

THE LOS ANGELES ZANJA SYSTEM: ARCHAEOLOGICAL MANIFESTATIONS AND MANAGEMENT CONSIDERATIONS

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This article correlates the available documentation of archaeologically encountered segments of the Zanja system, including underground linear features and structures associated with the system, to understand the now-abandoned system. This study concludes by examining past eligibility determinations and treatment of Zanja segments as a guide for future management.

First constructed in 1781, the irrigation system known as the zanja (Spanish for “ditch”) was the first major engineering structure to serve the Pueblo of Los Angeles. Originally built using Spanish acequia technology, the system was maintained, upgraded, altered, and expanded into the American period. It was not abandoned as an irrigation system until 1904, when civil engineer William Mulholland, who saw its continued use as detrimental to the city drinking water system, caused its abandonment. By 1902, the Los Angeles zanja system consisted of seven reservoirs and 337 miles of mostly subsurface pipe. It is now a commonly encountered archaeological resource in Los Angeles. Despite its importance and the frequency with which it has been encountered and documented, no existing study correlates all of the known archaeological manifestations of the system to describe it as a whole.

HISTORY OF THE ZANJA SYSTEM

Spanish intruders brought plans to the Americas to remake the New World into a New Spain. Spanish law required establishment of pueblos on irrigable land, and existing engineering, technology, and ordinances were implemented to establish, operate, and maintain these systems, typically known as acequias (Crouch et al. 1982; Glick 1972; Gonzales 2014). Where they found Native American irrigation systems, these were reworked and incorporated into Spanish ones.

Living and dead acequias are found throughout the Southwest. In Texas, a Spanish dam supplies an active aqueduct near Mission San Francisco de Espada, while other acequias are buried throughout San Antonio (Cox 2005). The washing place (*lavenderia*) and weir (*computera*) of a mission acequia survive in Tumacácori National Historic Park, Arizona (Jeffery and Steinbrecher 2014). The New Mexico legislature estimates that more than 1,000 active acequias exist in the state (New Mexico Legislature 2007). In rural Colorado and New Mexico, use and maintenance of acequias spawned peculiar democratic social structures, legal systems, biological communities, and annual secular and religious rituals (Rivera 1998; Rodriguez 2006). Acequias have contributed to our national literature through John Nichols’ novel *The Milagro Beanfield War* (Nichols 1974) and Stanley Crawford’s memoir *Mayordomo* (Crawford 1988).

In California, the interacting Spanish missions, ranchos, and pueblos each had their acequias, known as zanjas (ditches). In Los Angeles County, Missions San Gabriel and San Fernando had their own water systems (Dietler et al. 2015; Pauley and Pauley 2005:203-239). State guidance, which claims “substantial rancho establishments often lacked an irrigating system of any size” (JRP Historical Consulting 2000:11),

understates the reality. California's ranchos required zanjias which were sometimes miles long (Gates 1967). One complex example is the system that still brings water into the María Merced Williams and John Rains House in Rancho Cucamonga (Black 1975).

Nearby tribes, including the Paiute and possibly the Cahuilla, practiced irrigation (Haverstock et al. 2022; Lawton and Bean 1968; Steward 1933), but I have found no evidence that the Gabrielino did. Skilled Cochimis from the Baja missions led local Gabrielino in constructing Mission San Gabriel's system (Street 2004:16). By 1781, Los Angeles may have had skilled local labor to draw on.

In the spring of 1781, Governor Felipe de Neve visited Yaangna, where he planned to establish Los Angeles. Twelve children and a married couple were baptized as the nucleus of a Native American Christian pueblo to provide the work force for Los Angeles. He specified that "the most immediate vicinity to the river or vicinity to the principal zanja shall be preferred" (de Neve [1781] 2004:157). He further ordered that "For the establishment of the Pueblo de Los Angeles, near the Rio Porciuncula, and on the land designated for this purpose, there shall be included all the lands that may be benefited by irrigation. There shall be marked out the best place to construct the dam in order that the water may be distributed to the largest extent of land" (de Neve [1781] 2004:157). In June of that year, the first pobladores (colonists) settled on the land (Kelsey 1976).

In 1819, Pedro Alvarez used an abandoned bed of Mill Creek to start a new irrigation ditch for Mission San Gabriel's San Bernardino Asistencia, today's Mill Creek Zanja (Atchley 2009:9). Following the same technique, the pobladores likely utilized a relict channel of the meandering Los Angeles River for the Zanja Madre. From a brush and earth dam that spanned half the Los Angeles River near today's Elysian Park, the ditch followed the base of the bluff south before turning east towards the plaza. J. J. Warner described the location of the first Los Angeles Plaza to be approximately where El Pueblo de Los Angeles Historical Monument's (El Pueblo's) Parking Lot No. 2 is now located (Warner [1876] 1936:21). The path of the Zanja Madre from the river to El Pueblo never changed. Mason and Duque (1981:15) erroneously speculated that the first plaza was located south of Fifth Street. The zanja did not extend as far south as Fifth Street until the American period.

By October 1781, the Zanja Madre was complete. Initially, the pobladores failed to use the system correctly. Acequias must be maintained and operated according to a seasonal round. The dam and intake must be repaired or rebuilt after winter rains, the main ditches must be cleaned, and gates must be operated on varying schedules to allow enough water to each field (Crawford 1988; Rivera 1998). The pobladores did not open the ditch in time and their seedlings died in the fields, so they were forced to plant a second crop which yielded less (de Neve [1782] 1971:165).

