# A Prometheus Among Us:
# William Mulholland Brings the Water to Los Angeles

## The California Water Crisis, the California Water Management System, and the Solution—NAWAPA, Part II

*"These are the wages for befriending man,*
*To whom, flouting divine authority,*
*You have so rashly and wrongfully surrendered*
*The property of the gods"*
**Prometheus Bound by Aeschylus**

## By Patrick Ruckert

**October 19, 2013**

**Los Angeles Aqueduct**
**November 5, 1913**
**The Opening Day of the Los Angeles Aqueduct:**
**"And the Water Came Tumbling Down"**

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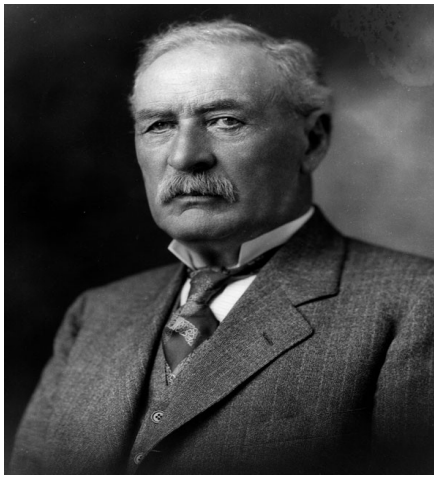
**Mulholland Dam**

# I. Introduction

Part I of this report concentrated on the entire California state water management system, the present water crisis, and the North American Water and Power Alliance (NAWAPA) as the long-term solution to that crisis.(1) Since that report was written the LaRouche Political Action Committee has upgraded their proposed NAWAPA to *"Nuclear NAWAPA XXI: Gateway to the Fusion Economy,"* which has recently been published by *21st Century Science and Technology* on-line magazine.(2) Part II, here, focuses on the Los Angeles Aqueduct and its builder William Mulholland.

**The Los Angeles Aqueduct--November 5, 1913**

November 5, 2013 is the 100th anniversary of the opening day ceremony when the first water from the Owens Valley arrived in Los Angeles via the just completed Los Angeles Aqueduct. For 100 years the people of Los Angeles have been indebted to the builder of that aqueduct, William Mulholland.



**William Mulholland**

But, it is not just the Los Angeles Aqueduct that Mulholland bequeathed to us in this city. He initiated the campaign to build the Hoover Dam and played a key role in ensuring that the Federal Government built it. To do so, as the superintendent of the Los Angeles Department of Water and Power (DWP), he was the key individual in the founding of the Metropolitan Water District of Southern California (MWD), which today distributes water to all the cities of the region from Ventura to San Diego. For more than 40 years Mulholland, as the superintendent of the (DWP), built the entire system that today quenches the thirst of more than three million people in this city. His impact was more than local. The DWP and the MWD became the models used by President Franklin Roosevelt in the 1930s, for the organization of the Tennessee Valley Project and, a few years later, for the Bonneville Power Administration on the Columbia River. There was no one in California in the first decades of the 20th Century who had more of an impact on the future of this region than Mulholland. He built Los Angeles to be what it is today, and made it possible for Southern California to be able to support more than 20 million people.


**The Los Angeles Aqueduct**

Today, after the 105 mile extension of the aqueduct to Mono Lake was completed in 1941, the aqueduct begins at Grant Lake, which feeds into Mono Lake, then to the headwaters of the Owens River.

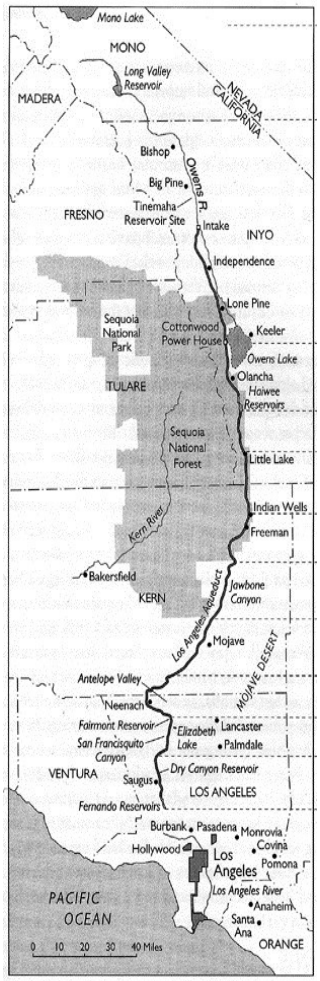
The original aqueduct begins in the Owens Valley, and takes the headwaters of the Owens river to the Long Valley Reservoir (now called Lake Crowley), the first of five in the system. The water then goes into a pipe and tunnel to three hydroelectric plants, then goes back into Owens River.

For the next 30 miles, the water flows in its natural river channel, where it is then put in the aqueduct, a 40-foot unlined ditch, which then becomes a lined-canal.

At the Hayley Reservoir, at the south end of Owens Valley begins the near 200 miles of pipes, tunnels and inverted siphons which end at the Cascades, near Sylmar in the north end of the San Fernando

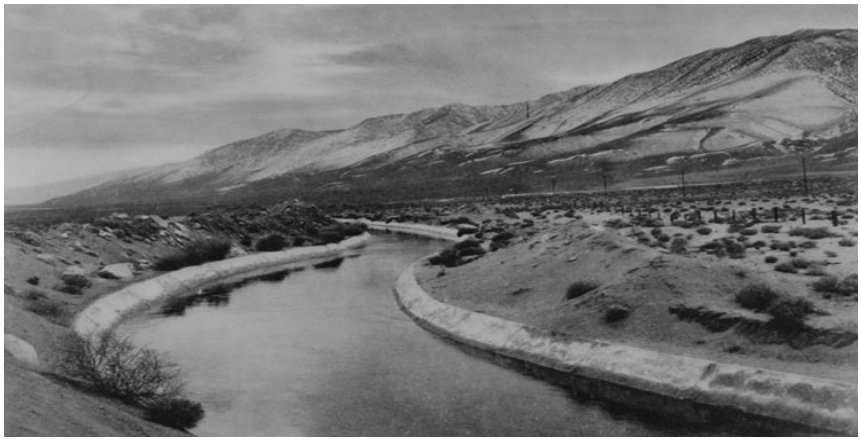
Now, let's look briefly at the Los Angeles Aqueduct, so we will have in our minds, as we proceed, what it is we are discussing here.

The aqueduct's construction began in late 1907, and the first waters from it flowed into Los Angeles on November 5, 1913, six years later. The 233 miles-long aqueduct has no pumps for lifting water over hills or mountains; it is a 100% gravity powered water delivery system-- the longest in the world.




**Schematic Map of the Aqueduct**

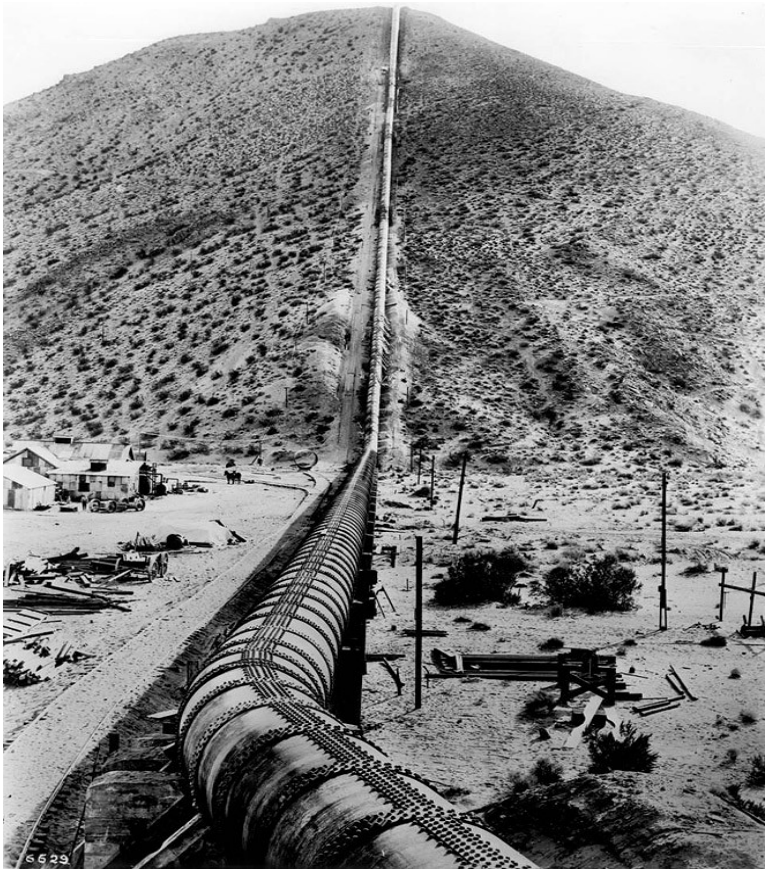

**The Owens River,  Owens Valley**



**Los Angeles Aqueduct-- lined**

**Photo Credit:  Water and Power Associates**

**Elizabeth Tunnel**



**Jawbone Inverted Siphon**

**The Cascades**

Mulholland designed and built the aqueduct, but he was the first to admit that he did not do it alone. He especially gave credit to the 3,900 men who did the tunneling, digging, and the laying of pipes and

concrete, as the ones who did the work. Mulholland knew that great projects were not built by the "rugged individualist." Great projects, whether it is the building of a water project or the building of a nation, are accomplished by a harmony that is developed among people who have a mission that they share in common. They cooperate to achieve that mission. That is why he paid tribute to the workers who did the physical work to built the aqueduct, giving them the credit for the accomplishing the harder task.(3)

## Three Presidents

The history of the United States, and much of the world, demonstrates that idea. When the United States organizes itself to accomplish a great project, and has the leadership that is committed to that mission, we transform the nation, its economy, ourselves and the world.

**Three Presidents**

**Abraham Lincoln**

**Franklin D. Roosevelt**

**John F. Kennedy**

In1861, President Lincoln's aggressive promotion of the project to build the transcontinental railroad brought the nation together, which committed itself to do it, even while in the midst of the Civil War. The completion of that project in 1869, changed the country from essentially two countries, separated by deserts and mountains, into one unified nation. The project was the driver for a massive industrial transformation of the economy, making the United States the most productive country in the world. Americans began, in this period, the transition from a mainly agricultural society into an urban-based science, technology and industrial identity. In addition, Lincoln's establishment of land-grant colleges and his opening up of Federal land to homesteaders, both increased the productivity of the economy and ensured that the vacant, but rich lands of the West, were settled.

Looking to the United States, other nations began the same process, with the help of Americans. Russia's Trans-Siberian Railroad was inspired by ours, and Americans helped to build it. Not only that, but it was American railroad technology that the Russians used to do it-- including the importing of the American Baldwin engines. Germany set in motion the building of the Berlin-Bagdad railroad, only halted by the removal of Bismark from the government, which set the world on the road to World War I. Japan "imported" American System economists, like E. Peshine Smith, to guide its transition from a feudalist society into a modern industrial one. In 1911, the successful Chinese revolution, led by Dr. Sun Yat-sen, was guided by what he called, "The Three Principles of the People," which were an echo of Abraham Lincoln's conclusion to the Gettysburg Address, "of the people, by the people, and for the people."

In the 1930s, under President Franklin D. Roosevelt, it was not one project, but thousands of dams, roads, schools, and bridges, plus entire water management systems, that, together, made the nation into

a great project. In addition, programs like the rural electrification policy, which in just 15 years, transformed the entire agricultural sector of the nation. In 1936, only 10 percent of the farms were electrified. By 1951, that figure was 90%.(4) The Manhattan Project to build the atomic bomb created a scientific and technological revolution that gave the world nuclear power. The Glass-Steagall banking law reigned in the parasites of Wall Street, while the new programs of unemployment insurance and Social Security gave the American people an economic security they had never had.

The United States became, once again, the powerhouse of production. Roosevelt's policies transformed America and created the infrastructure and industrial capability to fight and win World War II. Other nations once again turned to the United States as a model for themselves. Dozens of countries sent delegations to visit the Tennessee Valley Authority Project to learn how to build water management systems.(5) Countries in the Middle-East looked forward to the post-war period FDR promises to bring the American methods to their nations, to help them irrigate the deserts and bring them into the nuclear age.

The Central Valley Project in California and the Grand Coulee Dam in Washington State demonstrated to both the American people, and the people of the world, what can be done under a leadership committed to creating a future that expressed the principles best stated by the Preamble of the United States Constitution.(6)

Then, once again, beginning in 1961, we had another President who had that outlook and commitment. President John F. Kennedy was determined to not only revive the policies of his Commander in Chief during World War II, President Franklin D. Roosevelt, but to go beyond just extending what had and already did exist. Exemplified by his Apollo Project to put a man on the Moon within the decade of the

1960s, Kennedy intended to transform and shift the economy to a new platform of productivity, driven by the space program, nuclear power and water projects, with a special focus on water desalination. In just the years 1962 and 1963, Kennedy inaugurated one water project after another throughout the country. Opening up the San Luis Dam project in California on August 18, 1962, he said that a breakthrough in water desalination technology was even more important than the Apollo project. At the nuclear power complex at Hanford, in Washington State, on September 26, 1963, Kennedy defined what the real conservation of resources should be, as opposed to that represented by the lunatic greenies of today. Especially note the last paragraph of the quote below:

*"But the other part of conservation is the newer part. And that is to use science and technology to achieve significant breakthroughs, as we are doing today, and in that way, to conserve the resources, which 10 or 20 or 30 years ago may have been wholly unknown. So we use nuclear power for peaceful purposes and power.*

*"You know in the next 10 years, I hope the people of the United States realize it, that we double the need for electric power every 10 years! We need the equivalent of a new Grand Coulee Dam every 60 days! In the next 20 years, we're going to have to put into the electric industry, $125 billion of investment. And when we do that, this country will be richer. And our children will enjoy a higher standard of living. We don't realize that what we regarded as affluence, 30 years ago, is now way down below. Air conditioning, television, electricity, and all the rest have changed the life of this country, and we're going to find the same, extraordinary changes, in the next 20 or 30 years.*

*"I think we must do several things: First, we must maintain an aggressive program to use our hydro resources to the fullest. Every drop of water, which goes to the ocean, without being used for power or*

*used to grow, or being made available in the widest possible basis, is a waste. And I hope that we will do everything we can to make sure, that nothing runs to the ocean unused and wasted.... [applause]"* (7)

Like Franklin Roosevelt, Kennedy intended his policy to be the driver of a global transformation, that would be inspired and aided by the United States. His speeches and actions before he became a U.S. Senator, during his time in the U.S. Senate, and as President, made clear that he would revive Franklin Roosevelt's post-war intention of freeing the nations of Asia, Africa and South America from the last vestiges of colonialism. As President, he made available to countries throughout the undeveloped sector, the new nuclear technology that the U.S. was just then beginning to apply to civilian power production. He planned to transform the volatile Middle-East by offering the Arabs and Israel U.S. support for building nuclear power plants which would be set side-by-side with desalination plants. He was determined to end the Cold War, by not only his agreements with the Soviet Union to begin disarming the nuclear arsenals, but even offered to make the Moon landing a joint project.(8)

Those of us who were young adults at that time were inspired by that President, and many of us dedicated our lives to participating in bringing about a change that was based on looking into the future of world we wanted to create. The President created the Peace Corps, which exemplified his revival of Roosevelt's "Good Neighbor" policy and brought thousands of young Americans into his mission. The Civil Rights movement of the 1960s, was both encouraged by Kennedy and inspired by the idea of change which he represented.

