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## **Bill and Mike: How Two Irishmen Slaked the Thirst of California's Great Cities**

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# Bill and Mike: How Two Irishmen Slaked the Thirst of California's Great Cities

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- 1 How is it possible for almost 40 million people to live in a semi-arid coastal region of North America where rain falls unpredictably, and even then, in only one season of the year? How can California's warm, dry, sunny climate support a chain of vibrant, bustling conurbations along the Pacific Coast, teeming with multi-millions of people, despite the lack of any substantial fresh-water source within hundreds of miles? What daily marvels of hydraulic engineering are required to sustain California's two best-known cities, Los Angeles and San Francisco, with nearly five million residents between them, plus over 20 million more in their metropolitan areas? And, most improbably of all, how did two immigrants from a small, impoverished, well-watered island halfway around the world solve two of America's toughest urban infrastructure problems by bringing water to California's parched metropoli more than a century ago? That rather incredible story is the subject of this chapter.
- 2 California's water problems are well known, but poorly understood. TV news stories of drought-caused water shortages in California invite a simple knee-jerk response: why would anyone build big cities in a drought-prone area in the first place?<sup>1</sup> TV news viewers in other parts of the country are likely to change the channel in a huff, grumbling to themselves: "What were those crazy Californians thinking? What did they expect when they built cities in a desert? Don't they all have lawns and swimming pools anyway?" Some of these skeptics presumably build their own homes in flood or hurricane zones where they expect U.S. taxpayers to bail them out—literally, figuratively, and repeatedly—when the inevitable floods occur.<sup>2</sup> But aside from hypocrisy, what else is wrong with this common misconception regarding California's alleged lack of water to support its cities?

- 3 California has plenty of water—more than enough for nearly 40 million people who live there, in fact.<sup>3</sup> But the state does have two water problems that cause cyclical shortages in drought years, which climate change has made more frequent. The first problem is that most of the state's water (about 80% of total human water usage) goes to agribusiness, not cities. Billions of gallons a year are captured, stored, transported, and delivered below cost by various government entities to subsidize the profits of the state's sprawling corporate mega-farms, which consume all that liquid bounty to make money and grow crops. Vast and expensive water projects, built at public expense, have enabled California to claim first place among all states in agricultural output, measured in dollar value, for over a century.<sup>4</sup> Nearly half of all fruits, nuts, and vegetables consumed in the United States are grown in California, along with more than 90% of certain specialty crops (much of them exported) such as almonds, pistachios, broccoli, and strawberries.<sup>5</sup> But the enormous diversion of the state's precious water resources to the profit of corporate agribusiness leaves everybody else in the state, including cities, scrambling to scoop up whatever meager droplets are left after the big landowners and corporate farmers have gulped their fill.<sup>6</sup>
- 4 California's second water problem, more relevant here, is that most of the state's water is not located anywhere near the big coastal cities where millions of people live. Water is California's blessing, which makes it possible for so many city-dwellers to congregate along a sunny, temperate, semi-arid coastline.<sup>7</sup> But water is also California's curse, because it does not fall from the skies where or when it's needed. Instead, the bulk of California's water supply accumulates each winter in the Sierra Nevada Mountains from typically heavy annual snowfalls along the eastern edge of the state, far from the crowded coast. Few people realize, even in California, that the sun-drenched Golden State is also home to some of the world's most intense blizzards, which occur at the sparsely populated highest elevations of the Sierra Nevada Mountains. Up there, annual winter snowfalls create a dense snow pack that slowly melts in the spring and summer, flowing down into the state's 450-mile long Central Valley through a chain of rivers that drain into the Sacramento River in the north and the San Joaquin River in the south. These two great rivers meet and converge in the San Joaquin Delta, which flows westward and empties into San Francisco Bay.<sup>8</sup> This is the basis of California's water problem: to supply water to coastal cities, not to mention valley farms, one must tap mountain rivers hundreds of miles away. The melting snow that flows down from the distant mountains must be captured at its source, stored, and transported hundreds of miles to where most people live. "California simply couldn't become habitable or productive," a group of environmental engineers declared in 2020, "without a statewide water system of heroic magnitude."<sup>9</sup>

Figure 1: California Water Engineering Projects.



Adapted by author from <https://sites.uci.edu/energyobserver/2015/04/28/california-water-projects-feeding-southern-california/> and from [https://en.wikipedia.org/wiki/California\\_State\\_Water\\_Project](https://en.wikipedia.org/wiki/California_State_Water_Project).  
 Credit: Dennis Silverman, UC Irvine Energy Blog, posted 28 April 2015.

Figure 2: Major Rivers of California.



Source: Adapted by author from <https://commons.wikimedia.org/w/index.php?curid=22194638>.  
 Credit: Wikimedia Commons, posted 6 September 2010. Public domain.