Throughout the Spanish and Mexican periods, acequias were managed by an official known as mayordomo in most places, zanjero in Los Angeles. The mayordomo answered to the ayuntamiento. In locations so rural that there was no ayuntamiento, elected councils were eventually established. The mayordomo issued water permits and cited violators, repaired minor breaks, and managed the corvée labor required for maintenance. Property owners were expected to provide seasonal labor – their own or other labor they controlled – in accordance with how much of their land the acequia irrigated. Native Americans were pressed into service on zanjias well into the American period.

After the United States seizure of power, the zanja was treated as a utility to be maximized. In 1848, the City Council installed a permanent dam, ending the annual need to rebuild (Hayes [1876] 1936:54). Then in 1852, a new zanja was dug, initially called Zanja No. 2 and later Zanja No. 6-1, with its own headgate on the Los Angeles River (Hayes [1876] 1936:70). In 1854, a water wheel was added to the Zanja Madre but was never replaced when it was washed out in 1867-1868 (Layne 1952:21). The earliest

industrial use of the Zanja Madre was by the Eagle Flour Mills, located in the still-standing Capitol Milling Building, in 1855. An 18-foot drop through a 3-foot-wide brick conduit powered the mills (Layne 1952:20). Subsequently, the zanja system was put to a variety of industrial uses, powering flour, wood, wool mills, and ice factories. A third system, Zanja No. 7, was located on the east bank of the Los Angeles River. In 1867, the owners petitioned to move its headgate, which was located at a brush and sand dam near today's Cesar Chavez Avenue Bridge. They claimed water rights "of nearly eighty years," which would make it about as old as the Zanja Madre (Los Angeles Semi-Weekly News 1867). By 1880, Zanja No. 7 was seven miles long (Schuyler 1880:21).

In 1868, the privately owned Canal and Reservoir Company (C&RC) purchased Rancho Los Feliz's zanja. They broadened and deepened the zanja and called it the Main Supply Ditch. This started the High Service System, which irrigated the elevated lands west of today's Interstate 110 and also carried water in an iron pipe over the river to service Brooklyn (Boyle) Heights (Stevenson 1884). George Hansen and the C&RC constructed wool mills at the northwest corner of Fifth and Figueroa streets, and power was generated by the zanja water falling 78 feet over the bluffs (Newmark 1916:450). After the wool bubble burst, the mill was converted into an ice plant, but throughout its life it was known as the Woolen Mill Ditch. The ditch passed from the mills through a 500-foot-long tunnel to Flower Street. From there, it watered lands formerly serviced by Zanja No. 8, a sluggish zanja dependent on the Zanja Madre originally dug in the 1850s. On Flower and Figueroa streets, it was called Zanja No. 8-R (R for Reservoir). In 1878, the city acquired the C&RC and integrated the High Service System into the city system (Layne 1952:24-27).

Flooding in 1883-1884 washed out ditches and forced Angelenos to redesign the system (Gumprecht 1999:156-157). A board of engineers recommended that "Zanja Madre be carried in a closed brick conduit, from the mouth of the tunnel to First street, and down First street to the river, as an outlet for storm waters" (Hall 1888:568). From 1888 into the 1890s, the city implemented many of these recommendations. A brick conduit was built for the Zanja Madre. Cement piping replaced most of the rest of the system, including the numbered zanjias fed by the Zanja Madre. Open ditches south of downtown were improved with concrete lining (Layne 1952). In 1891, an ornamental concrete canal was constructed for Zanja No. 8-R in the wealthy neighborhood between Pico Boulevard and Jefferson Street at a cost of \$1.50 per foot, paid jointly by the city and property owners (Layne 1952:25).

At its height, the system consisted of seven reservoirs and 337 miles of canals and subsurface pipe. It included at least four separate systems, each with its own headgate connecting to the Los Angeles River: Zanja Madre and its subsidiaries; Zanja No. 6-1; Zanja No. 7 on the east bank of the river; and the High Service System that included the Main Supply Ditch feeding Zanja No. 8-R on the west side of the river and Zanja No. 9 on the east side of the river (Layne 1952). Ditches extended beyond city limits, where unused water was sold to county residents.

Angelenos tried to keep their drinking water separate from their irrigation system. A separate ditch for household water broke from the Zanja Madre north of the Spanish pueblo and ran west of the pueblo (Gumprecht 1999:44). Beginning in the 1850s, a series of private water companies built dams and piped water. Some of the infrastructure, like the brick reservoir that once stood in the plaza and the water wheel at the intersection of College and Alameda streets, is sometimes erroneously attributed to the Zanja Madre (Gumprecht 1999:64-65; Layne 1952). By the 1890s, the largest private water company, the Los Angeles City Water Company, bought out its competitors and operated as the city's domestic water system.