Kennedy was a fighter for the nation's future and its coming generations, and thus he had no tolerance for those who wished to break the federal government's direction of the economy. The following is an excerpt from a speech he gave at the dedication of Greers Ferry Dam, Arkansas on October 3, 1963:

*"This State is one great country and it seems to me incumbent, north and south, east and west, that we take those decisions now which will provide for a gradually increasing tide of life for the people of this State over the next 20 and 25 years. And those who think it can be left to chance are wrong. It was left to chance for 20 years between the two wars and as a result of the deliberate decisions made since then, it seems to me, this State is a fine product and example of what can be done by the people here, working together, working hard, and working with the support of intelligent national policies. And those people who say it is "pork barrel"—which is more wasteful: the waste of life and property and hope or a multi-purpose project which can be used by all of our people? Which is more wasteful: to fail to tap the energies of that river, to let that water flood, to deny this chance for the development of recreation and power, or to use it and to use it wisely? Which is more wasteful: to let the land wash away, to let it lie arid, or to use it and use it wisely and to make those investments which will make this a richer State and country in the years to come?*

*"These projects produce wealth, they bring industry, they bring jobs, and the wealth they bring brings wealth to other sections of the United States. This State had about 200,000 cars in 1929. It has a million cars now. They weren't built in this State. They were built in Detroit. As this State's income rises, so does the income of Michigan. As the income of Michigan rises, so does the income of the United States. A rising tide lifts all the boats and as Arkansas becomes more prosperous so does the United States and as this section declines so does the United States. So I regard this as an investment by the people of the United States in the United States."*(9)

Think about what Kennedy was doing, what he represented; then think back to how that affected you then, or how, if you just are learning about it now, it affects your mind today. Does it not resonate with the better side of your soul?

The assassination of President Kennedy, fifty years ago, turned the nation away from such a mission, and subsequent Presidents, one after another, neither inspired people, had any sense of a great mission, or actively betrayed the mission of the nation. And now, we have, today, reached the bottom. This is not the place to develop the details of this downward transformation, but I want you to think about where we would have been today if that President had lived. Just take what he had set in motion and see in your mind the world that could have been. Then dedicate yourself to revive that mission and to, once again work to create a new fundamental transformation. Since this question is one that the American people must know if the nation is to survive, I recommend the comprehensive video report on what the world would be like today if Kennedy had lived: *"The LaRouche PAC Weekly Report,"* of October 2, 2013. A written transcript of this presentation is also available.(10)

Man is not an animal. Man is unique among all living species. Man is the only creature who uses fire; and the only species that can know the future. Civilization has progressed because man has continuously discovered and applied more and more powerful forms of fire. The energy-flux density of wood was superseded by doubling the power wielded by the individual by the transition to a coal based economy. That power per capita was doubled again as petroleum became the energy base. With nuclear power the pathway was before us in the 1960s, to once again double the power each person had at their disposal. Only man could do that.

Knowing the future is what mankind does when he looks beyond today to see what tomorrow must be; he sees what projects must be built for future generations, just as his parents and grandparents built the projects that provide for him today. It is the creative power of the mind, as applied to what the future must be, that makes progress possible. Progress must be defined as man's continual mastery of the laws of the universe, thus increasing man's power to control that universe. Man is the only creature, who, through progress, changes nature. The environmentalist idea that we must leave nature alone is, fundamentally, not only anti-human, but anti-nature, since man himself is a creature of nature, and all that man does is thus natural.(11)

# II. William Mulholland: A Man Who Lived in the Future He Would Create

William Mulholland was one of those who lived that idea; who, like Lincoln, Roosevelt and Kennedy, though in a narrower sphere of action, lived in the future he would help to create. And, like those Presidents, he inspired those around him to join him in such a mission. As Prometheus brought fire and knowledge to man, Mulholland brought water to the people of Los Angeles.

Today, one hundred years after the completion of his greatest project, do most of the residents of Los Anageles even know his name? Well, in this case it is difficult not to at least have heard the name, even if you don't know of him. Named for him is Mulholland Highway and Mulholland Drive.


**Mulholland Highway and Mulholland Drive**

The most visible presence of the man is the Mulholland Memorial Fountain, at the entrance to Griffin Park on the corner of Los Feliz and Riverside Dr.

**Mullholland Memorial Fountain**

Then there is Mulholland Dam and its Hollywood Reservoir, which sits in the hills above Hollywood.

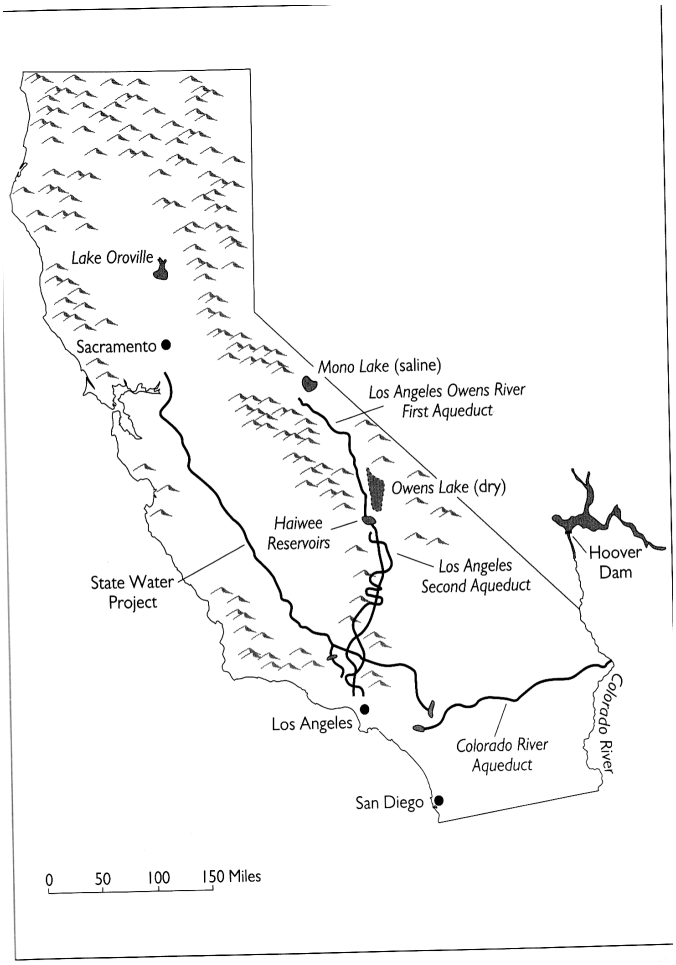

**Mulholland Dam and Lake Hollywood**

Some children in the San Fernando Valley attend the William Mulholland Junior High School.

Mulholland was a man who was always imagining the future, and then building that future that his imagination had created. He pushed forward the building of the aqueduct when the population of Los Angeles was 100,000 people, creating a water source for a city of one million. When the city, in the 1920s, was still growing rapidly and would soon surpass that million, he initiated the creation of the Metropolitan Water District of Southern California (WMD), bringing together most of the cities of Los Angeles and Orange County. The first project of the MWD would be the building of Hoover Dam,

Parker Dam and the Colorado River Aqueduct. Mulholland was always asking himself, what will we need ten or twenty years from now? His life was dedicated to answering that question, and then building what was required.

## The Desert That Became Los Angeles




Map 6. Southern California water supply, 1925 (Los Angeles Department of Water and Power).

**Southern California Water Supply**

Los Angeles and the entirety of Southern California, which averages less than 15 inches of rain annually, today, is dependent for 85% of its water supplies from water that flows hundreds of miles from three projects. The remainder comes from pumping ground water. An even more telling statistic is that Southern California has 60% of the state's population, but stores only 3% of the surface water runoff.(12)

**Those three projects are:**

1) The Los Angeles Aqueduct, which delivers an average of 430 million gallons a day to the city. That

is about 400,000 acre feet of water per year. That water comes 233 miles from the Owens Valley and 338 miles from Mono Lake.

2) The Colorado River Aqueduct, which delivers 1.2 million acre feet per year, 242 miles from Parker Dam and its reservoir, Lake Havasu, south of Hoover Dam on the Colorado River.

3) The California Aqueduct, which brings water nearly 600 miles from Oroville Dam on the Feather River, via the Sacramento River. The California Aqueduct, the longest in the world at 440 miles, pours enough water into Southern California to fill the Rose Bowl every hour and one-half.

For Los Angeles the proportions from each source, in 2003, for example, were: 48% of the city's water came from the Sierras via the Los Angeles Aqueduct. 41% came from the Metropolitan Water District of Southern California, which allocates water from the California Aqueduct and the Colorado River Aqueduct. The remaining 11% came from local groundwater.

## Who Was William Mulholland?

The best, and in my view, the most thorough and honest biography of Mulholland is, "*William Mulholland and the Rise of Los Angeles,"* by Catherine Mulholland, his granddaughter. The book was published in 2000. Catherine Mulholland died in 2012.

As she reports in her book:

*"William Mulholland presided over the creation of a water system that changed forever the course of Southern California history...."(13)*

*"This work is not only a biography of William Mulholland but also an account of how a small pueblo in a semiarid basin was able to secure the water and power that allowed it to grow into a major city."* (14)

*"For over forty years spanning the administrations of nineteen mayors, Mulholland was a central force in the creation of a municipally owned water and power system that allowed a small, otiose western outpost to swell to outsized proportions. As a self-taught and inventive engineer, he became the creator of a project that ranked in magnitude and daring with the Panama Canal."*(15)

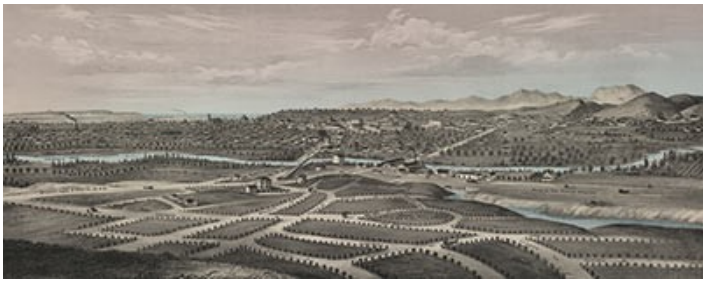
William Mulholland was born in Belfast, Ireland on September 11, 1855, to a Catholic lower middle-class family. He and his brother attended, for a few years, the O'Connell School run by the Christian Brothers, which had played a leading role in the Irish Revival, and was much like the Brotherhood of the Common Life schools during the Renaissance.(16) Mulholland never graduated from grammar school, yet became one of the most respected engineers in the world.

Mulholland's most cherished memory from that time is when, at the age of nine, a special assembly was held at which the father superior told them of the terrible tragedy that had just befallen the world-- that President Lincoln of the United States had just been assassinated.(17)

At the age of fourteen he left home and joined the British Merchant Marine, and for the next four years

he was a seaman, repeatedly crossing and recrossing the Atlantic.

In 1874, at the age of nineteen, he got off his boat in New York City, and never got back on. In 1876, he and some relatives migrated to California. He ended up in San Francisco, obtained a horse and rode to Los Angeles, arriving the next year.



**Map of Los Angeles 1877**

Los Angeles was still a pueblo of about 9,000 people. It had not even been connected to the railroad until 1876. Not finding much work, one day he decided to go to the port in San Pedro and ship out again.

He reported in 1907 what happened next: *"On the way down there a man who was driving a well offered me a job and I took it.... the first well I helped to drive changed the whole course of my life. When we were about six hundred feet down we struck a tree. A little further down we brought up some fossils. These things fired my curiosity. I wanted to know how they got there and so I got hold of Joseph LekConte's book on the geology of this country. Right there I decided to become an engineer."* (18)

Soon he was hired by the Los Angeles City Water Company, to which the city had leased its water supply in 1868. His first job was as a ditch tender. He kept the water flowing in a channel leading from the Los Angeles River, near the entrance to Griffith Park, to a reservoir in Elysian Park. He lived in a shack near-by, in which he would spend his evenings studying books on mathematics, engineering, hydraulics's, geology, and Shakespeare.

Shakespeare? You may ask. Mulholland 's mind was not limited, either by himself or others, and like other great builders of projects and nations, there was nothing that was human that was foreign to him.

In her book, *Rivers in the Desert*, Margaret Leslie Davis reports the following:

*"As one reporter noted, a big part of Mulholland's appeal was due to the fact that even though he was an engineer, he had none of the characteristics of the typically boring technician. He was, by all accounts, larger than life, and he credited his engaging personality to his theory of 'mental expansion.' Mulholland explained to one journalist that the reason engineers were considered dull was because they made no effort to 'broaden mentally in any other direction but by their slide rules.'*

*"'The only feasible way to study mankind is reading good books, written by men who were masters of their art,' he pontificated."*

*"'Damn a man who doesn't read books. The test of a man is his knowledge of humanity, of the politics of human life, his comprehension of the things that move men,' he once exclaimed to yet another weary reporter."*(19)

Mulholland was also a close student of Classical Opera, which was a reflection of that same quality of mind that characterized his contemporaries in the field of science, like Albert Einstein and Max Planck. The creative mind responds to and participates in that activity that best expresses the creative power of man. It is scientific discovery and classical art which provide the creative field for such minds. Einstein, of course, often made the point that his creative discoveries in science were products of his

very serious work in mastering the violin and the music of Mozart.(20)

## The Emergence of Mulholland, the Engineer

In his early years at the water company Mulholland's career was shaped by two men. The first was William Hayes Perry, the president, and the second was Fred Eaton, the superintendent and engineer. Eaton was Mulholland's mentor and started him on the path his life would take from then on.

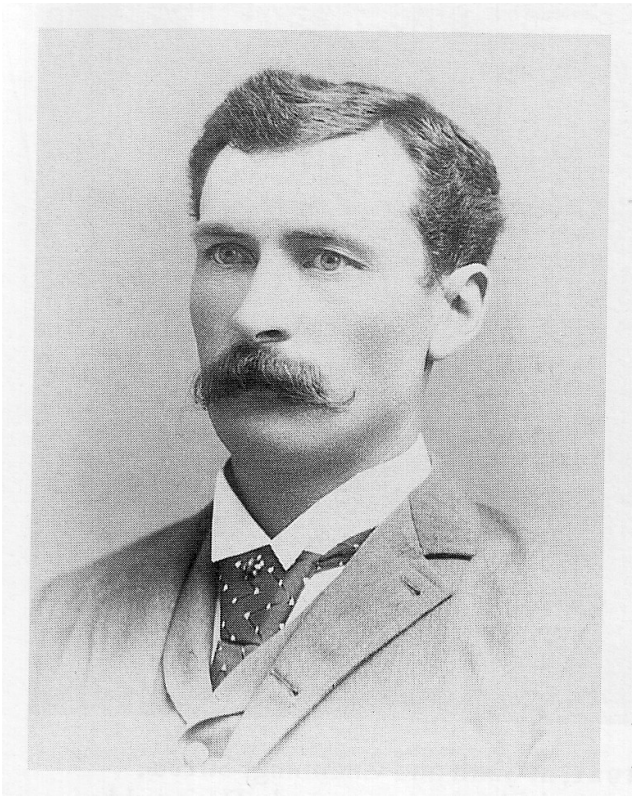
**Frederick Eaton**
**(1856-1934)**

*"The story has often been told how Perry, as he made his rounds of the waterworks, spied a worker vigorously clearing weeds and debris along the zanja that led to the reservoir at Elysian Park. Calling out 'What are you doing?' he received the rude "None of your damn business' from the young worker, who continued shoveling. After Perry had flicked his reins and ridden on, a fellow worker informed the rude laborer, Mulholland, that the departing man was president of the water company. Prepared to be fired, Mulholland headed for the office to turn in his time but instead was advanced to foreman of the work crew."*(21)

Fred Eaton left the company when he was elected City Engineer in 1886. He became the most outspoken proponent for the city to buy out the private company, since the company was ill serving the people of Los Angeles, with high rates and poor water supply and quality.

Under the private water company, there was always something going wrong-- leaky pipes, dirty water or even fish coming out of the faucet, a mud slide, a broken pipe, not enough water pressure, and not enough water for sprinkling the dusty streets, or people just stealing water from the company's supply, ie. the Los Angeles River.

During these years, the population of Los Angeles just kept growing. By 1890, more than 50,000 people now lived in the city, having jumped from 11,000 just three years before. Not only was the city growing in numbers, but also was annexing more areas surrounding it. It was in this period that the city annexed a narrow strip of land southward, all the way to what is now San Pedro, in order to own the land that the Los Angeles Port would be built.



**William Mulholland 1890**

When Eaton left the company in 1886, Mulholland became the superintending engineer, in which position he remained until the city bought the company in 1902, fulfilling Eaton's plan of a wholly municipally owned system. Mulholland then became the superintendent for the new city owned water department, called then, the Bureau of Water Works and Supply, and today is the Los Angeles Department of Water and Power. As he put it, later, *"When the city bought back its water, it bought me too."*(22)

The statement by the Board of Water Commissioners made at the time, I think, gets at the heart of why private interests should never be allowed to control public utilities:

*"It is not the economic theory of municipal ownership and administration of public utilities which concerns us; we are confronted with a condition and not a theory. The city owns its water, and our experience should convince us of...the farsighted wisdom of our Spanish and Mexican predecessors in holding on to the rights of the waters of Los Angeles with a grip of iron."(23)*

Even though the city now owned its water works, electricity was still controlled by private interests, and the city did not succeed in winning the fight for public power until 1939. Then, the Los Angeles Department of Water and Power really did live up to its name.

