Toward Santa Monica Water Independence by 2020:
Groundwater & the 'Master Plan'

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Santa Monica has a romantic history of self-reliance. Blessed with a large groundwater basin and issuant springs that kept her in supply, Santa Monica grew into an oasis pressed against the mountains and overlooking the Pacific Ocean, the destination for the hot, dry, and weary. As a result, the small city has had to labor to meet its ever-growing population's demand for fresh water, and overcome crippling obstacles to provide it. While California endures a fourth straight year of drought and a summer of rationing, Santa Monica has taken matters into its own hands once again.

The Santa Monica area was originally inhabited by the Chumash and Tongva Indians before the Spanish arrived. Even during Spanish and Mexican occupation in the early 1800's the region's ideal grazing land was amply fed by streams flowing out of the Santa Monica Mountains and numerous small springs bubbling forth near the foothills (Loomis, 2015). By the 1870's, when American settlers were arriving, individual wells were common, and many new Californians were pumping their own water and storing it in small tanks (Santa Monica History, 2015).

In 1874, Senator John P. Jones of Nevada, who had made a fortune in silver mining, visited the coast, and by 1875, he and wealthy landowner Robert Baker began purchasing and then reselling the plots that would lay the foundation for Santa Monica. At the time, the San Vicinte and other springs fed such development, and cisterns for collecting rainwater were commonly implemented on residential properties. The 1880's brought a real estate boom with the Southern Pacific railroad, and the landowner's private development of pumped water required two large reservoirs to be built near the foothills of the mountains (Loomis, 2015). The newly emerging town of 1,000 was incorporated in 1886. As the population grew, so did the water business, and private companies like the Sawtelle Water Company, the Artesia Water Company, and the Santa Monica Land & Water Company began building individual tracts of piping to residential tracts and businesses from their property's wells. Jones and Baker both sold their large land holdings (and thus, water holdings) to the Santa Monica Land & Water Company (SMLWC), which, by 1897, was piping fresh groundwater to most of Santa Monica's 3,000 people (Ingersoll, 1908).

Robert Coran Gillis, a rich developer, saw opportunity in such land and water holdings and bought the SMLWC and all of the surrounding parcels in 1904(Loomis, 2015). Population was doubling, and the water works were proving inadequate, so Gillis and the SMLWC dug new wells, added pipe, and encouraged adjacent communities' water companies to do the same for themselves.

The subsequent water infrastructure projects gave birth to neighboring communities in Brentwood (then "Westgate"), the "Palisades", Ocean Park and Sawtelle, and provided the very water distribution network that is being improved upon today (Ingersoll, 1908).

In 1913, a train ride away, the powerful city of Los Angeles was securing a water supply to ensure its place as a world class city. With 300,000 people to quench, the LA Department of Water and Power had promised and delivered an aqueduct that could provide enough water to supply the city's individual communities, if they agreed to be annexed to Los Angeles. The city made a heavy push to get its sister cities to buy into such worry-free provision (Loomis, 2015). "Westgate", Sawtelle, Venice, and "the Palisades" all annexed to the city of LA, but Santa Monica, after much trepidation and public discourse voted against annexation (Ingersoll, 1908).

With a boosted city government, and population doubling every ten years, the City of Santa Monica got into the water business, buying water infrastructure and development rights from the SMLWC in 1916 (Loomis, 2015). By 1917, the city voted for independence from neighboring Los Angeles, and voted again in 1923 for a $1 million bond to replace and improve upon an aging infrastructure, two bold acts that were rooted in groundwater abundance (The Water Plan, 2015).

Coming out of the Great Depression with a population near 35,000, Santa Monica was forced to augment its own supply with water newly diverted by the Colorado River Aqueduct and the Metropolitan Water District of Southern California (MWD) in 1931. By 1960, having doubled in size, Santa Monica was continuing to purchase imported water from the MWD when the State Water Project began sending Sacramento & San Joaquin river water south. The early quest for self-sufficiency was hampered by the real difficulty of meeting water needs, and while Santa Monica continued to grow, it needed to import water from other sources.

With a population of around 92,000 that swells to 300,000 daily with tourism and commerce, Santa Monica gets its water from only three sources: local groundwater, imported water, and recycled runoff; but the succinct water portfolio is actually more complex. Groundwater comes from a group of underground basins, known as the Santa Monica Basin, divided into the Arcadia, Charnock, Coastal, Crestal, and Olympic subbasins. Imported water comes from two sources: the Colorado River by way of the Colorado River Aqueduct, and the Sacramento and San Joaquin Rivers in Northern California via the State Water Project. Both delivered by wholesale company the Metropolitan Water District. Runoff water is recycled from storm drains by the Santa Monica Urban Runoff Recycling Facility (SMURFF) primarily for the City's landscape irrigation use. Although intermittent obstacles have shuffled the percentage of each's use, together these sources ensure that water flows to its residents and business, schools, hospitals, and even its fire hydrants seamlessly (Urban, 2010).