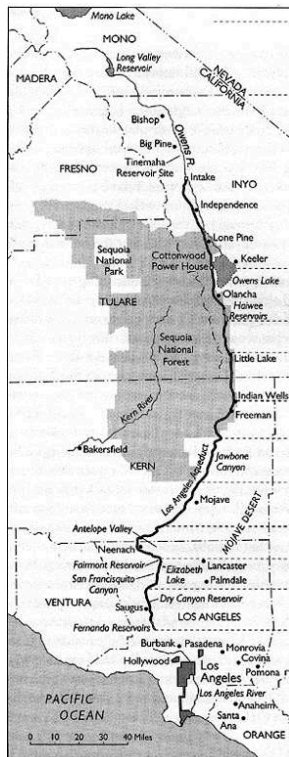
- 5 Who were the heroes who created water systems for Los Angeles and San Francisco? These astonishing feats of hydraulic engineering were accomplished over a century ago by a pair of Irish Catholic immigrants named Bill and Mike. These two very practical men left their famously green and damp homeland in the late nineteenth century to travel halfway around the world, eventually to solve California's urban water problem. The first of California's improbable water-saviors was Bill, better known as William Mulholland. Born in Belfast in 1855, Mulholland grew up in Dublin, where his father worked as a guard for the Royal Mail. Young Bill's father beat him regularly, until finally, after one last beating for a bad report card, the boy had had enough. Mulholland ran away to sea, signing up as a common sailor at the tender age of fifteen. He worked aboard steamers and sailing ships for a few years, crossing the Atlantic nineteen times before he decided to jump ship and stay in America. After a few years working in various states as a lumberjack, store clerk, mechanic, and miner, Mulholland wound up in Los Angeles in 1877, when he was just 22 years old.<sup>10</sup>
- 6 Los Angeles at that time had about 10,000 people who relied on the small Los Angeles River as their main water supply. Later, Mulholland would recall that the river held "the greatest attraction" for him, right from the start. "It was a beautiful, limpid little stream, with willows on its banks," he wrote. "It was so attractive to me that it at once became something about which my whole scheme of life was woven, I loved it so much."<sup>11</sup> Today, the Los Angeles River is a desolate, industrial, concretized channel choked with trash, shopping carts, old tires, and weeds, ringed with barbed wire and chain-link fences, frequented by feral rodents and unhoused people.<sup>12</sup> No one is likely to fall in love with this urban eyesore, but the Los Angeles River was rather more idyllic

in Mulholland's day. His love affair with the riparian namesake of his adopted hometown was consummated in 1880 when Mulholland got a job digging ditches and laying pipes to bring water to local residents and businesses. Like most Irish immigrants to America in the nineteenth century, Mulholland had little education; he was a school dropout, but at least he could read. On his own now, Mulholland began to teach himself the rudiments of hydraulics and civil engineering by reading textbooks from the public library at night. Within a few years, Mulholland the self-taught water expert knew enough about the subject to take over as superintendent of the Los Angeles water department in 1886, largely because he had memorized the town's entire network of wells, ditches, pumps, pipes, and levies.<sup>13</sup>

- 7 With Mulholland in charge of its water supply, Los Angeles kept growing rapidly, reaching 50,000 in population by 1890 and then 100,000 by 1900.<sup>14</sup> The hard-working Irishman struggled mightily to slake the thirst of his burgeoning city. "There is nothing concerning the life of a municipality more important than its water supply," Mulholland firmly believed.<sup>15</sup> He installed water meters in homes and businesses for the first time in an effort to encourage Los Angeles residents to conserve the city's most precious resource. Right away, per-capita water usage was cut in half.<sup>16</sup> Local families had to share bathwater by taking turns dousing themselves in the same small tub. Some residents bought precious drinking water by the pitcher from handcart peddlers who roamed the dry, dusty streets.<sup>17</sup> Mulholland knew that the city needed more water, but the meagre Los Angeles River, his first love, was tapped out, and he lamented to his superiors in 1904 that "every mountain stream within a radius of a hundred miles of this city has been appropriated long ago."<sup>18</sup> That same year, Mulholland took a long trip considerably beyond the hundred-mile radius to which he alluded. He rode off toward the far distant southern Sierra Nevada Mountains with his friend Fred Eaton, former mayor of Los Angeles. Eaton and Mulholland, "two sots on a spree" as Bill's granddaughter put it, supposedly left a trail of whiskey bottles behind their wagon on their epic desert trek some 200 miles northeast of their hometown.<sup>19</sup> Their destination was the Owens River Valley, where Eaton had gone hunting and fishing in the past. Fred was familiar with the territory and now he showed it to his Irish friend, Bill—who proceeded to fall in love all over again with yet another river.
- 8 Eaton introduced Mulholland to the pristine, high-altitude Owens River as it bubbled and gurgled with fresh Sierra Nevada snowmelt waters in the springtime. The surrounding valley was already filling up with prosperous farms and orchards that drew on the Owens River for irrigation.<sup>20</sup> Eaton persuaded Mulholland that this river should supply not the people of the Owens Valley, who lived along its banks, but rather, the much more distant and numerous people of Los Angeles, who, Eaton and Mulholland agreed, needed it more, deserved it more—and could pay more for it.<sup>21</sup> At first, "I thought the project was chimerical on account of the remote distance, and the great physical difficulties that interposed between there and our city," Mulholland later recalled. "But the city was growing so fast that we all realized that heroic measures were necessary, and if we were going to have continued growth and prosperity in the city, we would have to be brave and courageous and enterprising in securing a water supply."<sup>22</sup> Perhaps the scheme appealed to Mulholland most of all from an amateurish low-tech engineering standpoint: the Owens Valley is much higher in elevation than the city of Los Angeles, so even though mountain ranges lay in between, the waters of the Owens River could be transported over 200 miles downhill, uphill, and downhill again by a simple gravity siphon, with no dams or pumps. The

water would flow like a giant backyard garden hose.<sup>23</sup> Even a marginally trained engineer like Mulholland could grasp the basic principle behind what Los Angeles publicists would call “the most gigantic and difficult engineering project theretofore undertaken by an American city.”<sup>24</sup>

Figure 3: Los Angeles Aqueduct, Original Extent (ca. 1908).