Mulholland favored the idea of a city owned water works. In *"Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California,"* Steven P. Erie discusses *"...the thoughtful side of a visionary man of action. Mulholland traced his personal and professional ethic back to a sacred site predating modern marketplace society. Noting that King Hezekiah had channeled*

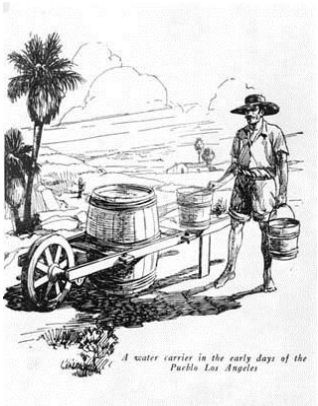
*water to the City of David, Mulholland pointed to the absence in the biblical account of 'any mentions of dividends...we may infer that the works were public, for public officials are guiltless of paying dividends-- except in an indirect way of good service-- if it so happens that they are good servants.'"* (24)

## Early Los Angeles Water Systems

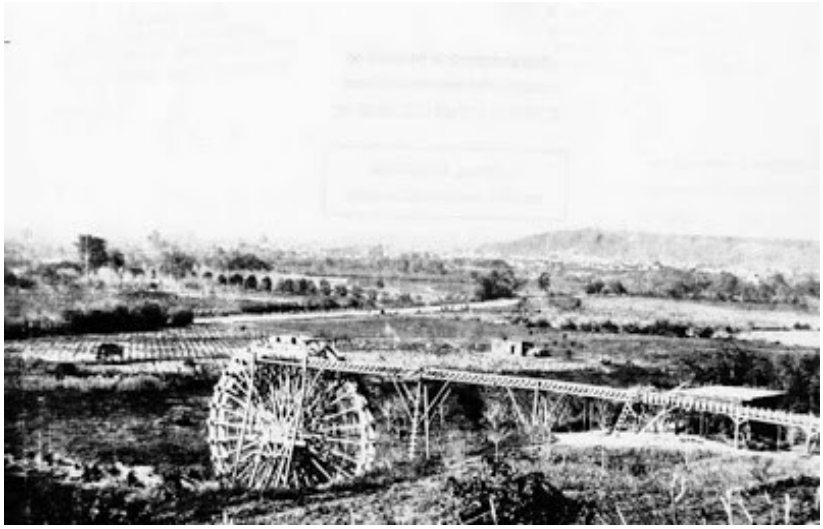
Water rights, or wars for water, has always been a fact of life in Southern California. The Spanish crown, upon its founding, had granted the pueblo of Los Angeles ownership and control of its water, mainly the Los Angeles River. When the city incorporated in 1781, it was vested with all of the rights of the Pueblo, including the city's ownership of its water.(25) The founding families of Los Angeles constructed the first water system by building a dam across the Los Angeles River. The dam diverted water to the Zanja Madre, or mother ditch, which fed water to smaller ditches for irrigating crops. In 1854, the water system became a city department. By the time Mulholland arrived in the city, a century after its incorporation, nine tributary zanjas flowed from the Mother Ditch, providing irrigation for crops. But the private water company controlled water for domestic use.

Now, let's look at the early water supply system of Los Angeles.

In the early 1800s, water was delivered door to door by buckets, either carried or in carts. By the middle of the 19th Century, a water wheel on the Los Angeles River would lift water to the Zanja Madre.




**Indian Water Carriers-- Early 1880's -door-to-door water vendors. Photo credit: "Water in Early Los Angeles," Water and Power Associates**



**1863 waterwheel on the Los Angeles River taking water to the brick reservoir in the Plaza via the Zanja Madre.**

**Zanja Madre means "mother ditch", and it was an open, earthen ditch dug by the community within a month of the founding of the pueblo. It was the original aqueduct bringing water from the Los Angeles River.**

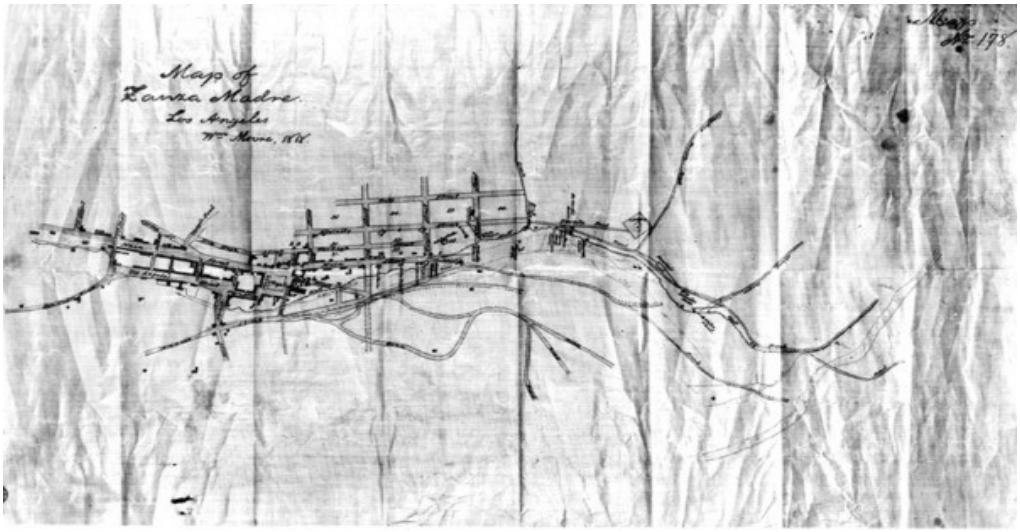
**(1869)* - View showing the LA Plaza with the Old Plaza Church on the left and the city's first above-ground water reservoir on the right. The square main brick reservoir was the terminus of the town's historic lifeline: The Zanja Madre. Photo credit: "Water in Early Los Angeles," Water and Power Associates**

Here is the Buena Vista Reservoir in 1876.

**Buena Vista Reservoir in Elysian Park in 1876**

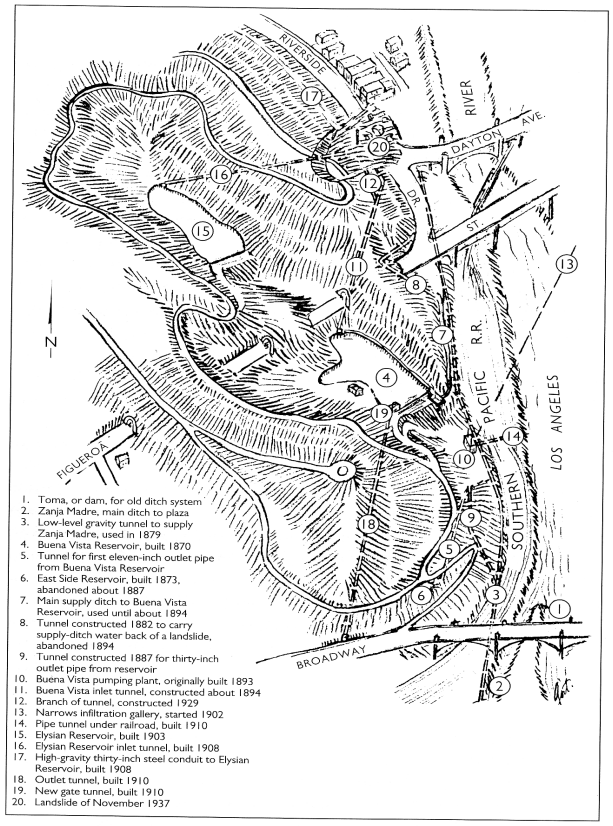
**Built by the privately-owned LA Water Co. this was the company's first water storage facility. Photo shows reservoir seen from the hills, looking east from present-day location of the Pasadena Freeway. Photo credit: "Water in Early Los Angeles," Water and Power Associates**

Here is a 1888 map of the Zanja Madre and its smaller ditches, or zanjas, that delivered water to Los Angeles residents.




**Map of Zanja Madre in Los Angeles, 1888**
**Courtesy of the Los Angeles Public Library**

This late 1920s illustration features all the major early water works of the city in the Elysian Park area.




Map 1. Waterworks structures, Elysian Park area, showing waterworks structures dating from Zanja Madre days to 1937 (from Thomas Brooks, assisted by Laurance E. Goit, *Notes on Los Angeles Water Supply,* September 1938).

# III. The Genesis of the Los Angeles Aqueduct

By 1903, with the city of Los Angeles now the home of 100,000 people, Mulholland was worried about where the city would get its water. He kept building more and more pipelines and reservoirs, but the Los Angeles River was beginning to reach its limit. Ground water had always been pumped in Los Angeles and the San Fernando Valley, supplementing the supply form the river, but that, too, had a limit.

In addition, the 1890s had been a decade of drought.

*"'Since the summer of 1893,'* he wrote, *'there has not been a season that has not shown a decrease in the flow of the stream over that of the preceding year... until in the present year the diminution.. amounts to considerable over 50 percent from that of 1893.'"*(26)

# Mulholland Could Smell Water 200 Miles Away

It was in 1903, that former City Engineer and Mayor, and mentor to Mulholland, Fred Eaton, began to pursue the idea of taping into the Owens River, 230 miles from Los Angeles on the east side of the Sierras. But, according to Mulholland, Eaton had been talking about this idea for more than a decade.

An interview with Mulholland in the *Los Angeles Times* of July 29, 1905, quotes Mulholland:

*"Fred Eaton did it. He has been working on it for 13 years. He is the greatest natural engineer the West has ever known. He has made it possible for us to accomplish the greatest scheme of water development ever attempted in this country.*

*"Thirteen years ago Fred Eaton told me that Los Angeles would one day obtain its water from Owens Valley. I laughed at him.*

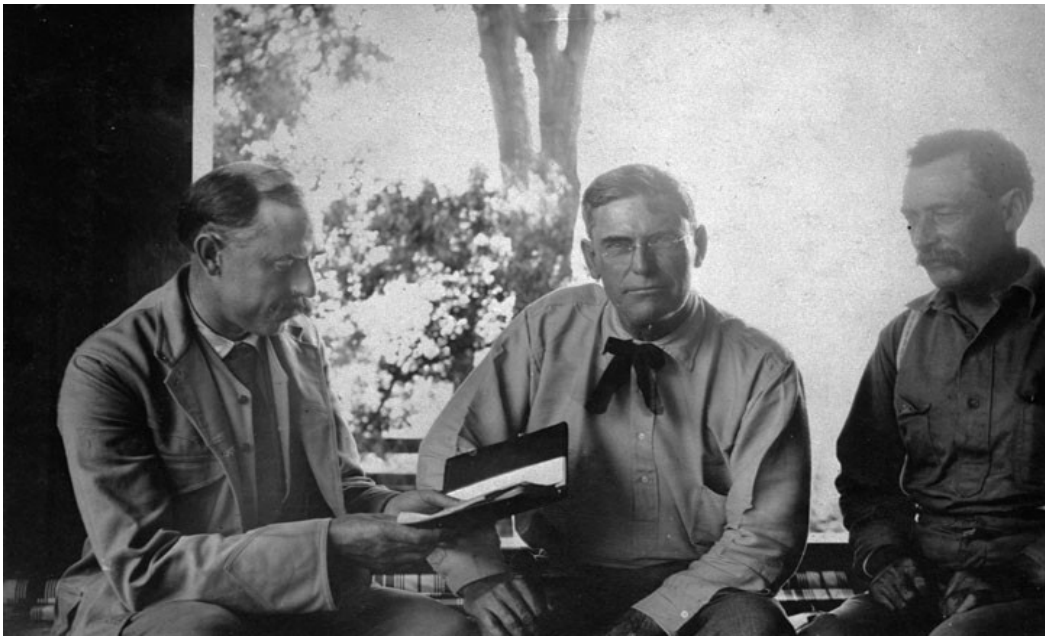
*"Four years ago I began to discover that Fred was right. Our populace climbed to the top, and the bottom seemed to drop out of the river. Then-- I turned my attention to the Owens Lake country."*(27)

So, according to Mulholland, if the Los Angeles Times correctly reported on what he said, it was in 1901, that he began to think about the Owens River as a new source of water for Los Angeles.

But, it was not until September, 1904, when Mulholland and Fred Eaton traveled to Owens Valley, that Mulholland made the decision to build the project to bring the valley's water to Los Angeles. Eaton was, a short time later, appointed to act as the sole agent for the City of Los Angeles in Owens Valley in buying up land and water rights, which he had already begun to do.

Joseph Barlow Lippincott, employed by the National Reclamation Service in 1904, had worked with Eaton for several years on water related projects. By the end of 1904, he had joined with Eaton in promoting the Owens River project. Lippincott would work with Mulholland building the aqueduct, serving as the Assistant Chief Engineer of Aqueduct Construction.

At that time, too, Mulholland now presented it to the City Council of Los Angeles.



**The Three Fathers of the Los Angeles Aqueduct**

**August 6, 1906 – left to right: Joseph B. Lippincott, Fred Eaton and William Mulholland.**

**Lippincott was the Assistant Chief Engineer of Aqueduct Construction. Eaton is the former City Engineer and Mayor who initiated the idea for the project.**

**Photo credit: Water and Power Associates**

## Controversy? Too Much A Do About Not Quite Nothing

The Los Angeles Aqueduct is 100 years old and will be of service another 100 years. The controversies around it are just as old, and are either over-blown or have been portrayed as the most important element of the story. As for the latter, the 1974 movie "*China Town,"* is the most extreme example. The movie has been discussed by others in great detail, especially in the book "*Beyond Chinatown--The Metropolitan Water District, Growth, and the Environment in Southern California*," by Steven P. Erie, published in 2006. Here, I will just dismiss the movie as being the fiction that it is advertised as being.

Then there is the story that Mulholland collaborated with a syndicate of the richest businessmen in Los Angeles, providing them insider information which allowed them to buy up thousands of acres of land in the San Fernando Valley in anticipation of dramatic rises in land prices once the water flowed from the aqueduct.

Leading the syndicate was Moses H. Sherman, a member of the city water commission, which ran the city water company. Sherman was a ruthless and greedy buyer and seller of companies, railroads and water companies. His associates in the land syndicate, the San Fernando Mission Land Company, included General Harrison Gray Otis, the owner of the *Los Angeles Times*, and his son-in-law Harry Chandler, general manager of *The Los Angeles Times*. Also included in the syndicate were E.H. Harriman, H.E. Huntington, and others. In November, 1904, the syndicate incorporated and bought the Porter Ranch, which with more than 16,000 acres, comprised one-third of the northern half of the San Fernando Valley.(28)

General Harrison Gray Otis created fights wherever and whenever he appeared. He was one of the most vicious anti-union personalities on the West Coast in the early years of the 20th Century. His title of "General," did not come from his actual service in the Union Army in the Civil War. It came about 35 years later. It was bestowed upon him by the offices of President William McKinley as a reward for volunteering to send young men into the Philippine jungles during the Spanish-American War.(29) He did his part in that first imperial war by the United States, in helping thousands of young American soldiers die of malaria.

As the publisher of the *Los Angeles Times*, Otis led the anti-union campaign in Los Angeles. In 1910, the *Los Angeles Times* building was bombed, and later, two union activists were found guilty of the crime, which had killed 21 workers who were in the *Times* building when the bomb went off. But you did not have to be a union organizer to receive vicious attacks by Otis. After editorial attacks in the *Times* on Hiram Johnson, the Progressive candidate for Governor, Johnson gave a speech in Los Angeles. Johnson, as a public prosecutor, had gone after the rich and corrupt businessmen in the Bay Area. Johnson could give as good as Otis, and as for Otis, he said:

*"In the city of San Francisco we have drunk to the very dregs of infamy. We had vile officials, we have had rotten newspapers. But we have had nothing so vile, nothing so low, nothing so debased, nothing so infamous in San Francisco as Harrison Gray Otis. He sits there in senile dementia, with gangrened heart and rotting brain, grimacing at every reform, chattering impotently at all things that are decent; frothing, fuming, violently gibbering, going down to his grave in snarling infamy. This man Otis is the one blot on the banner of Southern California; he is the bar sinister upon your escutcheon. My friends, he is the one thing that all California looks at when, in looking at Southern California, they see anything that is disgraceful, depraved, corrupt, crooked and putrescent-- that, that is Harrison Gray Otis!"*(30)

E.H. Harriman was the ruthless head of the Union Pacific Railroad, which during the late 1800s and early 1900s, got anything it wanted as it bought up politicians by the handfuls, who then protected its sometimes violent rapacious actions. He was also the father of Averill Harriman, who in the 1920s, partnered with Prescott Bush in the Union Banking Corporation, which provided Adolph Hitler the funds, in late 1932, that kept his Nazi Party alive so he could be appointed Chancellor in January, 1933.