In 1902, after its lease on city water expired and years of negotiation, the city acquired the Los Angeles City Water Company. The city's new Board of Water Commissioners appointed the water company's superintendent, William Mulholland, superintendent over the new Department of Water. The last Zanjero, a

placeholder appointed to fill the position during negotiations, became cashier (Layne 1952:227). Mulholland saw the zanja as a drain on the city's finances and domestic water. Not only did it cost more to maintain the system than it collected in receipts, but twentieth century Los Angeles needed all its water for domestic use. Mulholland allowed the Bureau of Street Services to destroy zanjas as they built roads. He claimed that "The grading and improvement of streets in many instances tore out the zanja pipes, and in a few cases we were asked to restore them ... the action of the Board in asking that those who desired to use the pipes torn out should restore them at their own expense, was the only proper one" (Mulholland 1903:21).

Mulholland pumped water out of the Main Supply Ditch and the Zanja Madre into the domestic water supply during the summer of 1903, at the time of year when irrigators needed the most water. In the summer of 1904, Mulholland permanently diverted the entire zanja water supply into the domestic system. May 1904 was the last time the Zanja Department sold water (Anderson 1904:42). Mulholland (1904:23) informed the Water Commissioners that, "This caused a good deal of hardship to many who had rich alfalfa fields and orchards within the city limits, but they patiently accepted the inevitable and relinquished the rights they or their predecessors had held for over a century."

Parts of the system gained new life after the abandonment when they were incorporated into the storm drain system. In 1889, after the Zanja Madre on First Street was abandoned (Los Angeles Times 1889), a new brick conduit was constructed under Second Street. It was used to irrigate for only about 15 years, but in 1908 it was incorporated into a new Second Street Storm Sewer. An "Old 4'-6" Zanja, 2 rings brick" east of today's Astronaut Ellison S. Onizuka Street was connected to a new brick conduit designed to resemble the Zanja Madre, but was constructed of one ring of bricks rather than two (Hamlin 1908). This segment is known from city plans but appears in few maps. Other zanjas reused as storm drains may remain to be identified.

ARCHAEOLOGY OF THE ZANJA SYSTEM

The zanja system is often encountered during construction work downtown. Table 1 is an incomplete list that AECOM prepared for the Los Angeles County Metropolitan Transportation Authority's (Metro) Regional Connector Transit Project (AECOM 2014) and is supplemented by 10 years' worth of experience conducting archaeological work in the city. A complete study would have to consult every Department of Parks and Recreation (DPR) 523 series form and every archaeological report at the South Central Coastal Information Center (SCCIC) that overlaps mapped paths of the zanja system. No one has completed such a study, nor has anyone yet prepared a DPR form documenting all known segments of the zanja system as recommended by state guidance (JRP Historical Consulting 2000).

Of the 18 projects listed in Table 1, 12 have documented the brick conduit of the Zanja Madre. There must be a sampling bias here. The brick of the Zanja Madre is noticeable and well-known. Brick conduits and concrete pipes were common in twentieth-century sanitary sewers, storm drains, and water mains (Layne 1952; Sklar 2008). Most concrete pipes encountered in Los Angeles are simply not documented. To identify zanjas in the field, physical remains must be matched to period descriptions and maps. Figure 1 shows the open ditch zanja system at its height in 1876. However, maps are static representations of the system at a moment in time, and no one map shows the entire system throughout its lifespan.

Zanja Madre

Projects encountering the Zanja Madre document the 1888 brick conduit, measuring approximately 4 feet 6 inches in diameter, constructed of two courses of brick. The brick conduit was apparently unearthed

Table 1. Archaeological Encounters with the Los Angeles Zanja System.

Project	Organization	Primary No./ Trinomial	Segment	Citation
Avila Adobe Interpretation Center	California State University, Long Beach?	--	Zanja Madre	--
Placita de Dolores Development	Department of Public Works	P-19-000887/ CA-LAN-887	Zanja Madre	Costello and Wilcoxon 1978
Federal Center Complex	Berger and Associates	--	Zanja No. 3	Berger and Associates 1987
CA-LAN-007 Test Excavations	Caltrans	P-19-000007/ CA-LAN-007H	Zanja Madre	Romani 1997
Metropolitan Water District Headquarters	Applied Earthworks/Foothill Resources/Sonoma State	P-19-001575/ CA-LAN-1575H	Unnumbered Zanja Madre lateral	Costello et al. 1999
Avila Adobe Interpretive Center Sewer Line Trenching	Greenwood and Associates	--	Zanja Madre	Foster 2001
North Spring Street Bridge Seismic Retrofit and Widening	URS	P-19-003103/ CA-LAN-3103	Zanja Madre	Wesson 2002
Catellus (Mozaic at Union Station Apts)	Applied Earthworks	P-19-001575/ CA-LAN-1575H	Unnumbered Zanja Madre laterals	Warren 2005
Metro Gold Line	Cogstone	P-19-190309	Zanja Madre	Gust and Parker 2004
City Emergency Operations Center	Greenwood and Associates	P-19-003352	Zanja No. 6-1	Foster 2005
Placita de Dolores Improvements	Greenwood and Associates	P-19-000887/ CA-LAN-887	Zanja Madre	Slawson 2006
Temple Street Widening	AECOM	P-19-004113/ CA-LAN-4113	Zanja No. 6-1	Dietler et al. 2009
Puestos Utility Upgrade	Greenwood and Associates	--	Zanja Madre	Greenwood et al. 2009
Alameda Street/ North Spring Street Arterial Redesign	AECOM	P-19-003103	Zanja Madre	Gibson and Dietler 2011
Siqueiros Mural Shelter	Greenwood and Associates	--	Zanja Madre	Slawson and Kay 2012
Blossom Plaza	Cogstone	--	Zanja Madre	Gust 2007
Interstate-110 Flyover	Caltrans	--	Zanja No. 8-R	Harper and Smith 2015
Metro Regional Connector	AECOM	pending	Zanja Madre; Zanja No. 3; Zanja No. 8-R	Carias et al. 2015; ICF n.d.