Map showing the full extent of the 233 miles long Los Angeles Aqueduct running from its intake in Owens Valley to the point at which the water cascades down into the northeast San Fernando Valley.

Credit: Water and Power Associates, Mulholland-Scattergood Virtual Museum. Source: [https://waterandpower.org/museum/Construction\\_of\\_the\\_LA\\_Aqueduct.html](https://waterandpower.org/museum/Construction_of_the_LA_Aqueduct.html). Public domain.

- 9 The hard part was that Mulholland would have to convince the Owens Valley farmers and ranchers to sell or sign over their water rights to the city of Los Angeles. Only with the consent of Owens Valley residents could a faraway city quench its thirst by depriving a blossoming farming and ranching community of its liquid lifeblood. As California water expert David Carle has explained, echoing many other historians, Mulholland and Los Angeles applied “imperialistic pressure,” compounded by subterfuge, to appropriate the waters of the Owens River.<sup>25</sup> The inglorious aspects of this transaction were later immortalized, albeit inaccurately and anachronistically, by screenwriter Robert Towne and director Roman Polanski in their classic film *Chinatown* (1974).<sup>26</sup> Mulholland recruited secret agents to pose as federal officials from the U.S. Bureau of Reclamation who were ostensibly in the area to build an irrigation project that would benefit the fruit orchards, grain fields, and cattle ranches of the Owens Valley. Mulholland’s bogus agents convinced a good number of the valley’s farmers and ranchers to sign over water rights and land options to what they believed was a local irrigation project financed by the United States government. In fact, the Owens Valley populace had unwittingly sold out their landed livelihoods at a pittance to faraway Los Angeles, a city that many of them had probably never even seen.<sup>27</sup> To reference another



Hollywood classic, *The Wizard of Oz* (1939), it was as if the Munchkins had been duped into draining all the wells in Munchkinland to send their water to the Emerald City.

- 10 The truth came out in 1905, when the *Los Angeles Times* gleefully revealed that Mulholland had captured practically all of the Owens River to serve the city's future water needs. "Titanic Project to Give the City a River," ran the headline, although "give" was a charitable choice of words. Owens Valley newspapers portrayed the story somewhat differently, such as in this headline from the *Inyo Register*: "Los Angeles Plots Destruction, Would Take Owens River, Lay Lands Waste, Ruin People, Homes, and Communities."<sup>28</sup> The farmers and ranchers of the Owens Valley realized with dismay that L.A.'s gain would be their own existential loss, and that bringing water to the city would mean the desiccation and desolation of their valley. A local town meeting demanded an investigation by the U.S. Secretary of the Interior, claiming that loss of access to the Owens River would mean "the eventual ruination of this beautiful valley and conversion of the same into a barren waste of desert."<sup>29</sup> The local district attorney wrote despairingly to President Theodore Roosevelt that shunting the Owens River to Los Angeles "will mean the depopulation and devastation of the whole Owens River Valley and homes here cannot, in the very nature of things, withstand the encroachments of a large and wealthy city."<sup>30</sup> But it was too late: Mulholland had already acquired the necessary water rights, and in short order, Los Angeles voters approved funds for Mulholland's aqueduct by a vote of 10,787 to 755.<sup>31</sup>
- 11 Historians have documented a sordid side-story of this tragic tale: before plans for the Los Angeles Aqueduct became public knowledge, Mulholland's allies in and out of city government secretly bought up thousands of acres in the San Fernando Valley, near the aqueduct's planned end point. The syndicate of speculators included some of L.A.'s leading luminaries, such as streetcar magnates, power company executives, bankers, newspaper publishers, and most importantly, Moses Sherman of the Los Angeles Board of Water Commissioners, who was privy to inside information about Mulholland's aqueduct plans. These men anticipated the rising value of San Fernando Valley real estate after it would be irrigated with Owens River water before anyone else, including the San Fernando landholders, knew that the water was coming. Naturally, the unsuspecting ranchers of San Fernando had no idea what the future held in store when they sold their scrubby brown pastures to the Los Angeles syndicate at low prices. After Mulholland's aqueduct brought irrigated water to the San Fernando Valley on its way to Los Angeles, those same pastures became lush citrus groves capable of producing a very handsome income per acre, and still later, prime suburban developments of tract homes worth much, much more.<sup>32</sup>
- 12 Mulholland himself has not been implicated in the San Fernando land scheme. Instead, the Irish engineer was busy convincing Los Angeles taxpayers to pony up the money for his aqueduct. Mulholland worried that voters might be reluctant to approve the expensive bond measures necessary to finance his grand project. "If only we could make the people see the precarious condition in which Los Angeles stands," he fretted. "If only we could pound it into them! If Los Angeles runs out of water for one week, the city within a year will not have a population of 100,000 people. A city quickly finds its level and that level is its water supply!"<sup>33</sup> Mulholland's public appeals grew increasingly alarmist: "If you don't get the water now, you'll never need it," he warned the anxious residents of Los Angeles in the hot, dry summer of 1905. "The dead never get thirsty."<sup>34</sup> Mulholland meant, of course, not that the city would actually die, but that it would stop