So, the syndicate bought up the land shortly after Mulholland had actually made the decision on building the aqueduct. According to Steven Eire, *"The syndicate used privileged information about the city's successful negotiations with the United States Reclamation Service (renamed the Bureau of Reclamation in 1923) over the aqueduct project to buy up irrigable land."*(31) Eire, and others, claim, with just suspicion, that water commissioner Moses H. Sherman was the source of the insider information, especially since he was a founder and a beneficiary of the syndicate.

For a moment we shall leave the syndicate.

As stated above, it was late in 1904, that Mulholland now presented his plan to the Los Angeles City Council, and it was not until March, 1905, that he officially put before the Board of Water Commissioners that the Owens Valley was the only viable source of needed water for the city. During the next few months, Eaton bought up more and more land in the Valley, with both he and Mulholland keeping quiet on what was planned, in order to prevent speculators from moving in. Since Eaton was offering generous prices, the residents of the valley sold willingly.(32)

The proposal was first made public by a front page article in the *Los Angeles Times* on July 29, 1905.

There were two general reactions, one from the people of Los Angeles and the other from the people in Owens Valley. From the first it was enthusiasm; from the later, anger.

That anger would never go away, and is kept alive today by the periodic dust storms that plague the valley from the dried up Owens Lake, which the people of the valley blame on Los Angeles for taking the water that kept that dead-end alkali lake filled.

**Owens Lake Today**

**Dust Clouds Rise off of Owens Lake**

At the time, the complaint was that Eaton had deceived people into selling their land by claiming he was buying land for cattle ranching. Even though no one who sold their land ever complained that they did not get a fair price, they still felt they had to complain. Later, the real problems of not enough water in the valley and the dust storms became a legitimate claim by the residents, and the city of Los Angeles has spent or given billions of dollars in compensation and environmental restoration, in addition to reducing the amount of water it takes from the Owens Valley.(See Appendix I).

There is one more element to this story as is reported by most reporters and historian, including by

Davis in "*Rivers in the Desert*:"

*"Mulholland's work on the aqueduct was well under way when a second syndicate was formed in 1909, this time composed of Harrison Gray Otis, Harry Chandler, Otto F. Brant, Hobart J. Whitley, and Moses Hazeltine Sherman. This new syndicate, called the Los Angeles Suburban Homes Company, or simply the Board of Control, secured an option on 47,500 acres in the San Fernando Valley..."*

*"Together, the two syndicates' tracts encompassed nearly the entire San Fernando Valley from the present site of Burbank on the east to Tarzana on the west, including what is today known as Van Nuys, Canoga Park, Reseda, Sherman Oaks and Woodland Hills...."*(33)

Here, we will allow Mulholland himself respond to the charge of deception:

*"Some people appear to be objecting to the scheme. They say we worked in the dark. In fact, we worked in the light, while they were in the dark, for if some of the objectors had been 'on' to what was happening, there would have been a migration to the Owens Valley, and we never could have obtained the water for anything like the price we are to pay."*(34)

Before leaving this distraction, a final word: Mulholland knew most of these men personally or politically, and detested some of them, but no serious reporter or biographer of Mulholland has ever been able to establish that he accepted any bribes, or any other kind of favors, from these men or anyone else.

# IV. "Of Course It Has Never Been Done! That is Why I Am Going To Do It!"

Of course, the response of the people of Los Angeles was not unanimous, with some claiming that such a project could never be built. Mulholland responded by simply dismissing such pessimism, saying, *"Such a thing has never been done. This will be one of the greatest engineering achievements in the world."*(35)

Mulholland had nothing but contempt for the argument, which we too often hear today, that something, which has never been done before, could not be done because it is not practical. When you hear someone say something is not practical, I recommend you turn that around on them and tell them that by thinking the way they are thinking, they are preventing progress, and that is not a practical thing to do.

The truth is that among the people of Los Angeles, opposition to the Aqueduct was miniscule. The people had to vote on a bond to fund it, for without that go ahead from the citizens, it could not be built. The bond was for $25 million, equivalent to about $800 million in today's dollars. For a city of just over 100,000 people, taking on that much debt was unheard of. The bond measure passed with a 90% yes vote.

Mulholland was absolutely right, such a project had never been built. So let's look at the Los Angeles Aqueduct once again to get an idea of just how challenging the project would be. Remember, this is one hundred years ago, when there were virtually no roads or railroads anywhere near the route the aqueduct would follow. Electricity generation did not exist in the area. And, very importantly, this was

the Mohave Desert, with summer temperatures sometimes reaching 120 degrees, and winter temperatures below freezing. Water for the workers, and as we shall discuss shortly, the mules, had to be piped from many miles away.

**William Mulholland on the job**

Just to build the aqueduct, the following is a partial list of the infrastructure it required, which mostly had to be constructed before work on the aqueduct could really get under way:

215 miles of road
230 miles of pipe line, for water
218 miles of power transmission line
377 miles of telegraph and telephone line
57 camps were established along the line of the aqueduct for the 3,900 workers employed to build it.

In addition, the Southern Pacific Railroad built a line into the area, which was critical for moving the tons of materials required for the job. An estimated 350,000 tons of freight were required to be delivered.

The aqueduct would be a 233 mile long combination of channels, pipes, tunnels, conduits, inverted siphons, and reservoirs that would take the water from the Owens River, which is fed by run-off from the eastern slope of the Sierras. There would be no pumps, all the water would flow by the power of gravity. It is the only aqueduct in the entire California water management system so constructed. Here are the lengths of each component of the completed aqueduct:

34 miles of open unlined channel
39 miles of concrete lined channel
98 miles of concrete conduits
12 miles of steel and concrete pipe
8 miles of reservoirs
10 miles of power tunnels and waterways

142 tunnels totaling 43 miles

On August 15, 1905, Mulholland spoke to the Municipal League of Los Angeles about the project, providing us today a valuable insight into the thinking of the man:

*"With the aid of maps, Mulholland outlined the city's past, present, and future water needs; spoke of the Los Angeles River and its sources and its limitations; recounted his explorations of other sources with Eaton and Lippincott; and finally, detailed the investigations in Owens Valley and the reports provided by F. H. Newell and Jacob Clasen of the Reclamation Service. He referred to himself as having been 'a kind of step-mother to the Los Angeles River,' as for the past thirty years he had worked during storms, in gumshoes and gum coat, to keep mud out of the reservoirs so that the people would not have turbid water 'such as the people of St. Louis drink the whole year round.' He spoke of Lippincott's studies and explorations for water in the southern country, and of Eaton, he said, 'Mr. Eaton has talked to me about Owens River for thirteen years, and would twit me with the fact that sooner or later the city of Los Angeles would go to the Owens River country to get an additional water supply. When he first broached the thing to me I thought it was so absurd that I just fairly laughed in his face.' Admitting he had been a pessimist, Mulholland confessed he had thought he would never live to see the day when the city would have 100,000 people."*(36)

In June, 1906, Mulholland traveled to Washington, D.C. to push the proposal through the Congress and the White House, then occupied by Theodore Roosevelt. It was necessary to get Federal permission to traverse and build on government land. By the end of June, that task had been accomplished. On June 30, 1906, the United States Congress passed the law that provided the right-of-way. The law stated that it granted Los Angeles *"...All necessary rights of way, not to exceed two hundred and fifty feet in width, over and through public lands of the United States in the Counties of Inyo, Kern, and Los Angeles...."*

While shepherding forward the Owens River project, Mulholland kept busy in Los Angeles. Two new reservoirs were begun: Ivanhoe, in 1905 and Silver Lake, in 1906. Both are located in Ivanhoe Valley in the hills between Elysian Park and Hollywood.

Silver lake is named for Herman Silver, a German Jewish immigrant to Los Angeles, who became President of the City Council and Acting Mayor in 1896. He was also President of the Los Angeles Water Commission in 1902.

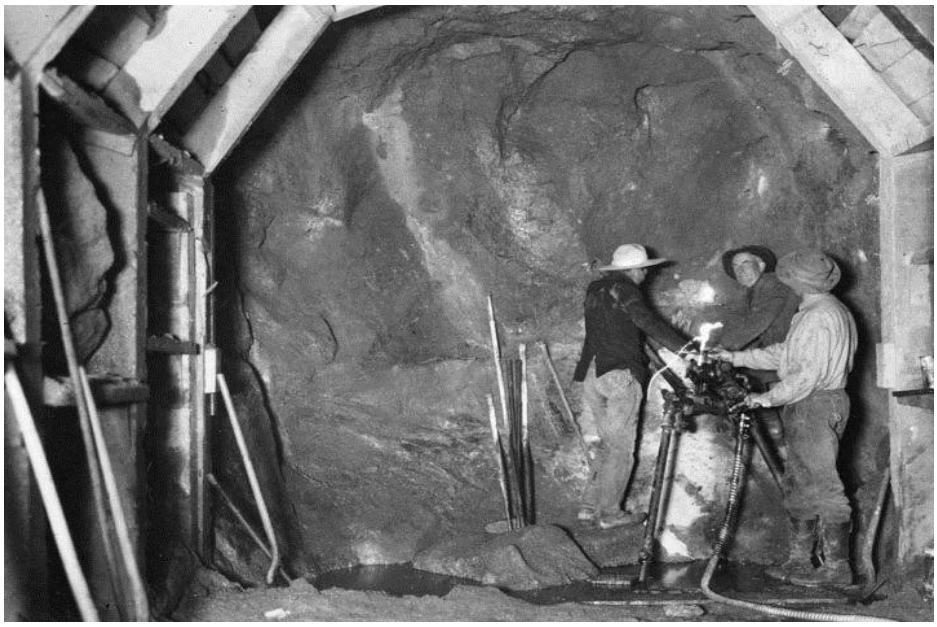
**Silver Lake and Ivanhoe Reservoir**

**Herman Silver**
**President of the Los Angeles Water Commission in 1902**

*"Because Silver Lake would be poised in the hills above the city where a break could cause a disaster not unlike the Johnstown flood, Mulholland did not design the usual earthen dam. Instead, its core was a concrete wall three feet thick, and at its center a continuous watertight wall of riveted steel plates extended from bedrock to water level. He also introduced an application of hydraulic sluicing that threw up the mud being dredged from the bed onto the dam that was to create the reservoir. This so-called innovation created a stir in engineering circles.... The method aroused the interest of the Isthmian Canal Commission, which sent one of its engineers to observe the process. He was favorably impressed not only with the sluicing method but also with a centrifugal pump designed by Mulholland. Similar hydraulic sluicing was later used on the difficult Culebra (now Gaillard) Cut of the Panama Canal and eventually on similar projects in the Northwest."*(37)

## The Construction of the Aqueduct

Construction on the aqueduct began in September, 1907, at the Elizabeth tunnel, a five mile-long tunnel that would be the task that defined how long the whole project would take. Work began on the aqueduct generally about mid-1908.



**A construction crew drilling in the Elizabeth Tunnel**
**photo credit: Water and Power Associates**

As construction was about to begin, Mulholland commented on what building the aqueduct would entail:

*"'I'm going into this as a man in the army goes into war, because it would be cowardly to quit. It will take the life out of me and if I stay to the end I'll come out a rickety old man, tied together with bailing wire. But if you think I'm going to wear myself out for a lot of political jobbers, you can think again.'"* (38)

The political jobbers Mulholland was referring to were job seekers who were friends with politicians. Mulholland was incorruptible and a rigorous steward of the public's money. The estimated cost for building the aqueduct was $25 million. Mulholland not only finished the job under budget, but also 20 months ahead of schedule.

Mulholland brought in a retired general to run the logistics, Lieutenant General Adna Romanza Chaffee, a decorated Civil War veteran who had distinguished himself as a cavalry officer at Gettysburg.

Mulholland was a fun loving guy. Toward the end of 1907, Mulholland led a group, including Chaffe, the Mayor Harper and others on an inspection tour. At one point, *"Mulholland picked up a piece of blue-ribbed rock from a nearby pile and said to the engineer in charge, 'This is gneiss rock all right. I do not believe we shall encounter much real granite.' The mayor, in an effort to be agreeable, echoed, 'Very nice rock.' Mulholland smiled and explained, 'This nice is spelled g-n-e-i-s-s, Mayor. Striated granite and much easier to tunnel than granite.'"*(39)

*"Work on the formidable Jawbone Division could now proceed. Even today this section of the aqueduct stands out as the most impressive achievement of the entire undertaking with its gigantic mile-and-a- half long siphon accomplished by the dramatic use of fifty-two-mule teams to haul the pipe up the canyon."*(40)

**The Jawbone Siphon**

The siphon Katherine Mulholland is referring to here is actually an inverted siphon, of which the aqueduct has 23 in all, with a total length of 11.4 miles. The siphons ranged in length from 611 feet to over 21,00 feet, and had a diameter of between eight and 12 feet

Siphons, generally are a tool for moving liquids from one container to another by using either a pump or atmospheric pressure and gravity as the energy source. A regular siphon moves water from a higher to a lower level. Inverted siphons move water from one source that is near equal to the height of the receiving source.

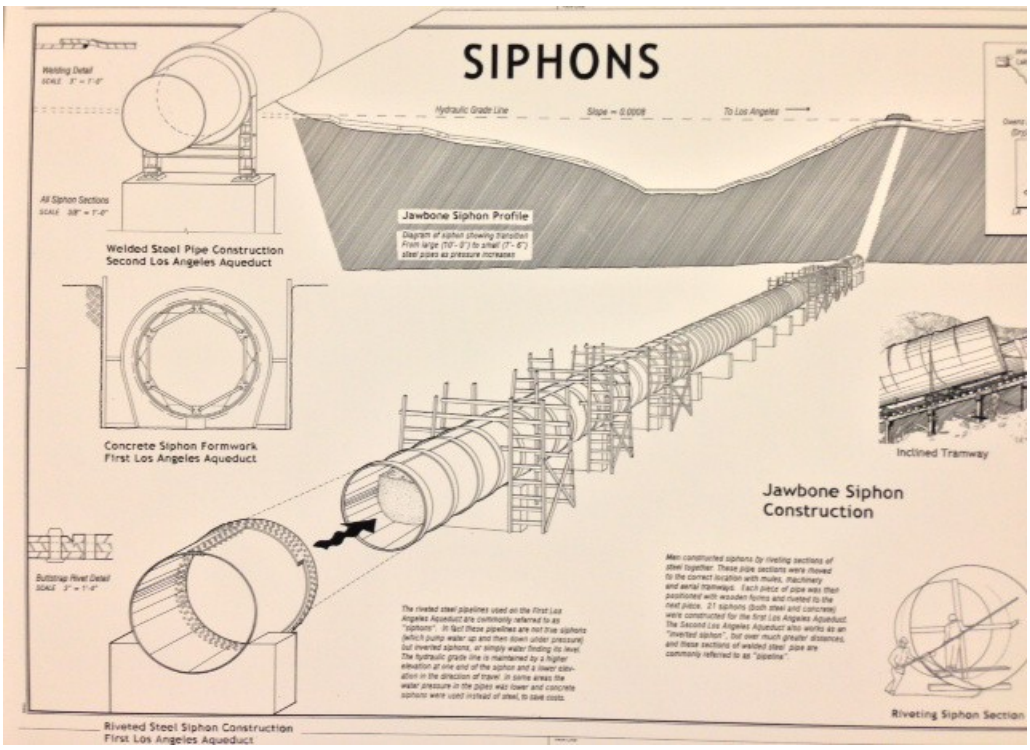
Inverted siphons are used to cross valleys or canyons by running a pipe down one side of the valley and up the other. By the pressure built up by the water in the pipe on the down-slope (the head), it is forced to the top of the pipe on the up-slope. By narrowing the pipe on the up-slope even more pressure can be created, allowing the outlet of the siphon to be at or near the elevation of its inlet. Inverted siphons were not a new invention by Mulholland; the Assyrians built one for the Nineveh Aqueduct thousands of years ago.(41) What Mulholland did was build them longer and bigger than anyone had before--way bigger and longer.