Santa Monica is the only city drawing water from the Santa Monica Basin even though it extends well beyond the city limits. The basins natural boundaries are the Santa Monica Mountains to the north, the Newport-Inglewood fault zone to the east, the Ballona bluffs to the south, and the Pacific Ocean to

the West. It is recharged by 11.3 inches of local average rainfall that percolates deep into the soil, but only about 4 inches so far in 2015 (Water Issue, 2015). As it seeps into the basin's ground water flows generally from the north to the south. Although Santa Monica sits above the Arcadia, Olympic, and Coastal subbasins, it draws water primarily from three wells in the Charnock subbasin under the 405 freeway in Mar Vista, the Olympic subbasin along Olympic Boulevard, and the Arcadia subbasin along the foothills of the Santa Monica Mountains (Urban, 2010). The city has never drawn water from the Crestal subbasin, and the Coastal subbasin is left alone as it serves as a fragile barrier to saltwater intrusion from Pacific Ocean groundwater; Lincoln Boulevard is considered the western extent of useable groundwater (Water Issue, 2015). At present, the only significant areas for basin recharge are located in golf courses, city parks, and residential lawns, but still only supply 5 to 10% of aquifer recharge (Water Issue, 2015). Estimated total storage capacity of the Santa Monica Basin is 1.1 million acre-feet (AF), but total combined groundwater in storage at present is about 317, 400 AF (about 24 years' worth of water at today's usage rate). The USGS estimated an annual average yield between 1971 and 2000 at 7,500 acre-feet per year (AFY). Historically, Santa Monica has pumped an average of 4,277 AFY, but in recent years has pumped up to 11,000 AFY. Since 2011, about 9,500 AF has been pumped from the Santa Monica Basin each year, or about 70% of Santa Monica's total water demand (Plan Update, 2014). Over the course of the City's 140-year history, careful groundwater management has prevented any overdraft conditions from occurring, an especially remarkable feat given the area's climate and susceptibility to recurring drought (Water Issue, 2015).

The idea of becoming a completely water-independent city may have been a long time in the making as Santa Monica's rich history describes, but new interest arose in 1990. Amid statewide drought, talk of diminishing supplies from the Colorado, Sacramento, and San Joaquin rivers led to measures by the City of Santa Monica to reduce use of MWD water through increased groundwater production and citywide water conservation policies and programs. As a result, in only five years, total water supply from local groundwater extraction increased from 31% to 70% (Executive Summary, 2014). The coup would save the City over half of its expenditure per gallon of imported water by using its own resources (MWD water costs about 25 cents/gallon, while Santa Monica groundwater costs about 11 cents/gallon to pump) (Water Study Session, 2011).

The reinstated independence didn't last long. The Charnock subbasin and well field had been supplying Santa Monica with fresh water since 1924. It constituted 50% of the City's fresh water in the 90's (Charnock, 2013). In 1996, however, contamination in the form of gasoline additives methyl tertiary-butyl ether (MtBE) and tertiary-butyl alcohol, as well as other volatile organic compounds from underground pipe leakage and seepage, was found in the Charnock subbasin, and its supply was completely cut off. The closure forced the city to return to MWD to make up for the loss, and began importing 85% of its total water supply at higher cost and statewide strain (Charnock, 2013). In the midst of the crisis the City pledged to "restore the groundwater supply at no cost to the public", and to do its "utmost to make sure that no other communities faced the same fate" (Lawrence, 2010).

Santa Monica sought first to negotiate with the oil companies responsible to restore the well, but agreements quickly dissolved, so the City found help in federal and state agencies. The Environmental Protection Agency (EPA) and the Los Angeles Regional Water Quality Control Board issued orders that required the parties responsible to pay for all replacement water related to the contamination, which footed the MWD bill for as long as environmental remediation in the Charnock (and Arcadia) wells lasted (Lawrence, 2010). In 2000, Santa Monica sued all of the oil companies involved (among them ExxonMobil, Shell, and Chevron) seeking compensatory and punitive damages. Within two years the oil companies agreed to pay for the removal of the contaminants, a new water treatment facility valued at $65 million, and $121 million in damages (SM Mirror, 2006). (In 2006, the settlement was amended with the oil companies agreeing to ultimately pay the lump sum of $131 million toward the water treatment facility.) The settlement would not only pay for the expensive additional imported water, but also finance the well field restoration project and upgrade the City's water treatment facility. The total was an unprecedented $252 million. It would take 14 years to get the polluted Charnock and Arcadia well fields back on line, but the result has been a restoration boon for all of Santa Monica. The environmental disaster was transformed into a completely financed overhaul and rejuvenation of the City's groundwater project.