during Christine Sterling’s leveling and paving of Olvera Street, in El Pueblo. She noted in her diary on February 5, 1930, “We came to the pathway of the old Zanja Madre. Mr. Stevenson helped me mark its course by old maps and records.” On February 8, she wrote, “We marked the pathway of the old Zanja and

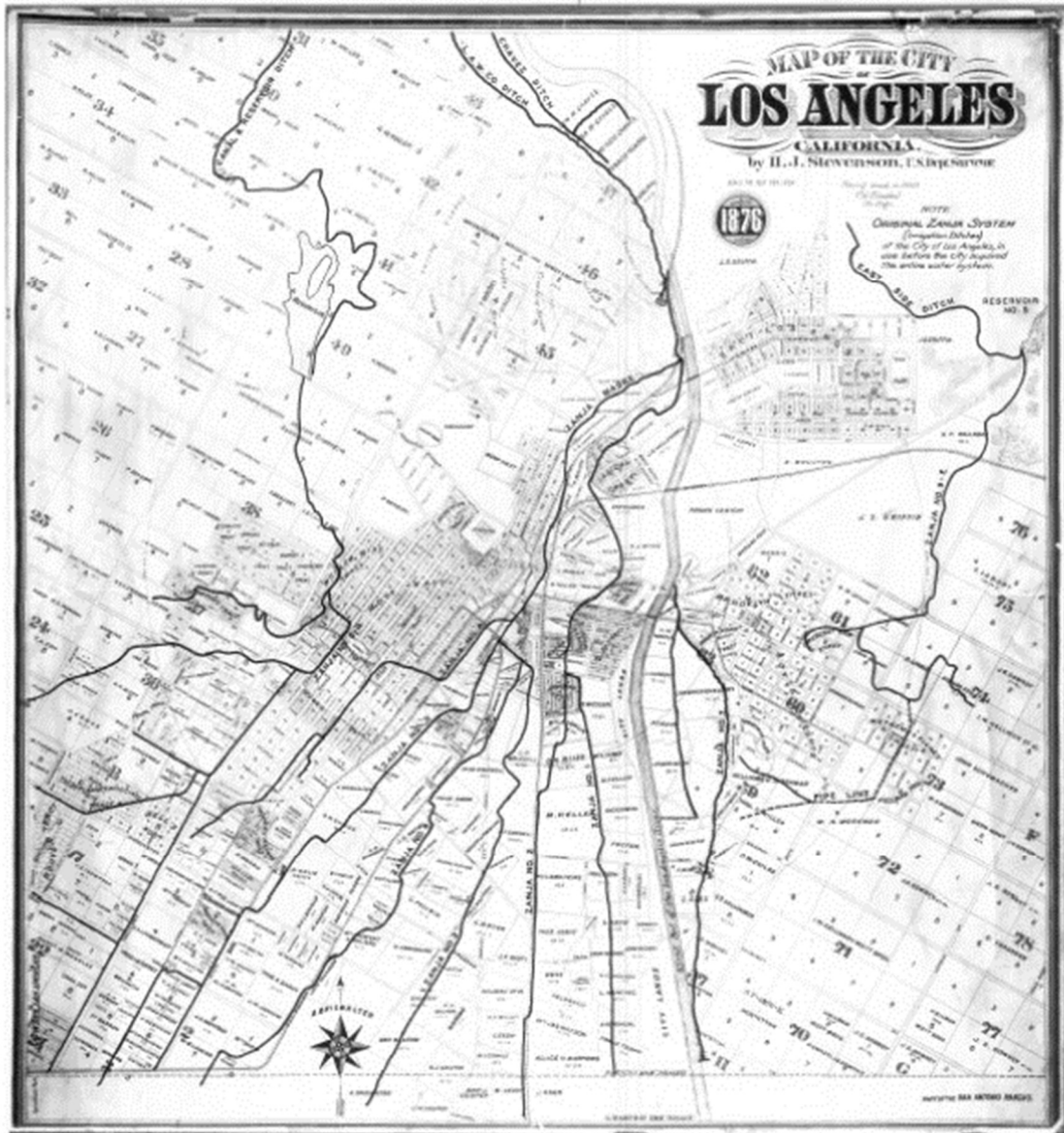


Figure 1. Map of the Zanja System in 1876 (bold lines). Image courtesy of the Los Angeles Department of Water and Power.

are building a fountain in memory of this very important stream of water which gave life to the growing things of the pueblo” (Sterling 1947:19). The fountain still stands. The pavement was redone on the fiftieth anniversary of the establishment of Los Angeles Department of Water and Power (LADWP) and marked with a plaque dated February 8, 1952.