In order to minimize the weight of the steel, tapering of the diameter and the varying of the thickness of the pipe was done, according to the pressure that would be required for each siphon. Since the pipe was all cast in East Coast steel mills and shipped around South America, the pipe not only had to arrive on time, but also had to meet the rigorous specifications such requirements demanded.

The Jawbone inverted siphon is 8,095 feet in length, and the steel it is made out of weighs 3,216 tons. The longest inverted siphon in the aqueduct is the Antelope Valley siphon at 21,767 feet in length.

After the aqueduct was in service, one of the inverted siphons suffered a break and collapsed. Instead of replacing the pipe, water pressure was gradually introduced into the pipe and it re-rounded itself. This was the first time this technique had been tried.(42)

Here is a diagram of the Jawbone siphon, describing it's construction. I must apologize for the small size of this reproduction, but it is the best I can do in this report.




**Jawbone Siphon Diagram**

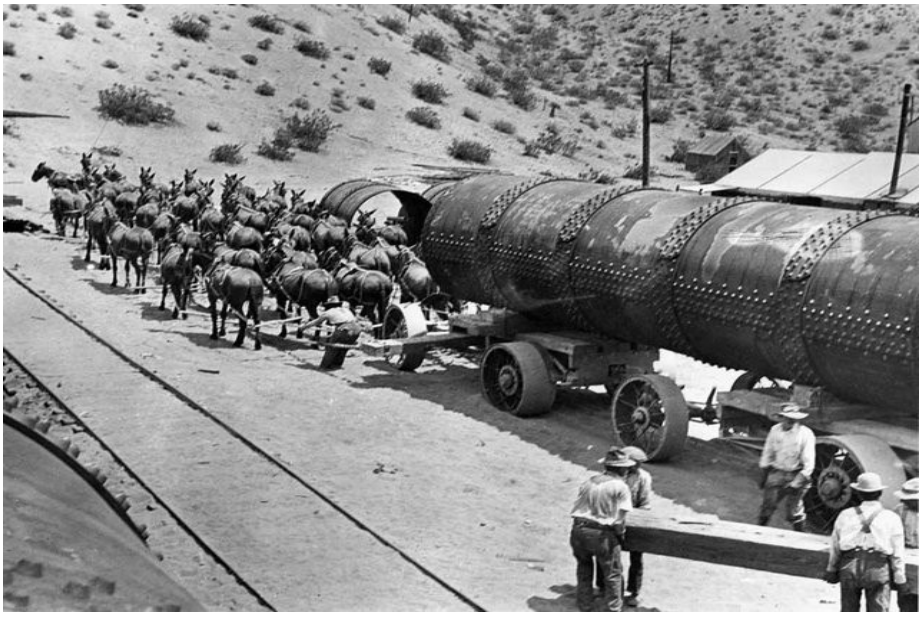
Now the mules. 1908, saw the beginning of the use of mules for hauling the massive amount of supplies and equipment for the project. It began with the purchase of 200 of the animals. Mules were required because there was no machine that could do the work on the steep slopes of the canyons the aqueduct had to cross. A new invention, the steam-powered tractor with treads was tried until its repairs were costing more in time and money than it was worth. When Mulholland first saw the tractor crawling up a hill he said, that looks like a caterpillar. The name stuck, and we have the Caterpillar tractor today.


**The first Caterpillar tractors were used to help build the Aqueduct**
**photo credit: Water and Power Associates**

*"The mules had to be good, for they faced a task that became the stuff of legend among the water men: hauling pipe for the great Jawbone Siphon. Twenty-mule teams and tractors were already in use along the aqueduct, but neither was up to this labor, which a singular use of fifty-two-mule teams was about to solve. To haul 36-foot sections of 7 1/2-foot-diameter pipe weighing around 26 tons each from the station at Cinco 4 miles up to Jawbone Canyon, Harvey Van Norman devised an ingenious arrangement of massive wagons with flat beds on steel wheels with tires 2 feet wide. Two of these powerful wagons were then drawn in tandem by fifty-two-mules controlled by three jerklines: eight rows of six animals abreast, two wheelers' at the tongue, and a lead pair at the head."*(43)

**Mule team hauling materials to build the Los Angeles Aqueduct**

**The roadless territory was too tough for the automotive travel of that era**

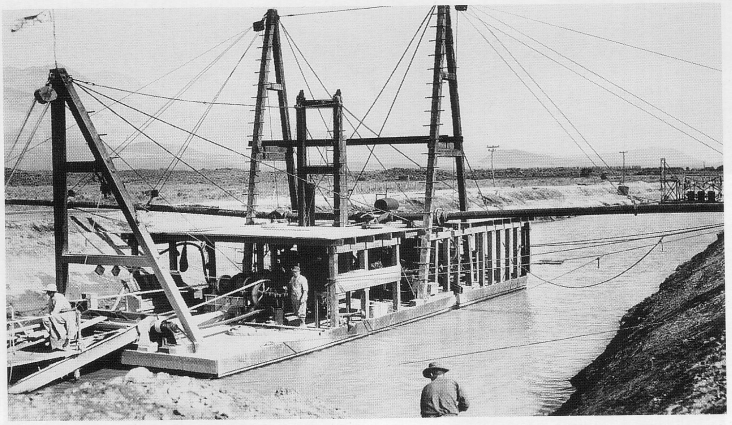


**Mule team hauling materials to build the Los Angeles Aqueduct**
**The roadless territory was too tough for the automotive travel of that era**

As work progressed on the aqueduct, financing would periodically become a problem. In 1910 Mulholland traveled to New York to work on the financing of the aqueduct. The banks were holding back bond sales, and work on the aqueduct had to be curtailed, laying off most of the men for a time.

Mulholland did not have much respect for bankers. While in New York, *"....He described a moment of insight as he had stood on the steps of one of the banks. 'I noticed in looking up...that the halls of Mammon were fully ten stories higher than the cross of Christ on the steeple of the little church across the way,-- a fact which would indicate a degree of degradation that might easily exercise malign and potent influence on the habitues of that region.'"*(44)

The northern most portion of the aqueduct is about 65 miles of open canals, both unlined and lined with concrete. They were excavated by using floating electric-powered shovels. Water was let into the canal gradually as it was dug to float the shovels. This had never been done before.(45)

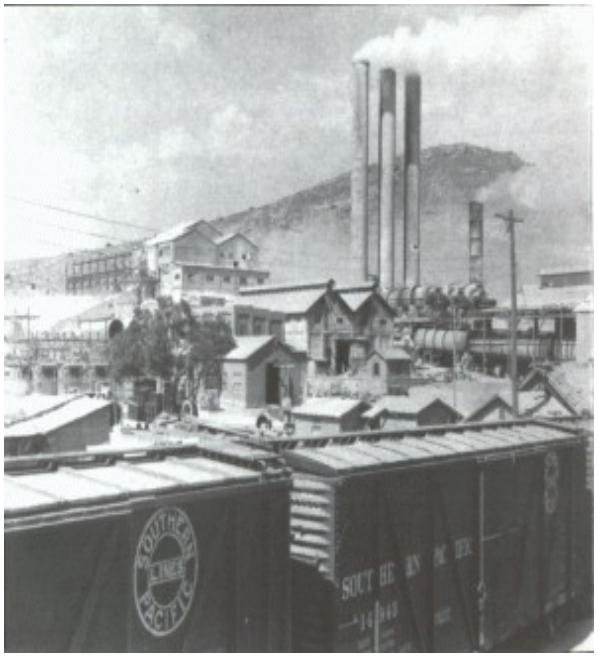


Dredge No. 1, working in Owens Valley.

## Floating Electric-Powered Shovels

The city built its own cement plant for the project. The Portland cement factory at Monolith, located near Tehachapi, is about in the middle of route of the aqueduct. The construction of the cement plant was one of the first infrastructure elements built. It was near a plentiful supply of limestone and clay needed to make the cement.

Another innovation by Mulholland was making the aqueduct's concrete from a mixture of Portland cement and ground tufa. As compared to just using 100% Portland cement, this mixture takes longer to cure, but is, when cured, much stronger. Tufa is the calcareous and siliceous rock deposits of springs, lakes, or ground water.



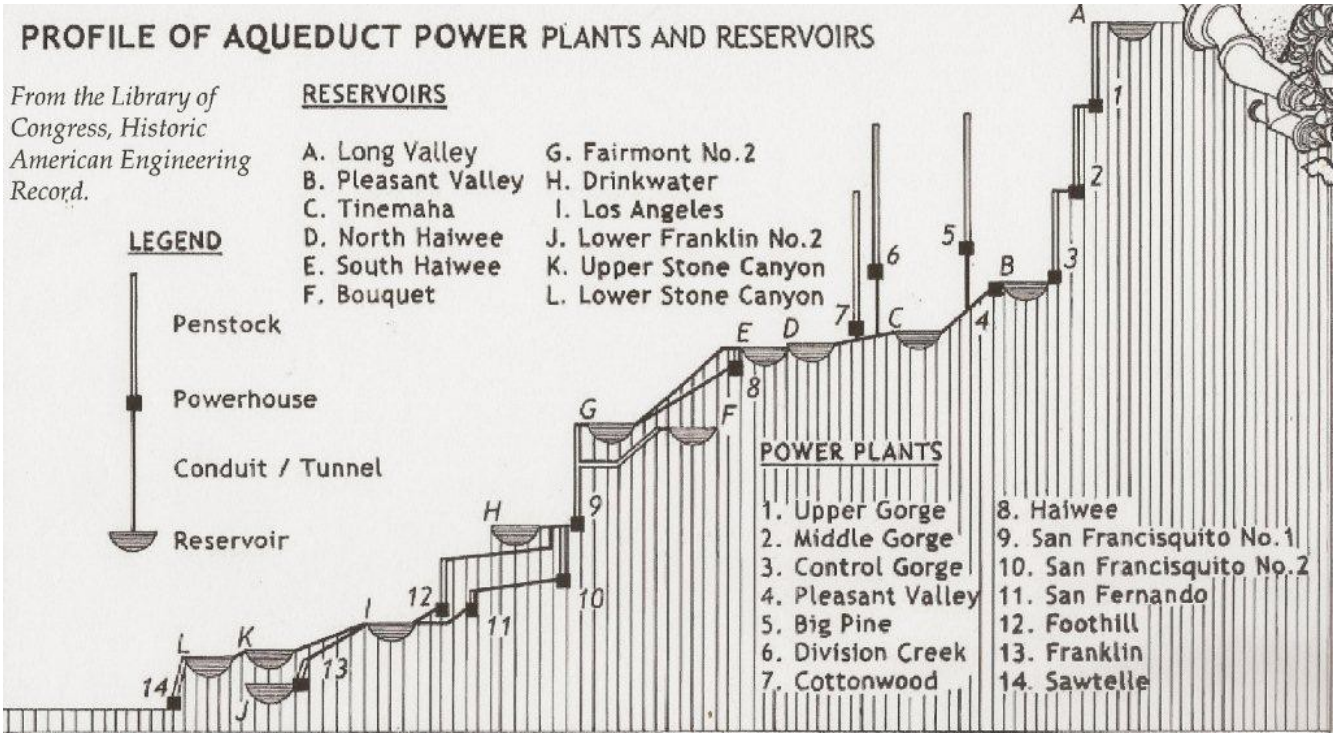
**Monolith Portland Cement Plant in 1923**

Here is a photo of tufa pyramids you can see today in Mono Lake.


**Mono Lake Tufa Tower**

The digging of the tunnels, all 142 of them, required an army of miners, who sometimes worked around the clock and set several world records for the amount of tunnel completed in a day or a month. Mining is inherently dangerous and the safety of the miners and other workers on this project was a high priority for Mulholland. For example, more than 150 workers died in the building of New York's aqueduct from the Catskills, which was completed at about the same time as the Los Angeles Aqueduct. On the Los Angeles Aqueduct project, by comparison, only five men died during the entire six years of construction; three of them in one accident at the Elizabeth Tunnel.

Fourteen hydroelectric power plants were built along the Aqueduct. In 1908, two were built to provide electricity for constructing the aqueduct. This was the first time electric power had been used in such a construction project.




**Power Plants on the Aqueduct**

**The aqueduct system was extensively developed to take advantage of the drop in elevation as water descends from the High Sierras to Los Angeles. Up to 14 hydroelectric power plants were built along the Los Angeles Aqueduct. In 1908, the Division Creek Power Plant in Owens Valley became the first hydro-electric power plant to be constructed. It, along with the Cottonwood Power Plant, were built for the purpose of constructing the aqueduct. This was the first time electric energy had been used in such a construction project. Credit: Water and Power Associates**

## November 5, 1913: "And the Water Began to Flow"

After six years of construction, on November 5, 1931 the long-awaited day arrived when the water from Owens Valley would pour into Los Angeles. More than 30,000 people were on hand to witness the ceremony of the opening of the gates that would allow the water to flow into the canal that would take it to the reservoir near present day Sylmar. The city made the day an official holiday, one that would be remembered for years to come.

**November 5, 1913 - The water gates are opened and the Los Angeles Aqueduct water starts to flow down into the San Fernando Valley**

On the speakers' stand Mulholland was brief in his remarks:

*"....You have come here today to ask us to render an account of our stewardship, and we come ready to do it. If the project fails, we are to blame. We took responsibility for failure willingly and gladly and have done the best we could....This rude platform is an alter, and on it we are here consecrating this water su*pply *and dedicating this aqueduct to you and your children and your childrens' children-- for all time."*(46)

As the gate was opened and the water began to flow the crowd went wild, cheering and laughing as they sampled the water. Mulholland simply turned to the Mayor of Los Angeles and said: *"There it is Mr. Mayor. Take it."*(47)

**"And the Water Came Tumbing Down"**

The *Los Angeles Times* the next day reported on the event, under the headline, *"Silver Torrent Crowns the City's Mighty Achievement:"*

*"From the mountain fastnesses of the snow-capped Sierra, through the world's longest man-made conduit of steel, cement and solid granite, sparkling water poured in a mighty torrent from the aqueduct's mouth... It gurgled and splashed its cheerful message of good health, great wealth, long life and plenteous prosperity to Los Angeles and her people."*(48)

Here is a four minute video that encapsulates very well the building of the aqueduct. The *"Construction of the Owens Valley Project,"* is available on YouTube at: https://www.youtube.com/watch?v=QesBtxLwvWY

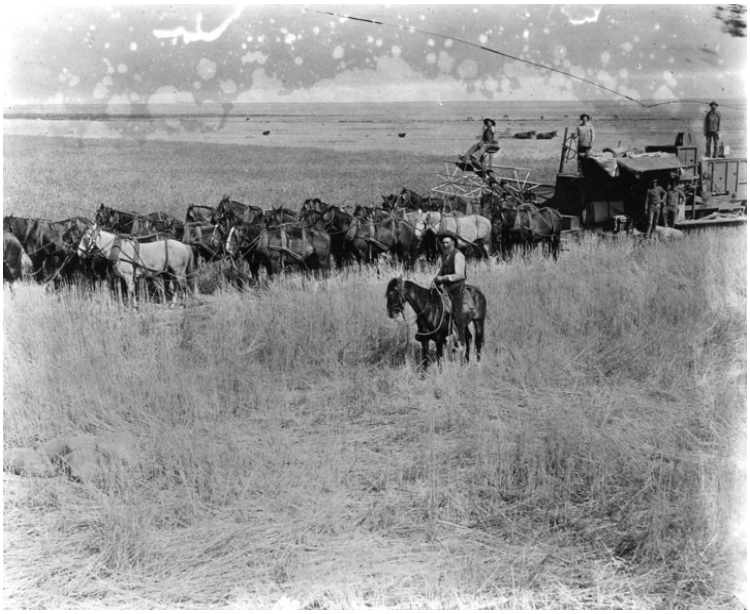
The job was done, and it was done well. But, Mulholland was, as he often said, responsible to the future. The city was still growing rapidly, and the now plentiful water from Owens Valley had opened up the city to even more rapid growth. For the next 15 years Mulholland worked to ensure that the millions more coming to the city, and Southern California generally, would have the water they would need.