growing if it couldn't get more water, and growth itself was already L.A.'s biggest business in the form of the construction and real estate industries. Voters got the message: indeed, the wide margins of approval for aqueduct bonds represented a mass public vote of confidence in Mulholland himself. As a fellow engineer noted, "the public at large realizes his untiring efforts in providing the city with the most essential element of its growth—nay, its very life blood," meaning water from the Owens River.<sup>35</sup> Los Angeles voters did not seem to care, or even notice, that the Owens Valley would lose its own "life blood" in the process. Indeed, the city's official report on the project asserted pitilessly that "the waters diverted from Owens Valley to the City of Los Angeles are waters saved from loss and which have been of little beneficial use."<sup>36</sup>

- 13 From 1908 to 1913, Mulholland worked himself to exhaustion by personally supervising the construction of the Los Angeles Aqueduct, which he had conceived and designed as a 250-mile long steel-pipe siphon. The mammoth project employed over 4,000 men working in high mountains and remote deserts where temperatures soared over 110 degrees F. in the daytime and fell below freezing at night.<sup>37</sup> "We had to pass through a country that was wholly uninhabited, that was forbidding in the extreme," Mulholland boasted. "There was but one idea, and that was to save the city, and we came through with flying colors."<sup>38</sup> With much sweat and muscle, his men dug over 150 tunnels, laying hundreds of miles of giant steel pipes that were forged on the East Coast and then shipped by sea all the way around South America. It was the world's second-greatest civil engineering project of its day, after the Panama Canal, which was under construction at the same time.<sup>39</sup> When Mulholland's aqueduct was completed in 1913, on time and under budget, the worn-out engineer gave a pithy dedication speech: "There it is. Take it."<sup>40</sup> Within a few years, however, he had much more to say, none of it nice, about the Owens Valley farmers and ranchers who struck back against what they perceived as nothing less than L.A.'s water theft. After their pleas for additional compensation went unanswered, some of the Owens Valley townsfolk resorted to terrorism: they dynamited sections of Mulholland's precious aqueduct on multiple occasions in the 1920s. Horrified, Mulholland sent armed guards with machine guns up to the Owens Valley to chase away the saboteurs who dared to harm his handiwork.<sup>41</sup> Now he regretted, Mulholland said, that there were not enough fruit trees left in the Owens Valley "to hang all the troublemakers who live there."<sup>42</sup>
- 14 In the 1920s, as bombings periodically disabled the aqueduct, Mulholland realized, belatedly, the need for more large-scale water storage closer to the city. Los Angeles needed to keep a ready supply on hand to sustain its fast-growing population in times when drought, earthquakes, technical failures, or foul play might temporarily interdict the flow from the Owens River. This is why Mulholland, while he was preoccupied with battling aqueduct dynamiters, made the fateful decision to build a large dam in the San Francisquito Canyon, northwest of Los Angeles. Mulholland's plan was to store water from the aqueduct close by the homes of the half-million people (with more coming all the time) who relied on it. Mulholland's concrete dam was of grand scale, but very simple design, just like the aqueduct itself, both drawn up on the self-taught engineer's well-smudged drafting table with little input or oversight from anyone else. The St. Francis Dam, as he called it, was finished in 1926, and by then the population of Los Angeles was booming more than ever. In the single decade of the 1920s, the already giant city nearly doubled in size from 576,000 to 1.2 million residents. "Whoever brings the water, brings the people," Mulholland had predicted—and he was right.<sup>43</sup> Now the Irish engineer frantically drew up new plans to bring even more water to his city from

the far-off Colorado River by an even longer desert aqueduct. But others would have to build that project; Mulholland would not be around to see it through.