The Zanja Madre was probably scientifically excavated for the first time by Franklin Fenenga in the 1970s. The Zanja Madre is not mentioned in his report (Fenenga 1973), but it is generally understood that “workers” uncovered this 11-foot-long segment near the surface as a result of work for the new interpretive center (Hoffman and Stern 2007:1). The conduit was left exposed and was the focus of an LADWP exhibit for years but is now closed (Figure 2). A hole was cut so the interior of the zanja could be viewed, but it is unclear if this was done for analytical reasons or for the sake of the exhibit.



Figure 2. Exposed Zanja Madre conduit in the Avila Adobe Interpretive Center, El Pueblo de Los Angeles Historical Monument. Image courtesy of the Los Angeles Department of Water and Power.

The first excavation of the Zanja Madre for which documentation exists at the SCCIC is Julia Costello and Larry Wilcoxon's work at Placita de Dolores, the small plaza on the east side of El Pueblo (Costello and Wilcoxon 1978). They documented a round brick conduit set in a 7-foot-wide excavation trench. The trench was probably the original Zanja Madre. The conduit extended across most of La Placita, but in places it was partially collapsed, and beneath Los Angeles Street the top was completely removed. Their cross-section is representative of the Zanja Madre as a whole (Figure 3). In 2006, Greenwood and Associates re-excavated the conduit in La Placita and Wilcoxon and found it to be in much the same condition as when it was first recorded (Foster 2005:3; Slawson 2006).

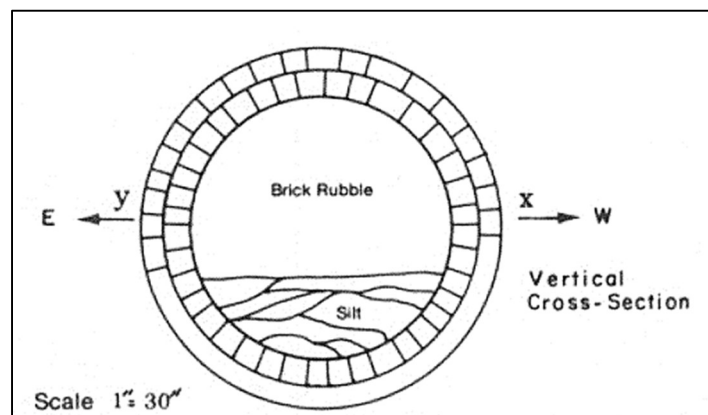


Figure 3. Cross-section of the Zanja Madre (Costello and Wilcoxon 1978:Figure 3).

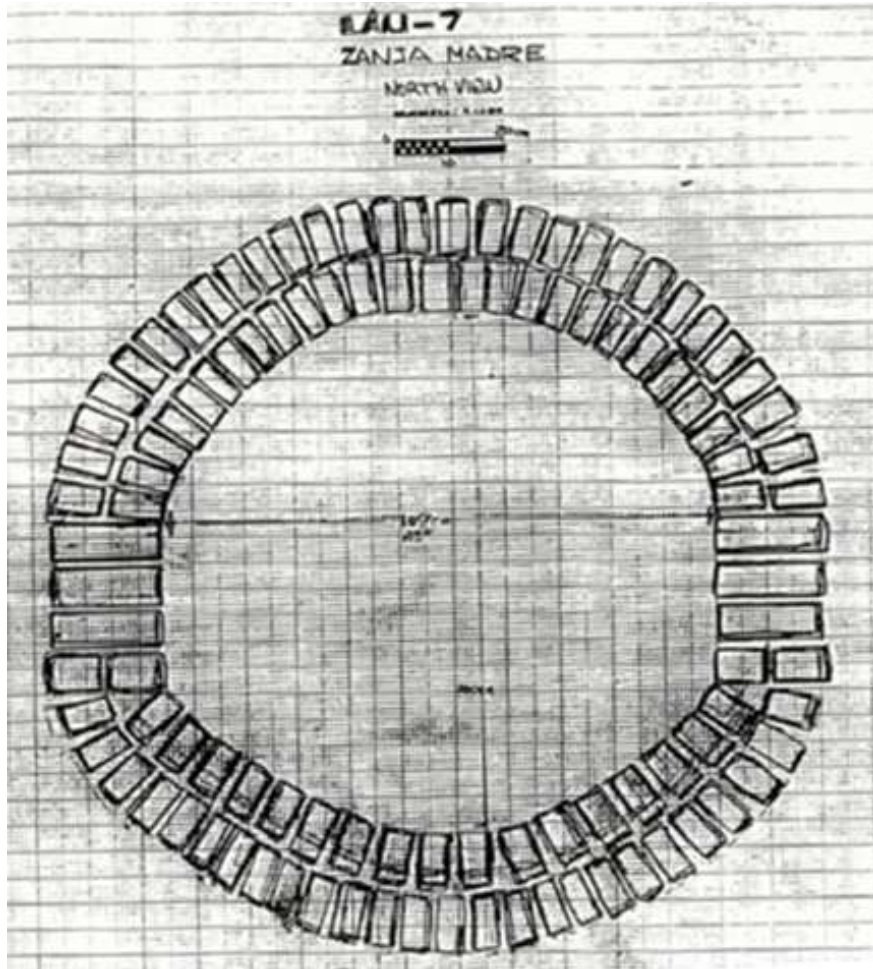


Figure 4. Brick Zanja Madre Cross-section at P-19-000007 (Romani 1997:Figure 8).