Here is a chart of the population growth and growth of the geographic size of the City of Los Angeles:

**Population Growth and Physical Size of the City of Los Angeles 1876-2013**

| Year | Population | Size |
|---|---|---|
| 1876 | 9,000 | |
| 1890 | 50,000 | |
| 1900 | 102,000 | 44 square miles |
| 1903 | 175,000 | |
| 1913 | 400,000 | |
| 1920 | 577,000 | 364 square miles |
| 1930 | 1,238,000 | |
| 1940 | 1,504,000 | |
| 1950 | 1,970,000 | |
| 1960 | 2,479,000 | |
| 1970 | 2,816,000 | |
| 1980 | 2,968,000 | |
| 1990 | 3,485,000 | |
| 2000 | 3,695,000 | |
| 2013 | 3,800,000 | 503 square miles |

From the chart, please note the following: First, while the aqueduct was under construction, the population nearly doubled. Second, during the 17 years between the completion of the aqueduct and 1930, the population tripled. Third, note the dramatic growth in the geographic size of the city after the 1913 completion of the aqueduct. This was due to the incorporation of the San Fernando Valley into the city. And with that incorporation, Los Angels became the largest city geographically in the world.



**San Fernando Valley, circa 1900**

Prior to the aqueduct the San Fernando Valley was a near desert, with very few inhabitants. With the water now available, at first, orchards were planted, and soon Los Angeles County was the most productive agricultural county in the nation. Gradually, over the next decades, the orchards were replaced by residential, business and industrial neighborhoods.

Catherine Mulholland highlights the importance of the aqueduct and the effective leadership Mulholland provided as the superintendent of the city water and power system, for the growth of the city. She writes, the growth of the city *"was predicated on an efficient municipal water organization's providing am adequate supply at low rates, along with a growing power system able to produce low-priced electricity in competition with private systems."*(49)

It was not until 1939 that the city of Los Angeles bought out the last of the private electric companies and established a municipally owned electric power system. The battle of public vs private power all during the early decades of the 20th Century was decisively settled by President Franklin D. Roosevelt in the 1930's, in favor of publicly owned electricity. Though private power companies continued to exist, they no longer had either the sentiment of the public, nor the political support among elected officials that in the early years of electricity favored private power. That is, until the disastrous electricity privatization policies of the 1990s, which gave Americans a new look at the corruption private power facilitates, with the poster child being Enron.(50)

Some years later, Congressman Carl Hayden of Arizona declared that Los Angeles was now the best lighted city in the world, with the cheapest manufacturing power.(51)

In 1914, the University of California at Berkeley awarded Mulholland an honorary degree, which read, "He broke the rocks and brought the river to the thirsty land."

Always a creator, in 1915, he invented a process of making relief maps, which he used to build a scale model of the aqueduct. He used vulcanized pasteboard to reproduce topographical surveys. Later, the

United States government adopted this method.(52)

# V. Now, Let's Build Hoover Dam

Mulholland never quit working and looking to the future. Again, from Katherine Mulholland: As *"...Mulholland, a man who rarely took a day off, remained devoted to his adopted city, became ever more deeply involved in civic affairs, and with Scattergood, began to consider the Colorado River as a source of hydroelectric power. In early 1921, they made an exploratory trip to study possible dam sites there, which resulted in a later decision to send survey parties to continue the work."(53)*

That same year, the American Association of Engineers named him one of the top engineers in the world.

In 1923, Mulholland, *" initiated the Department of Water and Power's six-year survey of 50,000 square miles of desert that resulted in the route ultimately selected for the Colorado River Aqueduct."* (54)

After another trip to the Colorado River in November, 1923, *"...Mulholland announced that the trip had confirmed his studies and observations of the past ten years; that the project of bringing Colorado River water to Los Angeles was feasible; and that the dam site should be in Boulder Canyon."*(55) He also saw his responsibilities as being more than Los Angeles. In 1920 *"...Mulholland seeking new solutions embracing a broader vision of water and power regulation for California, attended a banquet in Los Angeles with Elwood Mead and other water gurus to discuss Colonel Robert Marshall's irrigation plan for the San Joaquin Valley."*(56) Thus, he was in on the early planning of what would become the Central Valley Project, initiated by the state, but built at the state's request by the Federal Bureau of Reclamation under President Franklin Roosevelt.

February 9. 1923, was the ceremony to inaugurate the construction of the Mulholland Scenic Highway, a highway from Hollywood to the ocean along a ridge of the Hollywood and Santa Monica hills. (See Image on page 10).

While increasing attention was being paid by Mulholland to the Colorado River project, he continued building the distribution system for the Owens River water in and around the city. Also that year, he had dams and their reservoirs under construction in both Weid and San Francisquito Canyons.

The proposed Boulder Dam (later renamed Hoover Dam) project became the center of the fight for public power. Mulholland, in January, 1924, went to Washington, D.C. to testify in favor of the Swing-Johnson bill for the Boulder Dam, then being debated. For two weeks of conferences with government officials on why the government and not private interests should and could build the dam, Mulholland then testified on February 15.

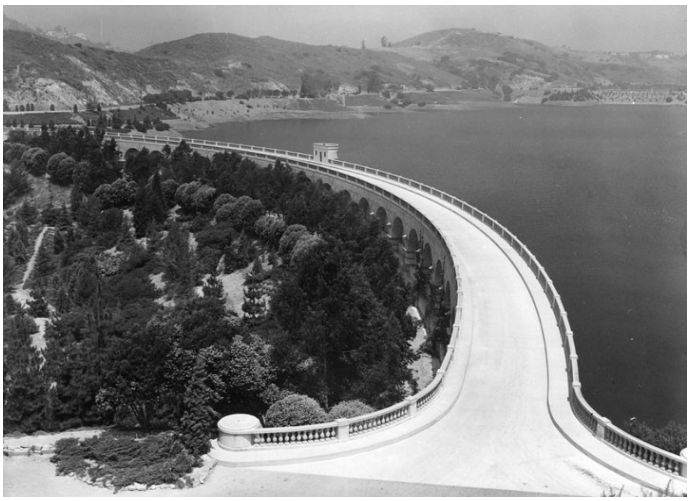
**Hoover Dam**

*"'I am here,'* Mulholland declared, *'in the interest of a domestic water supply for the City of Los Angeles, and that injects a new phase into this whole matter.'"*

*"Mulholland testified for two days, insisting that Boulder Dam would fit well with the city's plan to build an aqueduct connecting the Colorado River to Los Angeles. He predicted that the Boulder project would produce more power than all the oil fields in California and argued against creating the Topoc Dam being touted by private interests. Calling it the Poppycock Dam, he joked that its chief virtue was that, although it would hold water, it would produce no power. When probed to name the power companies and other organizations fighting the Swing-Johnson bill, he sidestepped by saying most of the activity was covert but that everybody recognized it. 'It is a good deal like a mole,' he described. 'You know the mole is there; you see where he has made the hole and the hump in the ground where he has crawled; but if you try to jab a snickersnee into him he may not be there. We had the same sort of opposition to building the Aqueduct.'"*(57)

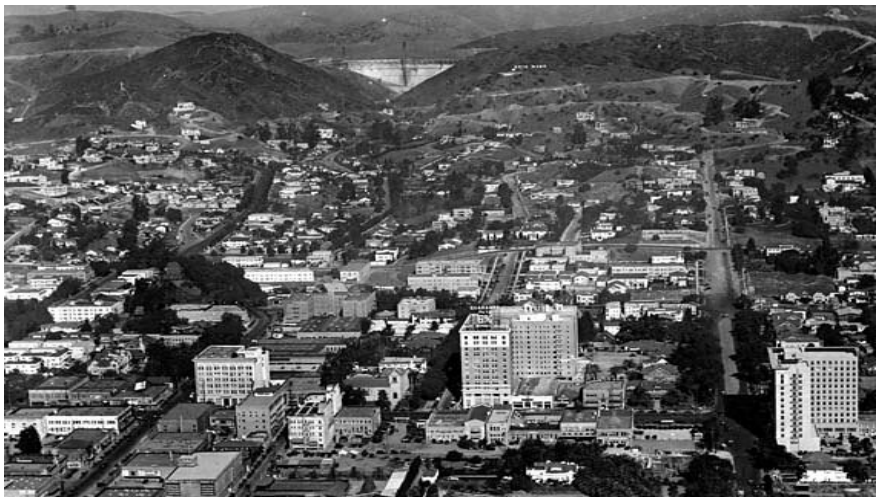
His opposition to private power derived from both his principle idea that utilities must be controlled by the public and his honesty. *"His attitude toward profiteering is best expressed in an anecdote he liked to tell his sons about a man he admired and often saw downtown-- a hauler of fat and renderings. Passing him one hot day, with his wagon stinking and dripping with the greasy leavings from restaurants and markets, Mulholland had called out, 'That's a dirty job you've got there, Sal.' Sal called back, 'Yes, Bill, but the money's clean.'"*(58)

In 1925, on St. Patrick's Day, Mulholland's Irish origins were honored with a day of celebration to dedicate Mulholland Dam in Weid Canyon, overlooking Hollywood. The reservoir, now called Hollywood Lake, holds 2.5 billion gallons (8,000 acre feet) of water, which originally came from the Los Angeles Aqueduct. Today the source of supply is a battery of sixteen wells in the San Fernando Valley. The dam is 200 feet high and 975 feet across the top. It is the most beautiful dam within the entire system owned and managed by the Los Angeles Department of Water and Power.



**Hollywood Reservoir and Mulholland Dam after landscaping**
**The front of the dam wall has been filled in with dirt for additional reinforcement and planted with trees and bushes.**
**Photo credit: Water and Power Associates**

The scene shown in the photo from the 1920s, below, of Mulholland Dam overlooking Hollywood, did make some people nervous having a couple of billion gallons of water sitting over them. After the Saint Francis dam collapse in 1928, the water level was temporarily lowered behind the dam and over the next few years thousands of tons of dirt was piled in front of the dam, giving it the appearance today as seen in the image above



**Mulholland Dam Overlooking Hollywood, circa 1930**

**1925 - William Mulholland at the dedication of the Mulholland Dam and Hollywood Reservoir** **Photo credit: Water and Power Associates**

## The Metropolitan Water District of Southern California

Mulholland shepherded the bill through the legislature in 1927, that created the Metropolitan Water District of Southern California (MWD), which would be the body that built the Colorado River Aqueduct. The Colorado River Aqueduct brings water from Lake Havasu behind Parker Dam, about 100 miles south of Hoover Dam, to an area that stretches from Ventura to San Diego. It was Mulholland's vision to create this institution, which today, nearly 20 million southern Californian's depend upon for their water. The Colorado Aqueduct was built during the 1930s, and was completed in 1939.

The MWD, as Steven P. Erie puts in in *"Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California,"* is, *"....Today, this unheralded organization is arguably the nations' and even the world's biggest and most important public water agency of its kind."* Discussing the history of the MWD, Erie states, *"In the early years, this extraordinary regional partnership financed and built the Colorado River Aqueduct, annexed most of Southern California into its service territory, and provided vital support for the 1960s-era State Water Project."*(59)

The MWD, when proposed, became part of the battle in the 1920s over public vs private power. *"....Opposing the initial 1925 MWD enabling act,... the Los Angeles Times denounced it as 'one of the most radical and Socialistic proposals ever submitted to the State Legislature....'"*(60) *Los Angeles Times* publisher Harrison Otis, and his successor/son-in-law Harry Chandler, just could not control their unbridled opposition to anything that would not benefit them personally or benefit their friends.

In 1964, the MWD entered into a contract with the Federal Atomic Energy Commission and the Department of the Interior for a detailed economic and engineering study of dual-purpose nuclear desalination plants with 50 to 150 million gallons per day (mgd) production capacity, to be in operation by 1970.(61)

In 1925, Mulholland was 70 years old, and in response to the idea of retirement, he said, *"If I knew of*

*anything that would afford me as much amusement and entertainment as the constructive work in this job, I would retire and do it."*(62)

Mulholland said he had too much to do. Decisions about the route of the Colorado River Aqueduct, he said, awed him. He related the following of an early experience when he was a sailor:

*"Soon after I went to sea at 14, I had a task to do on the quarterdeck. An old sailor named Jack, for whom I had formed a liking, was at the wheel. I had often edged up to him and let my hand rest on the wheel, while I watched the sails with him, getting the instinct for steering by the wind. This day as I stood there he remarked that he wished he had his sou'wester, as spray was wetting him. I said, 'Why don't you go get it? I'll take the wheel.' He did it, without stopping for a second thought and, as I stood there with the rolling ship responding to my touch as I held her to the right course, with wind abeam, I felt an elation, an exultation that cannot be described. I felt like Jove."*

*"He concluded, 'That is the way one feels at 70 at the wheel of an organization like this, and a task like the building of the Colorado aqueduct ahead. I am awed, as I was then by the majestic harmony of ship and sea and sail and wind, but I wasn't afraid then, and I'm not now.'"*(63)

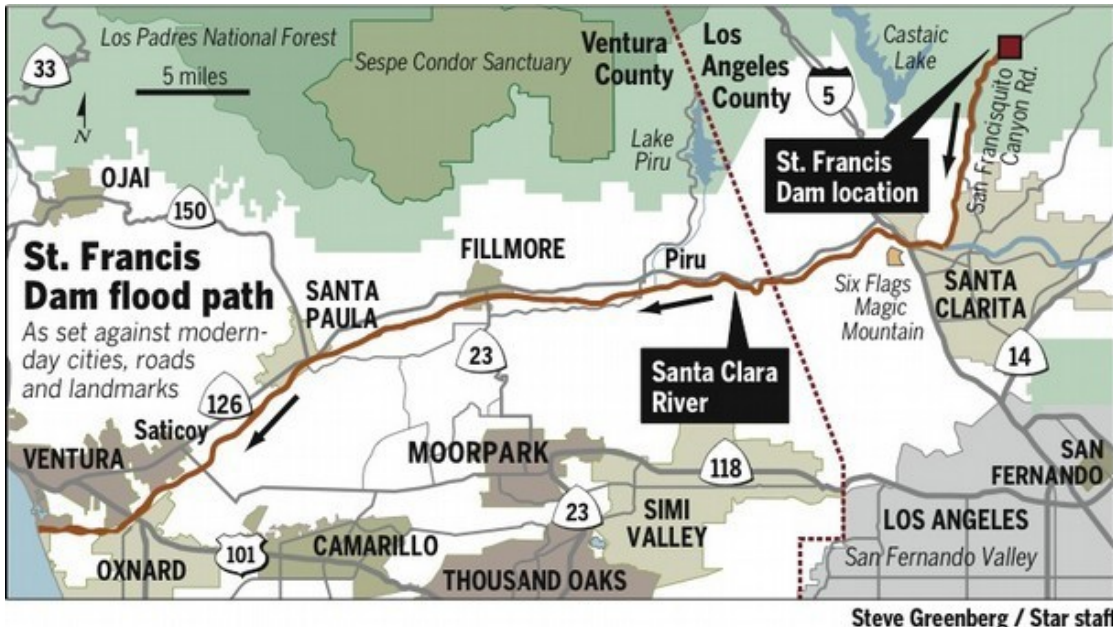
## Mulholland: The Final Years

In 1926, the Saint Francis Dam in San Francisquito Canyon was completed, and began to be filled with water from the aqueduct. Then, about midnight on March 12, 1928, the dam collapsed. In what was the greatest civil engineering failure in U.S. history, more that 400 people were killed, as a wall of water sixty feet high ran down the canyon, along the bed of the Santa Clara River, all the way to the Pacific Ocean, near Oxnard. The towns of Castaic Junction, Piru, Fillmore and Santa Paula were all heavily damaged or destroyed.

**Saint Francis Dam-- shortly before its collapse**

Leaks in the dam had begun to expand in the days before the collapse, but no one, especially Mulholland, who had designed the dam and overseen the construction, foresaw the possibility of its

collapse.




**Saint Francis Dam Flood Path**

**Saint Francis Dam, after its collapse**

The official investigation, completed within weeks of the disaster, found Mulholland was responsible, though why the dam collapsed was still unknown. The City of Los Angeles took full responsibility and paid for the clean-up and the compensation to the victims.