- 15 One day in March 1928, the St. Francis Dam developed cracks and started leaking. Mulholland, the great engineer, was summoned to inspect his handiwork. He pronounced the dam safe, and then he went home and went to bed. That very night, however, the St. Francis Dam collapsed from the weight of the waters it held—and from flaws in its design. Mulholland had chosen an unstable dam site and had not anchored the edges of his dam deep enough into the surrounding canyon walls.<sup>44</sup> At close to midnight on March, 12, 1928, the St. Francis Dam gave way on both sides. Only a solitary block of ragged concrete was left standing in the middle like a towering tombstone. Over 12 billion gallons of water burst forth in a violent, rampaging flood that obliterated farms, orchards, and homesteads across rural Ventura County. The rushing waters were mixed with rocks, trees, boulders, mud, and huge chunks of shattered concrete from the dam itself. The biggest chunk weighed some 10,000 tons, which did considerable damage as it rolled rapidly downhill in a 100-foot-high tidal wave that flattened whole towns and laid waste to the landscape. Over 430 people were killed in the St. Francis Dam disaster of 1928, a higher official death toll than the much better-known San Francisco earthquake and fire of 1906.<sup>45</sup> Even at this writing, it still ranks as California's deadliest single disaster.
- 16 Mulholland was immediately blamed for the collapse of the St. Francis Dam. The bursting of a poorly built dam washed away this Irishman's feet of clay. A consulting engineer well acquainted with Mulholland examined the ruined dam a few days after its collapse, and he wrote: "This site plainly required many precautions that were ignored, and William Mulholland trusted too much of his own individual knowledge, particularly for a man who had no scientific education."<sup>46</sup> Governor C. C. Young's official investigation of the disaster concluded that "the ultimate failure of this dam was inevitable," given its flawed design and "defective foundations." The state's investigating engineers delicately pointed out that "while the benefits accrue to the builders of such projects, the failures bring disaster to others who have no control over the design, construction and maintenance of the works."<sup>47</sup> At the coroner's inquest, Mulholland testified somberly that "if there is an error of human judgment, I was the human. I won't try to fasten it on anybody else." The stricken engineer, aghast at what he had wrought, now said that he envied the dead.<sup>48</sup> For a time, there was talk of indicting Mulholland for murder, which would have marked a sad *denouement* to his illustrious career. Instead, Mulholland, age 73, was simply allowed to retire without fanfare.<sup>49</sup> He died a few years later, a bitter recluse, a broken man no longer loved by the city that had once worshipped him as its savior. Indeed, his granddaughter recalled that in his final years, the disgraced Mulholland received frequent death threats and "he lived with an armed guard around his home."<sup>50</sup>
- 17 The story of Mike, California's other great Irish hydraulic engineer, is much less well-known or dramatic—but it, too, has an ironic ending.<sup>51</sup> Michael Maurice O'Shaughnessy was born to a prosperous farming family in Ireland's County Limerick in 1864, nine years after Mulholland's birth. O'Shaughnessy was well-schooled at the Queen's Colleges in Cork and Galway, and in 1884, he graduated from Royal University, Dublin, with a bachelor's degree in engineering. Mike, unlike Bill, was no autodidact who cribbed the craft of engineering from library books; he was a highly trained and certified professional. A year after graduation, O'Shaughnessy immigrated to America

and, following relatives, he wound up in San Francisco, where his career, like Mulholland's in Los Angeles, flourished from the start. It helped that there were precious few engineers in the Far West with credentials as sterling as O'Shaughnessy's. More common in those days were self-made, by-the-bootstrap types of the Mulholland variety. The better-qualified O'Shaughnessy found himself constantly employed. He designed railroads, dug tunnels, dredged harbors, built fairgrounds, laid out towns, graded roadbeds, and, auspiciously, consulted on water systems. His local reputation rose so far so fast that before his 29<sup>th</sup> birthday, he was named chief engineer of the California Midwinter International Exposition of 1893-1894.<sup>52</sup>

- 18 In an extraordinarily detailed (but unpublished) memoir of his early career, O'Shaughnessy recalled that upon arrival in California, his first impression of the climate and scenery "led me to believe I had reached the promised land." It was in California that "a resolute intent to develop my practical engineering [became] the dominant note in my life."<sup>53</sup> In fulfilling this ambition, O'Shaughnessy achieved notable success. He built a home in Mill Valley, Marin County, California, where "the water supply problem was one of much interest." The challenge of solving that problem for his new home drew him into his first foray with western hydraulic engineering. On the 4th of July, 1890, while hiking with friends on the slopes of Marin's scenic Mt. Tamalpais, O'Shaughnessy accidentally discovered a hidden stream that he believed could "solve the water supply of Mill Valley without a large and expensive dam."<sup>54</sup> Later that year, he moved to San Francisco, where the Irish engineer acquired valuable experience working for the Spring Valley Water Company, which possessed a lucrative monopoly on supplying water to San Francisco.<sup>55</sup> O'Shaughnessy then took on a series of consulting jobs in Hawaii, building his career as a private engineer-for-hire specializing in water works. He rushed back to San Francisco after the earthquake and fire of April 18, 1906, arriving a week later, when charred buildings were still smoldering and the parks were full of homeless refugees.<sup>56</sup> No doubt the grim spectacle impressed upon him the dangers of inadequate civic water supply such as the poorly engineered system in San Francisco that had failed so utterly—and catastrophically. The city's own official investigation of the causes of the 1906 disaster starkly concluded: "The protection against fires afforded by the system of the Spring Valley Water Company was inadequate."<sup>57</sup>
- 19 O'Shaughnessy worked for the next five years on designing and building San Diego's water system, but in 1912, he returned to San Francisco. Mayor James Rolph convinced him to leave his consulting work elsewhere and take over as the city's chief engineer—at a salary less than half of what he was earning in the private sector.<sup>58</sup> Still, in San Francisco, the better-qualified O'Shaughnessy was paid more than Mulholland was in Los Angeles. He would have to work hard to earn his salary. In 1912, San Francisco was still rebuilding from the earthquake and fire that had destroyed half of the city a half-dozen years earlier. The previous city engineer, Marsden Manson, resigned from the strain of overseeing multiple large-scale and rushed municipal construction projects all at once.<sup>59</sup> San Francisco was building new roads, reservoirs, streetcar lines, tunnels, sewers, and fire protection systems in great haste, even as private property owners were rebuilding everywhere in the city, too. The challenges facing the next city engineer would be numerous and onerous—but O'Shaughnessy confidently took up his predecessor's unfinished plans and drew up more of his own.<sup>60</sup>