Caltrans uncovered the Zanja Madre in El Pueblo Parking Lot No. 3. Romani (1997) documented two distinct cross-sections, one irregularly rounded, and the other two hemispheres connected by stacked bricks (Figure 4). The Zanja Madre has been encountered several times more in El Pueblo. Greenwood and Associates uncovered segments during two utilities projects (Foster 2001:4-5; Greenwood et al. 2009:31-38). Installation of the Siqueiros mural canopy counterweight encountered a segment just below the ground surface in the crawlspace of the 1909 Hammel Building (Slawson and Kay 2012). Although the building was constructed five years after the zanja was abandoned, an arch was constructed in the building foundation to preserve the conduit (Figure 5). This segment will serve as a focal point in a new LADWP historical exhibit.

Amateur “History Slugs” Craig Howell and Melody Carver identified the Zanja Madre near today’s Los Angeles State Historic Park (LASHP) in 2000. Alex Wesson professionally documented it two years later (Ramos 2000; Wesson 2002). It was further excavated and documented for the Metro Gold Line (Gust 2007; Gust and Parker 2004). In addition to the brick conduit, a partial curved concrete wall, topped with brick, measuring 1.7 meters high and 2.4 meters long and of unknown function, was uncovered (Gust 2007:11). AECOM documented the Zanja Madre along Alameda Street between LASHP and El Pueblo (Gibson and Dietler 2011). Cogstone documented a 142-foot-long segment approximately 15 feet below the ground surface exiting Capitol Mills; the builders’ trench was also noted (Furnis and Gust 2015:20-28).



Figure 5. Zanja Madre Segment Beneath the 1909 Hammel Building. Image courtesy of the Los Angeles Department of Water and Power.

North of Second Street between San Pedro and Azusa Streets, the Regional Connector Transit Project revealed the top of an 80-foot-long segment of the Zanja Madre 15 inches beneath the sidewalk. A camera lowered down a manhole filmed water flowing through approximately 330 feet of conduit. This is the longest segment of the Zanja Madre yet recorded, and the only identified segment still active as a water conduit (ICF n.d.).

Zanja Madre Laterals

Few lateral zanjás that once watered fields have survived. But around Union Station, laterals were covered by several feet of fill when the station was built. An earthen ditch, probably constructed by the Avila family in the 1820s for their vineyards, was uncovered during the Metropolitan Water District Headquarters Project. A conduit constructed of redwood boards, most likely for Matthew Keller in the early American period, was set inside the earthen ditch. It sloped south, dropping four inches over its recorded 60-foot length (Costello et al. 1999:74, 178). A “wood-lined water conveyance complex” was also uncovered on the Mozaic Apartments property. The property was owned by B. D. Wilson and later the Sisters of Charity. The complex, which consisted of a series of east-west and north-south ditches, probably dates to the early American period (Warren 2005:3).



Figure 6. Zanja No. 3 Concrete Pipe broken by 1897 commercial building foundation, view southwest. Image courtesy of AECOM.

Zanja No. 3

Zanja No. 3 separated from Zanja Madre at First Street west of Central Avenue. An unlined ditch and an 1869 brick culvert were documented by Louis Berger and Associates during construction of the United States Courthouse (Hotopp et al. 1986). The culvert was constructed when Commercial Street was extended over and perpendicular to the Mexican period ditch. A wooden sewer, constructed in 1869 and decommissioned in 1871, was attached to the culvert. This segment of Zanja No. 3 was abandoned and backfilled ca. 1882 and does not appear in most maps of the zanja system.

A later incarnation of Zanja No. 3 was documented by AECOM during the Regional Connector Transit Project (Carias et al. 2015). A 22-inch unreinforced segmented concrete pipe was laid in stages between 1891 and 1895 and abandoned almost as soon as it was completed, as demonstrated by the fact that it was broken by the foundation of a building constructed in 1897 (Figure 6).

Zanja No. 6-1

Zanja No. 6-1 was identified at its intersection with Temple Street (Dietler et al. 2009; Foster 2005). The resource consists of a 30-inch unreinforced segmented concrete pipe approximately 18 inches below the ground surface (Dietler et al. 2009:25-26; Foster 2005:15; Layne 1952:22). On the south side of the street, what was called a “drainage box” or catch basin, constructed of unstated materials and measuring 26 to 35 inches long, 18 inches wide, and at least 32 inches deep, was observed just east of the conduit (Dietler et al. 2009:25-26).

Zanja No. 8-R

The Main Supply Ditch of the High Service System fed Zanja No. 8-R, which watered the heights on both sides of the Los Angeles River. The intake for the Main Supply Ditch is likely long-destroyed or entombed beneath Army Corps of Engineers concrete. Reservoir No. 4, the last surviving reservoir of the zanja system, survives as Echo Park Lake. I am unaware of any surviving elements of the High Service System that are documented on the highlands on either side of the river, and any remnants of the wool mills that gave the Woolen Mill Ditch its name were demolished for the construction of Interstate 110.

