adopted by the County Sanitation Districts to increase the capacity of their sewerage facilities by building a number of complete oxidation plants similar to that of the Whittier Narrows, and discharging from these plants a water with all of the good characteristics of that which is now being discharged from the Whittier Narrows plant and which

will be available for irrigation and industry as well as for percolation into the underground beds, from which it may be repumped for unrestricted use.

It seems to be the feeling of the MWD officials--and when I speak of the officials, I mean the Board of Directors of that organization--that the presence or the anticipation of this water which is bound to be produced from these plants of the Sanitation Districts will constitute a barrier to the successful adoption of their extensive distribution plants. Whether or not it will do so is questionable. But there appears no alternative on the horizon to the construction of these plants, and if the plants are constructed, there is no question but that they will produce a type of water which may be used as that from the Whittier Narrows plant is now being used.

Were I a district official serving on the board of the Metropolitan Water District, I would have no fear, however, of the outcome. I still stand by my belief that water imported from a distant river source, water such as will come down from the north, is far more desirable than any which may be reclaimed from sewage, and that extensive use of sewage water for anything excepting irrigation and industry will not be chosen if it can be avoided.

The foregoing tape recording is largely, in fact almost entirely, from memory. It has I am sure some inconsistencies and some errors of names and so forth, which will be corrected when this manuscript is transcribed.

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