In the days immediately after the disaster, *"Mulholland had already asserted that if there were human error, it was his and his alone, which earned him praise and respect in many quarters as he went on to say, 'We must have overlooked something.'"*(64)

Why the dam collapsed has been studied for decades. One of the more recent studies is reported on the website of Water and Power Associates: *"J. David Rogers, a professor of geological engineering at Missouri University of Science and Technology, published a comprehensive account of the dam's failure. (in 1992) The dam's failure can be attributed to three major factors, he concluded: The instability of the ancient landslide material on which the dam was built; the failure to compensate for the additional height added to the dam's design; and the design and construction being overseen by only one person."*(65) Other studies point out that the ancient landslide could not have been detected by 1920s technology.

The disaster devastated Mulholland. He immediately retired from his position as Chief Engineer of the Los Angeles Department of Water and Power. As reported by Catherine Mulholland, he retreated from active public life, though *"...he remained unconvinced that an ultimate explanation had been reached. In accepting responsibility, he did not thereby consider himself to blame for something that had occurred beyond his power."*(66)

Yet Mulholland was still, mentally, an engineer and a builder, and he continued to have a hand in pushing through the national legislation that authorized the building of Hoover Dam.

Mulholland died on July 22, 1935. He was eulogized by national, state and city leaders, and during *"...services at Forest Lawn cemetery in Glendale, all work on the Colorado River Aqueduct ceased for a minute of silence in tribute to his memory while the waters at Haiwee Dam were also stopped in their flow to the city."*(67)

*"'We are a forgetful generation,'* declared Los Angeles Mayor Frank L. Shaw, *'but pray God that this community will never forget the everlasting debt of gratitude it owes this human diamond. His like we may never see again.'"*(68)

Mulholland had, long before he died, said, *"I want it written on my monument that I helped to build the Aqueduct."*(69)

**Mulholland Memorial Fountain**

On August 1, 1940, the William Mulholland Memorial Fountain designed by Walter S. Clayberg, was dedicated. In the main approach to the fountain memorial, a five-ton granite boulder has been placed. It was brought down from the hills above Haiwee Reservoir, where Mulholland saw it while the aqueduct was under construction and commented upon its pink beauty. The inscription reads as follows:

**To William Mulholland**
**1855-1935**
***A penniless Irish immigrant boy,***
***Who rose by the force of his industry,***
***Intelligence, integrity and intrepidity***
***To be a sturdy American citizen, a***
***Engineering genius, a whole-hearted***
***Humanitarian, the father of his city's***
***Water system and the Builder of the***
***Los Angeles Aqueduct:***
***This memorial is gratefully dedicated***
***By those who are the recipients of his***
***Unselfish bounty and the beneficiaries***
***Of his prophetic vision.***

# VI. Afterward

Between 1933-1941, the Mono Basin Extension Project, which extended the aqueduct 105 miles north from Owens Valley to the Mono Basin was built. This water then joined with the water from the Owens River to enter the aqueduct to Los Angeles.

A U.S. Supreme Court decision in 1963 (Arizona vs. California) allocated Arizona more water from the Colorado River, reducing the Metropolitan Water District's (MWD) entitlement to Colorado River water by more than 50%. In addition, water from the MWD was expensive because of the high energy costs involved in delivering it. Unlike the Los Angeles Aqueduct, the Colorado River Aqueduct requires pumping. This consideration, plus the availability of higher quality water, led to a decision to bring more Eastern Sierra water to Los Angeles.

The Second Los Angeles Aqueduct, an $89 million dollar facility, was completed in 1970. Beginning at Haiwee Reservoir, just south of the Owens dry lake bed, this project was shorter, half as wide as Mulholland's "ditch," and was easier to build as a result of improved construction equipment and the lower cost of steel pipe. The new aqueduct added another 50% capacity to the water system. The two Los Angeles Aqueducts can now deliver an average of 430 million gallons a day to the city.(70)

Today, the Los Angeles Department of Water and Power owns and operates 23 dams and 113 reservoirs in the Los Angeles area. It owns and operates 10 dams and reservoirs in Owens Valley, and owns 315,000 acres of eastern Sierra watershed land.

# VII. The Future

The future begins when people decide to create one. That is what William Mulholland did his entire life. The choice every generation must make has been to either busy oneself with the concerns of personal life and maybe a little more, or to know and act upon the nation and the world, helping to bring a future into being that is one that one can be proud of handing over to the next generation.

As I reported in Part I, "*The California Water Crisis, the California Water Management System, and the Solution—NAWAPA Part I"*, California is already in a severe water crisis. The fact that the Imperial Valley shuts down 40,000 acres of prime agricultural land in order to sell 180,000 acre feet of water to San Diego, and San Joaquin farmers only received 20% of the water they requested this year, should make the point.

I do not want to repeat here what I wrote in Part I, and I refer the reader to that report for a general discussion of the North American Water and Power Alliance XXI (NAWAPA XXI), which was produced by the LaRouche Political Action Committee (LPAC), and the updated report, *"Nuclear NAWAPA XXI: Gateway to the Fusion Economy,"* published by *21st Century Science and Technology* on-line magazine. Both of these reports and a video are listed in footnote (2) above.(71)

That report and the video link to *The LaRouche Weekly Report* of October 2, 2013, (see footnote 10, above) which provides the viewer with a window into the future as if you were living at the time of the John Kennedy Presidency, sets forth the task before us today.

That task is to complete the vision and the policies that President Kennedy had already begun, but died over the years after he died. Not just complete it, but through the creative power of the imagination, bring into being a world that has leaped to a new level of productivity through a nuclear powered up-shift in that productivity of man. One billion people on our planet do not have electricity; 800 million have no access to clean water. There is a lot of work to do.

The enemies of this nation, located in the financial oligarchy of London and Wall Street, have, for almost 50 years now, succeeded in turning our once proud industrial, scientific production system into nothing but a looted out gambling casino.

If that is the future you wish to bequeath to your grandchildren, then you, too, have succumbed to the corruption of the soul that has accompanied the destruction of the future.

I hope this report on one of the Promethean figures, of not only Los Angeles, but of the world, will provide you with at least a little of the inspiration we all require to meet the challenges that we face today. For, if there cannot be at least a few, today, who will provide the quality of leadership that Mulholland provided in his time, then our time, is indeed, a very sorry one.

Patrick Ruckert
October 18, 2013
Los Angeles, California

# VIII. Appendices

## Appendix I: The century old conflict between the Owens Valley and Los Angeles

1) Here is a statement that sums up the hard line view which we, in fairness I believe, must say reflects the view of the professionals at the LADWP. Though I think only those who have retired will say it

publicly, My view tends to agree with them.

"Owens Valley and the City of Los Angeles - A Complex Relationship

*"...the businesses and the homes were leased or rented back to the same people (residents of Owens Valley) to pursue their same activity. Most of them did and very successfully. Because, by that time, the impact of the city's improvements in the Owens Valley, and I don't mean the aqueduct, I mean in connection with the construction of the aqueduct, the city built a broad-gauge railroad from Mojave to Long Pine to connect with the narrow gauge railroad. So for the first time the Owens Valley had rail service to ship any products it had, including ranch products out of the city to Los Angeles. The City used its influence with the State of California to have the highway paved from Mojave to the Owens Valley, and that was done. So access to the Owens Valley because of the City's work, in its own behalf obviously, but still it was there and available to anybody that wanted to use it, both the railroad and the highway. The city built power plants in connection with the construction of the aqueduct, and those plants for a long time provided power to the Owens Valley, which didn't have it before the city came in there with the aqueduct construction.*

*"So there were a lot of benefits that occurred that, in my readings and listening to too many people that have no idea that those things happened or don't wish to... admit that those things happened."*

Robert V. Phillips, Chief Engineer and General Manager of DWP, 1972-75 (Both Mr. Phillips and his father knew and worked with Mulholland and Van Norman).(72)

2) From *"Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California,"* by Steven P. Erie:

*"As Los Angeles's water authorities after World War I began buying up more farmland in the Owens Valley to tap the water supply, critics charged that Mulholland—as President Theodore Roosevelt had appeared earlier-- seemed callous to the plight of Owens Valley people. Yet, recent research suggests that this was not necessarily the case. In all, Los Angeles spent over $24 million (or over $275 million in 2004 dollars) through 1934 to purchase Owens Valley agricultural and town properties. Compared to farmers and ranchers in neighboring Great Basin agricultural counties, Owens Valley landowners did substantially better in selling their land and water rights to the city than if they had stayed in agriculture and ranching. These were voluntary transactions; no land was purchased under threat of eminent domain. Further, most lands were leased back to their original owners for farming or livestock grazing. Later, Los Angeles, although a tax-exempt municipality, agreed to voluntarily pay property taxes in Inyo and Mono counties."*(73)

3) For those who wish to pursue this issue further, the following books are useful:

*My 40 Years at LADWP*, by Jim Wickser; 1999
Wickser argues that by 1890, long before the building of the aqueduct, there were about 250 miles of canals in Owens Valley diverting streams and parts of the Owens River from emptying into Owens Lake.

*The Owens Valley Controversy and A.A. Bierly*, by Robert A. Pearce, Ph.D.; 1999
Pearce lists articles from the *Inyo Independent* describing the dust problems which plagued the Owens Lake area before the acquisitions by Los Angeles.

*Vision or Villainy: Origins of the Owens Valley-Los Angeles Water Controversy*, by Abraham Hoffman;

Texas A&M University Press, 1981.

## Appendix II: Opposition to NAWAPA

In *Cadillac Desert: The American West and its Disappearing Water*, by Marc Reisner, published in 1986, the following screed is made after several pages of near honest reporting on the history of the proposed NAWAPA project:

*"....Suddenly, the monster project that had been all but given up for dead began to twitch again. In October of 1980, at a California conference on 'A High-Technology Policy for U.S. Reindustrialization' sponsored by the Fusion Energy Foundation—an offshoot of the U.S. Labor Party, which despises the Soviet Union but envies its inveterate commitment to gargantuan public works-- Dr. Nathan W. Snyder of the Parsons Company reintroduced NAWAPA to a large and enthusiastic audience. 'Ultimately, the decision to build NAWAPA-- or a project similar to it-- will determine, in some part, the future economic well-being in North America,' said Snyder. 'Water is the most basic of all resources. Civilizations grew or withered depending on its availability.'"*(74)

# Notes

(1) "*The California Water Crisis, the California Water Management System, and the Solution—NAWAPA Part I,*" July, 2013. The unpublished full report is available from the author at patruckert@hotmail.com. A published, but shortened version of the report is in *Executive Intelligence Review*; September 27, 2013. The links are:
http://larouchepub.com/eiw/private/2013/2013_30-39/2013-38/pdf/20-26_4038.pdf
http://larouchepub.com/eiw/private/2013/2013_30-39/2013-38/pdf/27-28_4038.pdf

A You Tube video lecture is available at:
Part I: https://www.youtube.com/watch?v=3IqiB-kp4g0
Part II: https://www.youtube.com/watch?v=nfgrt6aRXts
Part III: https://www.youtube.com/watch?v=5eK1xUZhRIc

(2) The earlier versions of the reports by the LaRouche PAC on NAWAPA XXI include a Special Report on NAWAPA and a summary video.

These two items can be found here:
*"NAWAPA XXI-- LaRouche PAC Special Report"*
http://larouchepac.com/files/20120403-nawapaxxi-forweb_0.pdf

NAWAPA XXI Animated Overview
http://larouchepac.com/nawapaxxi/overview

The updated report, "*Nuclear NAWAPA XXI: Gateway to the Fusion Economy,"* published by *21st Century Science and Technology* on-line magazine, can be found here:
http://21stcenturysciencetech.com/Nuclear_NAWAPA.html

(3) On opening day of the aqueduct, November 5, 1913, Mulholland, in an interview, paid the following tribute to the men who did the work:

*"My sympathy is alive for these men, and most of the time raw and bleeding, to think that they do so much to so*

*little purpose. I know this type of man; in my early life as a sailor I worked with them and slept with them, and I would rather be with them, to sit around camp with them, than to be in a circle of lawyers and doctors and bankers. Professional men are trained to conceal their thoughts, but these men are frank, blunt and human and a man gets more real insight into human life and affairs with them than with the other type. They were a grand lot, they did their work and took their chances in the tunnels, dry or wet, safe or indifferent, with gas or free from it, and in other dangerous jobs, and they spent their money like sailors ashore, and that is the one thing that saddens me today."* The *Los Angeles Examiner*, November 5, 1913.

(4) For a more extended discussion of the Rural Electrification Program of President Franklin D. Roosevelt, see my report, *"The Fight to Build the Grand Coulee Dam and the Economic Revolution that Transformed the Nation,"* by Patrick Ruckert; 2013. The report is unpublished, but is available from the author at patruckert@hotmail.com.

A video version is also available on YouTube under the title: *"Grand Coulee Dam - History of the Battle to build it- By Patrick Ruckert."*
https://www.youtube.com/watch?v=znWVTrD_FcU

(5) According to Steven P. Erie, the Tennessee Valley Authority was modeled after the Los Angeles Department of Water and Power and the Metropolitan Water District of Southern California. *Beyond Chinatown-- The Metropolitan Water District, Growth, and the Environment in Southern California,* by Steven P. Erie, (Stanford University Press, 2006), page 261.

(6) The Preamble to the Constitution of the United States of America:

*"We the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America."*

(7) Kennedy's speech at Hanford on September 26, 1963 can be found on YouTube, under the title: *"Kennedy at Hanford, 1963"*
https://www.youtube.com/watch?v=06YwfnWR4Qo

Also, a video featuring six speeches by President Kennedy inaugurating water projects in the Mid-West and Western states in 1962-63 is available from LaRouche PAC, at: http://larouchepac.com/reclaimjfk

(8) See, "*John F. Kennedy Vs. the Empire,"* by Anton Chaitkin; *Executive Intelligence Review,* August 30, 2013.
http://www.larouchepub.com/eiw/public/2013/2013_30-39/2013-35/pdf/04-19_4035.pdf

(9) JFK at Greers Ferry Dam, Arkansas on October 3, 1963,
http://www.presidency.ucsb.edu/ws/?pid=9455#axzz2hqZJVIYz

(10) The LaRouche Political Action Committee Weekly Report, *"A New Paradigm for Mankind,"* October 2, 2013. http://larouchepac.com/node/28384
A transcript of this discussion is available from *Executive Intelligence Review*, October 18, 2013, under the title, "WHAT HIS ASSASSINS KILLED: John F. Kennedy's Program for a Nuclear America,"
http://larouchepub.com/eiw/public/2013/eirv40n41-20131018/04-16_4041.pdf

(11) This idea is so fundamental to a scientific understanding of man's place and role in the universe, therefore, I include here the rather lengthy introductory remarks of Jason Ross from the LaRouche Political Action Committee's Weekly Report, *"A New Paradigm for Mankind,"* of August 28, 2013, which highlights the understanding of this question by one of the greatest scientific geniuses of the early 20th Century, Vladimir Vernadsky. The full video can be found at: http://larouchepac.com/node/27910

Jason Ross' opening remarks:

*So let's start with--I wanted to begin with a quote from Vernadsky, which I've been using a fair amount recently, about what the human species actually is. This is from a paper that Vernadsky wrote in 1925. ["Human Autotrophy"--PR] when he was in Paris, and it's going to be in the Fall issue of the "21st Century Science and Technology."*

*Vernadsky says that, "Man is profoundly distinguished from the other organisms by his action on the environment. This distinction, which was great from the beginning of mankind, has become immense with the passage of time. The action of other organisms is almost exclusively determined by their nutrition and their growth, and increase, their bodies. Mankind certainly acts in the same way as all these other organisms, but his mass is completely negligible in comparison with the totality of living matter, and the direct manifestations in living nature, of his nutrition and his increase, are almost nothing."*

*The wise Austrian economist, L. Brentano, has given a very clear representation of the scale of humanity within the environment. "If one assigns to each individual a square meter, and if one brings together all the humans existing on the terrestrial surface, the surface they would occupy would not exceed the size of Lake Constance. It is clear that the manifestation of such a living mass of people, of our bodies, considered on the scale of geological phenomena would be negligible. Reason changes all. Through it, man utilizes material in the environment--inanimate or living--not only for the building of his body, but also for his social life. And this usage has become a great geological force. Thought, by its existence, introduces into the crustal mechanisms, a powerful process having no analog before the appearance of man."*