In 2011, Santa Monica further parlayed its efforts embarking on an ambitious and proactive sustainability plan to achieve water self-sufficiency by 2020. The Sustainable Water Master Plan (SWMP) aimed to "develop strategies to close the 'gap' represented by the current purchase of imported water". This gap, a 2012 estimate of 3,700 AFY, grew to approximately 6,500 AFY that the City would need to find through increased groundwater extraction and general conservation in order to stop importing water by 2020 based on a projected 2020 total demand of 14,100 to 15,400 AFY. Some estimates expect up to 12,000 AFY to come from local groundwater supplies by 2020 (Update, 2014).

In order to satisfy the gap, the City moved to build upon its current groundwater operations to include the expansion of the Arcadia Water Treatment Plant, to develop a new Olympic Water Treatment Plant, the rehabilitation old wells and drill additional new wells in the Olympic, Charnock, and Coastal subbasins, and the development and implementation of improvements in efficiency of treatment to reduce the amount of water lost to brine disposal during treatment of pumped groundwater. These measures, the SWMP proposes, will provide an extra 6,000 AFY of groundwater toward closing of the gap (Update, 2014).

Closing the gap on imported water has also required implementation of water conservation policies and programs. Identifying the fact that half of all urban water is used outdoors, rebates have been offered by Santa Monica for home and business owners to transplant lawns with xeriscaping. The Sustainable Landscape Rebate reimburses $3.50 for every square-foot of lawn removed and replaced with climate-appropriate plants and City specified drip irrigation. Free water use consultations are available for residents and businesses that are trying to save water. During consultation a water conservation expert will check for leaks and provide specific recommendations and resources for conservation. The City has offered free high-efficiency, low-flow faucet aerators and

showerheads to residents. More rebates are available for businesses and landlords to install high-efficiency, water saving toilets and laundry facilities. The City even offers rebates for purchase and installation of rain barrels and cisterns for rainwater harvesting. Santa Monica has invested millions of dollars in retrofitting commercial buildings, and single- and multi-family dwellings, and more stringent building codes have mandated the capture of the first quarter-inch of rainfall on new developments (Mirror, 2015).

To conserve its own expenditures of water at landscaping spots and city parks, the City has converted conventional spray heads with more efficient rotary nozzles, it has stopped watering ornamental street medians, has removed non-essential turf in public areas and replaced it with mulch, and is installing "smart irrigation control systems" at large parks that require irrigation. Recycled water is used for pressure washing, and surface spraying in large commercial areas like the 3rd Street Promenade have been limited (Mirror, 2015).

The result of these conservation policies and programs has been a sweeping reduction in total water use, from 16,000 AFY in 2014 to a projected 12,000 AFY, or down 25%. Becoming self-sufficient saves the City large amounts of money, (MWD water should reach $794 per acre-foot by 2020, while Santa Monica groundwater will cost around $550 per acre-foot), but the actual water savings it offers the entire state may be as great (Water Issue, 2015). In its fourth straight year of pressing drought conditions, California's mandatory water cuts are cinching the belt on an already overexacerbated supply of Colorado Aqueduct and Northern California supplies, and Santa Monica stands to free-up over 6,000 AFY.

Santa Monica's next efforts are aimed at curbing its biggest water wasters, the wealthy home and land owners, who seem not to mind that mandates are in place and that their costs are high (CBS, 2014). The City is also attempting to safely augment its groundwater supply while preventing further accidents from occurring. While threat to underground resources is always looming, the efforts made by Santa Monica during the legal and legislative battles of the late 90's may ensure greater protection from potential contaminants in the future (Lawrence, 2010).

Groundwater is saved for the moment. Conservation is rapidly becoming a popular concept. Strained imports are down. Santa Monica appears poised to celebrate its new independence well before 2020: the "gap" is nearly bridged. The City has proven it can avert disaster and make highly potable lemonade out of a basket of poison lemons. Where water in California has traditionally been managed as separate systems of supply, quality, regulation, and flood prevention, Santa Monica has succeeded at taking the integrated holistic approach laid out by its unique water history, geology, and legal windfalls. In a region criticized for water excesses the City is proving its excellence. Armed with a strong conservation philosophy, Santa Monica is thinking differently about water and proving that progressive leadership and self-reliance can indeed change the flow.

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