- 20 Water was San Francisco's most pressing problem. A local engineer spoke for most city residents in the years after the earthquake and fire when he asserted that "we have the poorest water-system of any city in the United States."<sup>61</sup> Finding local water supplies was a perennial challenge: "We are not situated here in San Francisco, as in Los Angeles, with a great big river in our backyard," O'Shaughnessy liked to point out, implying that his Irish counterpart Mulholland had it easy.<sup>62</sup> To make matters worse, San Francisco's city leaders had to deal with the privately owned Spring Valley Water Company, which failed to invest adequately in developing or expanding its water works. The company preferred to reap profits from its undersized system—with disastrous results in the 1906 fire.<sup>63</sup> The inadequacy of Spring Valley's method of doing business was driven home to O'Shaughnessy one day in 1913 when he inspected the company's new Calaveras Dam in Alameda County. None other than William Mulholland himself had designed this dam for Spring Valley on a consulting basis.<sup>64</sup> O'Shaughnessy was not impressed: he scoffed at the "sloppy way" and "reckless manner" in which Mulholland's dam was built, deeming it "slipshod and crude."<sup>65</sup> It turned out that O'Shaughnessy's suspicions were justified: five years later, in 1918, the Calaveras Dam suffered a partial collapse of some 800,000 cubic yards of earthen fill and it had to undergo a thorough reconstruction to remedy original design flaws.<sup>66</sup> The dam had to be completely rebuilt again less than a century later in 2016.<sup>67</sup>
- 21 O'Shaughnessy's training and experience taught him to use first-class methods and materials in major construction projects, whatever the cost. Not everyone agreed with him, however—especially not the politicians who had to raise the money to pay for O'Shaughnessy's premium designs. He discovered that the greatest challenge of his job was not designing or building anything, but rather, working with the San Francisco Board of Supervisors. "I had to run an engineering school," he complained, "where as fast as I could teach the Supervisors what it was all about, the public turned them out and sent me new pupils."<sup>68</sup> O'Shaughnessy was painfully aware that, as he put it, "enthusiastic amateur critics among the public at large are prone to demand tangible results at the very inception of any great public improvement and to indulge in unbalanced criticism, with a lack of knowledge of the facts, at the expense of the officials in charge."<sup>69</sup> It was no secret, as the *Engineering News-Record* reported, that "Mr. O'Shaughnessy [is] particularly well known for his disregard for politicians' political methods in the carrying out of engineering work." He did not like newspaper reporters much better: "San Francisco papers, like its people, are famous for their petty antagonisms," he sneered.<sup>70</sup>
- 22 Nonetheless, O'Shaughnessy always had the full support of Mayor "Sunny Jim" Rolph. The city's Irish engineer could disregard political considerations as he calmly decreed where to build the dams, dig the tunnels, lay the pipes and reservoirs, and run the streetcar lines, confident of the mayor's support. "Chief," Mayor Rolph told him, "you are in the saddle, you're it, you are in charge."<sup>71</sup> O'Shaughnessy's authority was constrained only by the need to raise funds to pay for whatever civic infrastructure improvements he deemed necessary. O'Shaughnessy commissioned the first feasibility studies for bridges over San Francisco Bay, three of which were eventually built, but he doubted that politicians and taxpayers could be persuaded to pay for them.<sup>72</sup> Instead, his main preoccupation became the construction of San Francisco's epic Hetch Hetchy water project. O'Shaughnessy considered this "stupendous enterprise" to be third in scale in all of North America behind only the New York and Boston water systems, and

he ranked it as “the greatest asset that San Francisco possesses.”<sup>73</sup> Previous engineers had already started planning Hetch Hetchy, which would require building a dam on the Tuolumne River inside Yosemite National Park.<sup>74</sup> After Congress gave the go-ahead in 1913, O’Shaughnessy finished the plans and then directed construction of the elaborate system that brought mountain-fresh water down from the high Sierra, across the Central Valley, across San Francisco Bay, and up the San Francisco peninsula to the city.<sup>75</sup>

Figure 4: Hetch Hetchy Aqueduct.



Map of San Francisco's Hetch Hetchy Project and appurtenant facilities in California, USA.

Source : [https://commons.wikimedia.org/wiki/Category:Hetch\\_Hetchy#/media/File:Hetchhetchyprojmap.jpg](https://commons.wikimedia.org/wiki/Category:Hetch_Hetchy#/media/File:Hetchhetchyprojmap.jpg) Crédit : Shannon 1 CC BY-SA 4.0.

- 23 Hetch Hetchy didn't happen fast or come cheap. “The completion of the entire aqueduct will require several years' time,” O’Shaughnessy warned the public when it was still under construction, “and a great expenditure of money.”<sup>76</sup> At the outset, the project was slowed by years of political battles between conservationists, who wanted to preserve the natural beauty of Yosemite National Park, and San Francisco city officials, who were eager to dam the Tuolumne River and turn Hetch Hetchy Valley into a reservoir. Behind the conservationists were privately owned utility companies, not least the Spring Valley, that lobbied against all publicly owned water and power projects such as San Francisco proposed to build.<sup>77</sup> “I never handled any proposition where the engineering problems were so simple and the political ones so complex,” O’Shaughnessy said after the project was complete.<sup>78</sup> Nonetheless, both O’Shaughnessy and San Francisco civic leaders prevailed, and to this day, the dam that forms the centerpiece of the Hetch Hetchy project is called O’Shaughnessy Dam. This arched slab of reinforced concrete, unlike Mulholland’s ill-fated St. Francis Dam, is still standing at over 300 feet tall, nearly twice the height of the St. Francis Dam. O’Shaughnessy Dam has served the people of San Francisco for nearly a century, supplying the city and many other Bay Area communities with cheap, clean water and hydroelectric power from 150 miles away.<sup>79</sup>
- 24 Tragically, San Francisco’s mountain marvel of hydraulic engineering came at the cost of desecrating Yosemite National Park. As nature-loving critics protested at the time, O’Shaughnessy Dam turned the second-most beautiful valley of the Sierra (after Yosemite Valley) into a sterile mountain bathtub. Submerged in the flooding of Hetch