Segments of 22-inch segmented unreinforced concrete pipe, identical to that used to construct Zanja No. 3, were encountered eight feet beneath Flower Street, between Fourth and Seventh streets, by AECOM (2014; see Figure 7). The pipe may have once been closer to the surface. A thick layer of debris from California Branch Normal State School and Normal Hill, both of which were removed after 1914 to improve Fifth Street and build the Central Library, overlay the zanja. They were probably dumped there to backfill the Arroyo de Los Reyes, which formerly flowed down Flower Street (AECOM 2014; ICF n.d.). This part of Zanja No. 8-R was in very poor condition, with many collapsed segments interspersed with intact pipes.



Figure 7. Zanja No. 8-R beneath Flower Street, view southwest. Image courtesy of AECOM.



Figure 8. Zanja No. 8-R, view northeast. Image courtesy of Security Pacific National Bank Collection, Los Angeles Public Library.

Zanja No. 8-R flowed onto the west side of Figueroa Street in an ornamental open ditch until 1903 (Figure 8). In 1911, H. D. Barrows, founder and president of the Historical Society of Southern California, wrote, “The cessation of irrigation by means of open ditches, in the city, caused by the prodigious increase of population in recent years, and the consequent and imperative demand for water for domestic use, have caused this entire zanja system to disappear almost as completely as if it never had existed; the cement conduit along the west side of Figueroa Street south of Washington, is, I think, the only vestige of it left” (Barrows 1911:209).

An approximately 150-foot-long segment of this zanja survives and was documented by Caltrans (Harper and Smith 2015). Water flowed through a 2-foot-wide concrete trough, and between this trough and the sidewalk a second, 16-inch-wide trough served as a planter (Figure 9). Both troughs are now backfilled with soil. The zanja is lined with ornamental posts and ironwork.

The surviving zanja segment was located in the yard of a home built in 1888 and demolished in 1948. Visitors would step up and cross a 7-foot-wide pedestrian bridge to a paved path to the house (Figure 10). Two vehicular bridges at either end of the surviving segment are constructed in a similar fashion to the pedestrian bridge.

Summary

The zanja system consisted of at least four separate irrigation systems, each with its own intake from the Los Angeles River, and each with its own history. Segments of three of these systems, the Zanja Madre, Zanja No. 6-1, and Zanja No. 8-R of the High Service System, have been encountered archaeologically.



Figure 9. Zanja No. 8-R parallel to Figueroa Street, North of Adams Avenue, Stimson House in upper left corner, view north.



Figure 10. Pedestrian bridge and Zanja No. 8-R, view south.

A few earthen ditches have been documented, including a segment of Zanja No. 3 and lateral ditches in the vineyards now buried by Union Station. These may date to the Mexican Period, but Zanja No. 3 was improved with a brick culvert and the lateral ditches were improved with redwood box flumes in the American period.

The majority of the surviving infrastructure, consisting of pipes, dates to the American period. After 1888, the Zanja Madre was enclosed in a brick conduit measuring four feet six inches in diameter, and was two bricks thick. Similar brick conduits, dating to late nineteenth and early twentieth centuries and used for sewers and storm drains, exist throughout the city (Beherec and Gibson 2013:37-42; Sklar 2008). Brick may have been used to construct the largest bore conduit in the zanja system for technological reasons. The unreinforced concrete pipes used for the rest of the system are narrower, and unreinforced concrete may not have been strong enough to construct a pipe as wide as the Zanja Madre.

Zanja Nos. 3, 6-1, and 8-R were placed underground in segmented unreinforced concrete pipes. Zanja No. 6-1 flowed through a 30-inch pipe, and Zanjas No. 3 and 8-R through 22-inch pipes. A short segment of Zanja No. 8-R flowed through an ornamental concrete ditch.

Thus far, archaeology has done little more than confirm historical accounts. Other aspects of the system remain undocumented archaeologically. Dams, water wheels, wooden flumes, steel pipes, and other conveyance systems known to have existed have not been documented and are likely non-extant.

EVALUATION AND TREATMENT

The zanja system is usually considered significant and generally is preserved in place. Lack of integrity is the main barrier for registering eligibility. Zanjas appear eligible for local registry listing as a Los Angeles Historic-Cultural Monument (LAHCM). However, except for one mention in the Historic Resources Survey for the Cornfield Arroyo Specific Plan (Sorrell 2011:1), the historic surveys commissioned by Los Angeles City Planning do not document exposed segments of the zanja system. Reservoir No. 4 is the only listed segment of the zanja system (LAHCM 836), but is only designated as part of the larger park and not for its connections to the zanja system. The city has no public guidance for the evaluation or treatment of the zanja system.

Segments of the Zanja Madre seem to be obvious contributing features to historic districts at LASHP and El Pueblo. The brick conduit north of LASHP is associated with the industrial development of Los Angeles and was constructed within the period of significance of the River Station railroad site within LASHP (Dodds and Sampson 2012; Sampson and Garrett 2010).

The Los Angeles Plaza Historic District (formerly El Pueblo de Los Angeles State Historic Park District), encompassing El Pueblo, was listed in the National Register of Historic Places (NRHP) in 1972 (Reference No. 72000231). The Zanja Madre was important to the development of El Pueblo from its inception. The surviving segments date to about the same period as many of the contributing buildings. The importance of the zanja to the historical monument was noted by Christine Sterling and memorialized by a fountain and pavement.