*From a geological standpoint, our species is completely, fundamentally different from anything else. If you look at how life shapes the material of the planet, you will find things like the great oxygenation event. You fund the creation of some forms of fossil materials, like coal. You see changes in the atmosphere. But when you look at the human species, it's fundamentally different. All these other changes are made by the actual bodies of organisms. Plants make oxygen by their bodies. Coal is formed--you know--bodies. Coral reefs--bodies of coral. We're not like that. We don't, you know, build our homes out of the bones of our ancestors. We don't rely on, you know, collecting hair to make our clothing, or anything like that. It's different. Those are rather gross examples. Sorry. But we don't do that at all.*

*We are fundamentally different, in that we, by our action on the environment, have a social transformation character of the planet, and that's completely unique to us. And that is, the outlook that we really have to represent, and not be afraid to. Because this has been attacked, just by empire, over the years.*

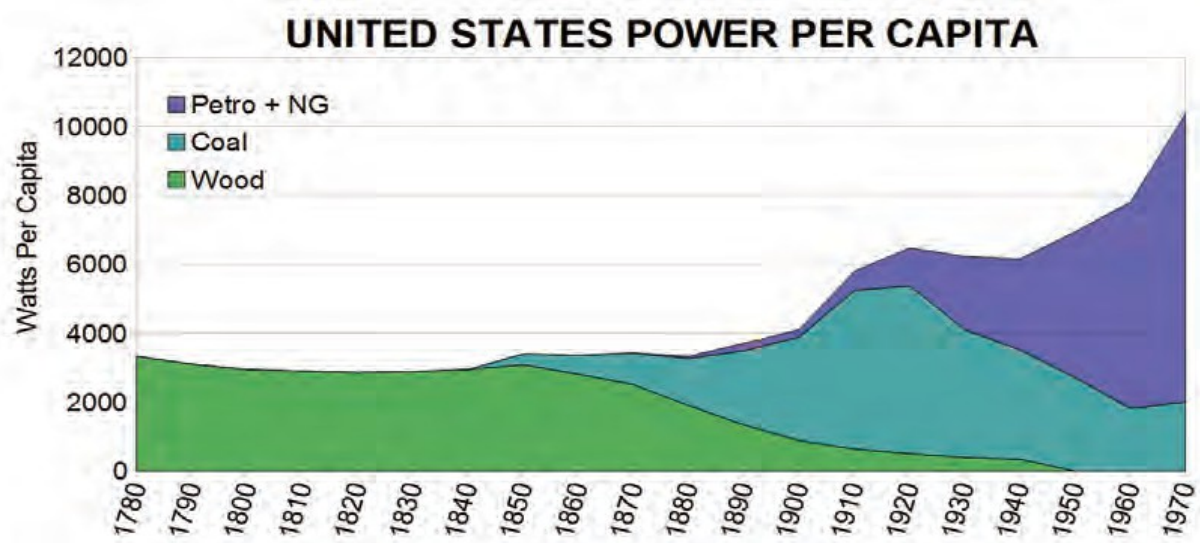
*I mean, somewhat more recently, Thomas Malthus, from the British East India Company, he said that the, while population grows in a geometric way, the amount of the fruit of the land, increases only in an arithmetic fashion. That's completely made up. It's just not true at all. And if it were true--you know, he's saying, we're going to have a collapse. There's just too many people, etc. There's a certain kind of people, he thought there were too many of, of course. Namely, you know, poor people. Or the Irish.*

*But, if he was right, you should be able to say that in the past, living standards were much higher. They weren't. You know, things are supposed to keep getting worse now. Were they better in the past? No. Of course not.*

*Let me just put that aside. I've got a quote from Henry George, who is a somewhat famous American author, thinker, mayor of the past. This is from a book he wrote in 1879, called, "Progress and Poverty". He wrote that, "If bears, instead of men, had been shipped to the North American continent from Europe, there would now be no more bears than in the time of Columbus. But within the limits of the United States alone, there are now 45 million men, where there used to be only a few hundred thousand. And yet, there is now within that territory, more food per capita for these 45 million men, than there was food per capita for the hundred thousand."*

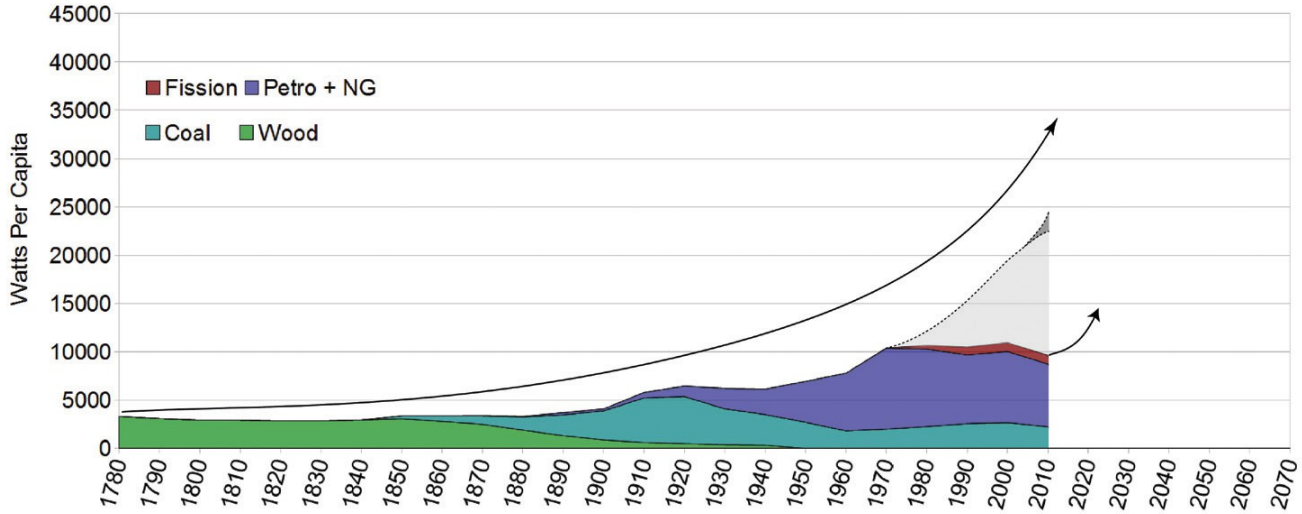
*It's not the increase of food that causes increase of men, but the increase of men that brought about the increase of food. There is more food because there are more men. Unlike other organisms, we don't wander around hoping to find some food to eat. We create out own food. We create our own living environment, like you might say plants do. So we're autotrophic in that way, as Vernadsky wrote in that paper, "Human Autotrophy."*

To demonstrate the idea of increasing energy-flux density, the below set of graphs from, "*Nuclear NAWAPA XXI: Gateway to the Fusion Economy," (*page 15), is below. Using these graphs one can trace the economic history of the United States through the ups and downs of total energy use by year. The most striking feature is the demonstration in the second graph of where we should be in energy use today had the historic growth of energy use continued instead of stagnating since 1970.




**Per capita power consumption for the United States from 1780 to 2010.**
Other power sources, such as hydropower, or so-called renewables, have been left out because of their minimal impact on the total per capita values.

Based on data from the U.S. Energy Information Administration's "2011 Annual Energy Review."




**Per capita power consumption for the United States from 1780 to 2010.**
**The general growth trend is indicated by the long arrow on top, with the gray wedge separating**

**what needed to occur with fusion power and the beginning of a fusion economy. The lower arrow on the right shows the direction of the immediate path which must be started today to overcome the 40 year growth gap. This requires a crash program for the development of fusion.**

(12) *Beyond Chinatown-- The Metropolitan Water District, Growth, and the Environment in Southern California,* by Steven P. Erie, (Stanford University Press, 2006), page 172.

(13) *William Mulholland and the Rise of Los Angeles,* by Catherine Mulholland, (University of California Press, 2000), page xxi.

(14) Ibid., page xvii.

(15) Ibid., page 3.

(16) *"The Brotherhood of the Common Life*," by William F. Wertz, Jr., *Fidelio,* July 1994, http://www.schillerinstitute.org/fid_91-96/942_bro_common_life.html

(17) Mulholland, Op. Cit., page 9.

(18) Ibid., page 17.

(19) *Rivers in the Desert: William Mulholland and the Inventing of Los Angeles*, by Margaret Leslie Davis, (Harper Collins Publishers, 1992), page 109.

(20) *"Einstein the Artist"*, by Shawna Halevy, LaRouche PAC, December 21, 2011, http://larouchepac.com/node/20891

(21) Mulholland, Op. Cit., page 28.

(22) Ibid., page 45.

(23) "Board of Water Commissioners, First Annual Report, 1902," as quoted in *"Facts and History, The Story of the Los Angeles Aqueduct; City Owns Its Water,"* Los Angeles Department of Water and Power; http://wsoweb.ladwp.com/Aqueduct/historyoflaa/

(24) Erie, Op. Cit., page 40.

(25) The state of California, too, asserts sovereignty over the water of the state. The California Water Code Section 102, states: "All water within the state is the property of the people of the state..." While the California State Constitution of 1879, states in article 14: "the use of water now appropriated, or that may hereafter be appropriated, for sale, rental or distribution, is hereby declared to be a public use, and subject to the regulation and control of the State." Further, the 1874 act, regulating groundwater, required that artesian wells be capped when not in use, and declared that water is the property of the people, to be used for the "greatest possible good upon the greatest number."

(26) Mulholland, Op. Cit., page 87.

(27) *Los Angeles Times,* July 29, 1905.

(28) Mulholland, Op. Cit., page 95-97.

(29) *Cadillac Desert: The American West and Its Disappearing Water,* by Marc Reisner, (Penguin Books, 1986),

page 71.

(30) Ibid., page 72.

(31) Erie, Op. Cit., page 35.

(32) Mulholland, Op. Cit., page 121.

(33) Davis, Op. Cit.., page 101.

(34) Mulholland, Op. Cit., page 112.

(35) Ibid., page 118.

(36) Ibid., page 120.

(37) Ibid., page 137-138.

(38) Ibid., page 159.

(39) Ibid., page 161.

(40) Ibid., page 164.

(41) Reisner, Op. Cit., page 456.

(42) LA DWP L. A. Aqueduct Centennial 2013, http://www.laaqueduct100.com/our-legacy/links/

(43) Mulholland, Op. Cit., page 175.

(44) Ibid., page 188.

(45) LA DWP L. A. Aqueduct Centennial 2013, http://www.laaqueduct100.com/our-legacy/links/

(46) Mulholland, Op. Cit., page 245.

(47) Ibid., page 245.

(48) *Los Angeles Times,* Nov. 6, 1913.

(49) Mulholland, Op. Cit., page 266.

(50) For a more thorough treatment of public vs. private power, see my report, *"The Fight to Build the Grand Coulee Dam and the Economic Revolution that Transformed the Nation, A Presentation by Patrick Ruckert,"* edited February 23, 2013. Unpublished, but available from the author at patruckert@hotmail.com. It can be found on You Tube under the title: **Grand Coulee Dam - History of the Battle to build it - By Patrick Ruckert**

Also, see: *"Facts and History, The Story of the Los Angeles Aqueduct; City Owns Its Water,"* Los Angeles Department of Water and Power, http://wsoweb.ladwp.com/Aqueduct/historyoflaa/

(51) Mulholland, Op. Cit., page 280.

(52) Ibid., page 259.

(53) Ibid., page 271.

(54) "*William Mulholland Biography,"* Water and Power Associates, http://waterandpower.org/museum/Water_in_Early_Los_Angeles.html

(55) Mulholland, Op. Cit., page 280.

(56) Ibid., page 276.

(57) Ibid., page 283.

(58) Ibid., page 300.

(59) Erie, Op. Cit., page 5.

(60) Ibid., page 50.

(61) *"Phase 1: NAWAPA XXI Treaty and Application of Nuclear Desalination,"* in *"Nuclear NAWAPA XXI: Gateway to the Fusion Economy," 21st Century Science and Technology*, page 27. The following is an excerpt from that report:

*"The most advanced research for large-scale desalination was launched under John F. Kennedy, but was never implemented. To this day, these designs are the most ambitious, rational, and scientific, and are therefore the model for today. In January 1963, Kennedy formed a task group with the Executive Office of Science and Technology to investigate the use of large nuclear reactors for desalination.*

*"Working closely with the Atomic Energy Commission (AEC) and the Department of Interior, the task group issued its report in March 1964, five months after his assassination. Their report estimated that if an appropriate research and development program were actively pursued, large-scale dual-purpose installations could produce 1,000 to 1,900 megawatts of electricity and 500 to 800 million gallons of water per day (.6-.9 million acre feet per year (MAFY). The report also suggested a program to develop and demonstrate a plant operating with an 8,300-MWt reactor, producing approximately 1,400 megawatts of electricity and 600 million gallons of water per day (.7 MAFY).*

*"This 8,300 MWt reactor was the 1975 goal. The 1970 goal was set for plants of intermediate size. The task group proposed producing a half dozen intermediate sized units, two in southern California, one in the greater New York area, several for the Gulf Coast, and one in Florida.*

*"The Metropolitan Water District (MWD) of southern California was the first site for such nuclear desalination, and entered into a contract with the Department of the Interior and the AEC in 1964 for a detailed economic and engineering study of dual-purpose nuclear desalination plants with 50 to 150 million gallons per day (mgd) production capacity, to be in operation by 1970.*

*"James Ramsey of the AEC remarked, "Such a project could convert more water from the sea than all the other sea water conversion units currently operating in the world." The 150 mgd plant was to produce enough water for a city of about 750,000 with a power output of 1.8 GW, exceeding that of the Hoover Dam, or enough for a city of about 2 million. Two large conventional light-water nuclear reactors, of about 3000 thermal megawatts each, were to be the energy source, and the water plant was to consist of three large multistage flash distillation sections, each producing 50 million gallons of water per day. The plant would have been 30 times larger than the largest existing water-desalination plant at that time."*

(62) Los Angeles *Examiner*, August 12, 1925; Los Angeles *Record*, August 14, 1925; *Los Angeles Times*, August 12, 1925).

(63) Los Angeles *Examiner*, August 14, 1925; Mulholland, Ibid., page 304.

(64) Mulholland, Op. Cit., page 323.

(65) "*St. Francis Dam Disaster,"* by Water and Power Associates, http://waterandpower.org/museum/St.%20Francis%20Dam%20Disaster.html

65) Mulholland, Op. Cit., page 328.

(67) Ibid., page 330.

(68) Ibid., page 330.

(69) Ibid., page 331.

(70) "*A Second Aqueduct – 1970,"* Water and Power Associates, http://waterandpower.org/museum/A_Second_Aqueduct.html

(71) Outside of LaRouche PAC and *21st Century Science and Technology*, the only other report I am familiar with at this time, that advocates a similar policy for an aggressive, Apollo Project approach to fusion power development is the, *"WHITE PAPER: Fusion Power – A 10 Year Plan to Energy Security," b*y The American Security Project, March, 2013. The authors of that report summarize their proposal:

*"ASP's report lays out an "Apollo Program" for fusion power that will lead to demonstration-level fusion power within a decade. To get there, the report provides several recommendations. For example, the President should appoint a Fusion Power Commissioner to organize, streamline and lead on fusion power development."*

The link to the report is here:
http://americansecurityproject.org/ASP%20Reports/Ref%200120%20-%20Fusion%20Power%20-%20A%2010%20Year%20Plan%20to%20Energy%20Security%20-%20White%20Paper%202013.pdf

(72) Water and Power Associates, http://waterandpower.org

(73) Erie, Op. Cit., page 5.

(74) Reisner, Op. Cit., page 490.

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A published, but shortened version of the report is in *Executive Intelligence Review*; September 27, 2013. The links are:
http://larouchepub.com/eiw/private/2013/2013_30-39/2013-38/pdf/20-26_4038.pdf
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A You Tube lecture is available in three parts, under the title: "The California Water Crisis and NAWAPA." The links are: :
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A lecture on James Fenimore Cooper by the author, incorporating new material, is available on You Tube, under the title, "James Fenimore Cooper: The Real Story." https://www.youtube.com/watch?v=ipx7_Htyzyw

# The Author at the Cascades, November 5, 2013