Hetchy were the same sort of eye-popping natural wonders—sheer granite cliffs, glacial domes, towering waterfalls—that still draw millions of visitors each year to Yosemite.<sup>80</sup> Nonetheless, O'Shaughnessy and his civic allies argued persuasively that San Francisco needed a reliable, publicly owned water supply, given that half of the city had recently burned down for the lack of one. Environmentalists who pleaded for protecting the park were led by John Muir, the Scottish immigrant who in 1892 founded the influential Sierra Club and who is often considered the father of the American conservation movement. Muir angrily denounced what he called San Francisco's "damn-dam-damnation."<sup>81</sup> He charged that flooding Hetch Hetchy would despoil one of God's finest works of natural splendor. "These Temple destroyers, devotees of ravaging commercialism, seem to have a perfect contempt for Nature," cried Muir. "Dam Hetch Hetchy! As well dam for water-tanks the people's cathedrals and churches, for no holier temple has ever been consecrated by the heart of man."<sup>82</sup> But O'Shaughnessy replied that a mountain reservoir could be aesthetically appealing, too. "The construction of a dam," he blandly informed the so-called nature-lovers, "would add to the scenic features of the country." O'Shaughnessy even suggested that flooding the marshy valley floor "would be a blessing and a comfort to the neighborhood and to all visitors" because, he said, it would kill off mosquitoes.<sup>83</sup> Whatever the merits of such arguments, two U.S. presidents and Congress ultimately sided with San Francisco, which is why, in the end, the Irishman O'Shaughnessy and his city prevailed over the Scotsman John Muir and the Sierra Club. "Hetch Hetchy is ours," crowed the triumphant city engineer. "We'll do what we wish with it and no one can take it away from us."<sup>84</sup>

25 For two decades, O'Shaughnessy was the moving force behind Hetch Hetchy and many other monumental public works in San Francisco. Mayor Rolph heaped praise on his city engineer for "great knowledge," "wide experience," "genius," "beneficence," "inspired vision," and "courage undaunted."<sup>85</sup> Likewise, historians have identified "long-term planning," "technological expertise," "efficiency," and "effective, low-priced service to the public" as hallmarks of O'Shaughnessy's distinguished career.<sup>86</sup> For two decades, he patiently educated the public about the city's urgent needs so that politicians and voters would approve expensive bond measures necessary to foot the bill.<sup>87</sup> Such efforts were not always successful. O'Shaughnessy faced constant carping about the skyrocketing price of his infrastructural spending spree. So often did he appeal for funds that critics charged that his initials "M. M.," which stood for Michael Maurice, actually stood for "More Money."<sup>88</sup> In response to cost concerns, O'Shaughnessy came up with the clever expedient of developing Hetch Hetchy's hydroelectric power first, so that San Francisco could start selling the electric power that the project generated in order to raise money for completion of the water system.<sup>89</sup> "It is to the advantage of San Francisco," he patiently explained to cost-conscious critics, "to begin as soon as possible to generate the power which is a by-product of the water development, so that the revenue from power sales can be used to pay interest and redemption charges on bonds, reducing the burden to be carried by the taxpayers on the water project."<sup>90</sup> Electricity revenues never covered anywhere near the project's total cost, but O'Shaughnessy arranged for at least part of Hetch Hetchy to be built on a pay-as-you-go basis.

26 Another source of delays and rising expenses for Hetch Hetchy was San Francisco's protracted, difficult negotiations with Spring Valley to purchase the company's existing reservoirs and pipelines. After several deals fell through, and as the price kept jacking upwards, O'Shaughnessy finally got San Francisco voters to approve purchase

of the Spring Valley system in 1930, including its network of distribution pipes already installed throughout the city. This made it possible to distribute Hetch Hetchy water to masses of residential customers. Hetch Hetchy took a decade longer to complete, and it cost twice as much as O'Shaughnessy had originally estimated, but nonetheless, in 1934, the first Tuolumne River water flowed across the state to San Francisco's eager taps.<sup>91</sup> Sadly, O'Shaughnessy himself never lived to see that day: he had suffered a fatal heart attack just two weeks earlier at the age of 70.<sup>92</sup> No doubt the constant battles with politicians, the press, and the public had worn him down before his time. O'Shaughnessy wrote to a friend: "No Irishman you ever heard of has run away from a fight and I have had all the entertainment of that kind that any countryman of mine could desire in the last twenty years."<sup>93</sup> Four days after writing those words, he was dead.

- 27 The stories of Bill and Mike encompass multiple ironies. Bill of Los Angeles is by far the better known of the two Irish immigrant engineers who brought water to California's two iconic cities, thanks to the classic, though historically inaccurate Hollywood movie *Chinatown*, plus a scenic namesake boulevard that snakes 8 miles through the Santa Monica Mountains. Bill lived to see one of his grand designs tragically fail—at the cost of hundreds of lives. Mike of San Francisco, much less well known, the subject of no Hollywood film treatments, and namesake of only a short one-mile road (plus a dam), died before he could see his grandest project succeed for the benefit of some 2.3 million grateful users who still rely on the Hetch Hetchy system that was built under his supervision. Clearly, O'Shaughnessy's career is a testament to the superiority of legitimate professional training over Mulholland's amateur autodidacticism. And yet, in different ways, with varying success, these two enterprising Irish engineers brought water to their big, bustling cities, which kept growing despite California's semi-arid climate and inadequate, unreliable water supplies. Ironically, the more water that the engineers appropriated for their cities, the more people moved into those cities, raising demand faster than supply long after Bill and Mike had vanished from the scene and California had run out of rivers to tap. In the twenty-first century, even as their populations decline, Los Angeles and San Francisco face profound new water supply challenges due to drought, climate change, and the sort of environmental concerns that never bothered Bill or Mike.<sup>94</sup> San Francisco is under pressure to restore the Hetch Hetchy Valley, Los Angeles must reduce its withdrawals from the Owens and Colorado rivers, and state residents are forced to drastically reduce their water usage.<sup>95</sup> Bill and Mike's handiwork, for all its technical merits, left a troubling long-term legacy for California that becomes more problematical all the time.

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## NOTES

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## ABSTRACTS

Abstract: Los Angeles and San Francisco, with nearly 20 million residents in their combined metropolitan areas, are California's two most famous cities. Yet neither city has anything close to an adequate water supply within hundreds of miles. Tremendous feats of hydraulic engineering are necessary to store and transport water from California's inland mountain rivers to big cities on the state's semi-arid coast. In the early twentieth century, a pair of Irish immigrant engineers named Bill and Mike took charge of building these water systems for Los Angeles and San Francisco. William Mulholland ("Bill") was a self-taught school dropout whose projects bringing water to Los Angeles were grand in scale, yet simple in design, and in one case, fatally flawed. Michael M. O'Shaughnessy ("Mike") was an academically trained, properly credentialed, and highly experienced engineer before he took over the design and construction of San Francisco's water system. The work of these two Irishmen made it possible for their adopted cities to keep growing, but at the expense of two scenic valleys that were despoiled in the name of urban progress. The careers of Bill and Mike demonstrated the value of professional training and expertise over amateur autodidacticism, but also the irony of the sort of water imperialism they practiced. The more water they appropriated for their cities, the more people moved into those cities, raising demand faster than supply. Today, even as their populations decline, Los Angeles and San Francisco face greater water challenges than ever due to drought, climate change, and the sort of environmental concerns that Bill and Mike could never have imagined.

Résumé : Los Angeles et San Francisco, avec près de 20 millions d'habitants dans les deux zones métropolitaines, sont les villes les plus célèbres de Californie. Pourtant, sur plusieurs centaines de kilomètres, les volumes d'eau sont très insuffisants pour combler leurs besoins. D'énormes prouesses d'ingénierie hydraulique sont nécessaires pour stocker l'eau des rivières et pour la transporter depuis les montagnes de Californie jusqu'aux grandes villes de la côte semi-aride de



l'État en traversant d'immenses étendues de territoire. Au début du XX<sup>e</sup> siècle, deux ingénieurs issus de l'immigration irlandaise nommés Bill et Mike ont pris en charge la construction des systèmes d'approvisionnement en eau de Los Angeles et San Francisco. William Mulholland (« Bill ») était un autodidacte dont les projets pour Los Angeles étaient de grande envergure, mais simples dans leur conception ; dans un cas, le projet était extrêmement défectueux. Michael M. O'Shaughnessy (« Mike ») était un ingénieur de formation académique, dûment qualifié et très expérimenté avant de prendre en charge la conception et la construction du système hydraulique de San Francisco. Le travail de ces deux Irlandais a permis à leurs villes d'adopter de continuer à croître, mais au détriment de deux vallées pittoresques qui ont été desséchées et sacrifiées au nom du progrès urbain. Les carrières de Bill et Mike ont démontré la valeur de la formation professionnelle et de l'expertise par rapport à la pratique autodidacte, mais aussi le paradoxe qu'impliquait le type d'impérialisme hydraulique qu'ils pratiquaient. Plus ils fournissaient d'eau pour leurs villes, plus les gens s'installaient dans ces villes, accroissant la demande plus rapidement que l'offre. Aujourd'hui, alors même que leurs populations déclinent, les villes de Los Angeles et San Francisco sont confrontées à des défis hydrauliques plus importants que jamais en raison de la sécheresse, du changement climatique et d'enjeux environnementaux qui n'ont jamais préoccupé Bill ou Mike.

## INDEX

**Keywords:** California, Water, Dams, Aqueducts, Los Angeles, San Francisco, Hetch Hetchy, Owens River Valley, water wars, Mulholland (William), O'Shaughnessy (Michael Maurice), Irish Immigrants, 20th century, History

**Mots-clés:** Californie, eau, barrages, aqueducs, Los Angeles, guerres de l'eau, Mulholland (William), O'Shaughnessy (Michael Maurice), immigrants irlandais, histoire

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