The original approved NRHP nomination includes a photograph of the pavement (Hunt 1972), and the 1990 boundary increase states, “The remains of the Zanja Madre contribute to the historic significance of the district” (Gardner and Charlton 1990:6). Nevertheless, the most recent amendment to the NRHP listing, a boundary reduction, neither documents nor evaluates the exposed Zanja Madre segments, the pavement, or the fountain. It makes very little use of the abundant archaeological literature, citing only Costello and

Wilcoxon on the zanja, and states, “without additional documentation to identify the resource and its current integrity, it is not possible to include it as a contributing resource at this time” (Treffers and Howell-Ardila 2016:Section 7, p. 13). The Zanja Madre is formally listed in the Built Environment Resources Directory as 6X, meaning it is determined ineligible for the NRHP by the State Historical Resources Commission or Keeper (Office of Historic Preservation 2022).

At least six acequias with origins in the Spanish period, scattered across the Southwest, are listed as individual resources in the NRHP (Table 2). Sometimes active acequias are nominated to the NRHP to preserve the greenspaces created by the water conduits (Atchley 2009). Other acequias are traditional cultural places because they provide unity to communities through their elected commissions and the annual maintenance rituals. In these cases, state or federal register nomination can be a tactic to preserve water rights (Rivera 1996:43). In California, NRHP-listed acequias include the active Mill Creek Zanja and an inactive segment of the stone San Buenaventura Mission Aqueduct. The listed acequia most similar to Los Angeles Zanja Madre segments is the San Buenaventura Mission Aqueduct.

Table 2. National Register-Listed Acequias.

Reference No.	Property Name	State	County
66000809	Espada Aqueduct	Texas	Bexar
77000329	Mill Creek Zanja	California	San Bernardino
75000497	San Buenaventura Mission Aqueduct	California	Ventura
80002572	Acequia System of El Rancho de las Golondrinas	New Mexico	Santa Fe
80004157	Mission Creek Dam and Acequia Site	Texas	Victoria
87001118	Acequia Madre	New Mexico	San Miguel

Nevertheless, the Zanja Madre is almost always considered significant as an individual resource (Table 3). Costello and Wilcoxon (1978:126-127) recommended the resource as eligible for inclusion in the California Register of Historic Resources (CRHR) under both Criterion 1 (important to the history and development of Los Angeles) and Criterion 3 (representative segment of the zanja’s construction). Their evaluation of CA-LAN-887 led State Parks to abandon plans to build within the Placita de Dolores; instead, they capped the site with fill.

In the 1990s, after the railroad vacated the 40-acre River Yard, the city approved a Mitigated Negative Declaration (MND) for development on the parcel. A court overturned the MND, however, because it acknowledged that the Zanja Madre was located on the property but there was no attempt to locate the resource or mitigate impacts beyond documenting its existence archaeologically if found (Kibel 2004). Howell and Carver brought additional public attention to the zanja by publicizing their discovery of a surviving segment (Ramos 2000), and the delays bought time for local activists to raise funds and purchase the property, most of which is now LASHP (Kibel 2004). When the new park was developed, Zanja Madre State Historic Park was among the names considered (Keck 2005:10).

Ironically, and somewhat inexplicably, that part of the property that contained the Zanja Madre was portioned off as a Metro right-of-way. Grading uncovered a well-preserved, 75-foot-long segment of the Zanja Madre (Gust 2007; Gust and Parker 2004). After discussion with stakeholders, plans to rebury the segment were abandoned. A retaining wall and landscaping were constructed to protect the segment, which remains visible from the Metro Gold Line and the LASHP (Not a Cornfield Project Blog 2005; Pool 2005).

Table 3: Evaluations of Documented Segments of the Los Angeles Zanja System.

Project	Segment	Evaluation	Citation
El Pueblo de Los Angeles Historic District NRHP listing	Zanja Madre in El Pueblo	Zanja included in NRHP nomination and listing	Hunt 1972; Gardner and Charlton 1990
Placita de Dolores Development	Zanja Madre, Placita de Dolores	NRHP eligible	Costello 1978
LAN-007 Test Excavations	Zanja Madre, LAN-007	Contributor to NRHP-eligible site; recommended enlargement of El Pueblo de Los Angeles Historic District boundary	Romani 1997
City Emergency Operations Center	Zanja No. 6-1	Recommended CRHR eligible	Foster 2005
Temple Street Widening	Zanja No. 6-1	Recommended CRHR eligible	Dietler et al. 2009
Alameda Street/North Spring Street Arterial Redesign	Zanja Madre	Recommended CRHR eligible	Gibson and Dietler 2011
Metro Gold Line	Zanja Madre, North of LASHP	Segment nominated to NRHP/Rejected	Taniguchi 2008; Toffelmier 2009
Metro Regional Connector	No. 3; No. 8-R, Flower; Zanja Madre, Second Street	Entire system treated as NRHP-eligible	Metro 2012; AECOM 2014
Blossom Plaza	Zanja Madre, South of LASHP	Ineligible segment but eligible for NRHP as part of district	Furnis and Gust 2015
I-110 Flyover	Zanja No. 8-R on Figueroa	Not eligible by consensus by Section 106 process	Harper and Smith 2015
El Pueblo de Los Angeles Historic District boundary reduction	Zanja Madre in El Pueblo	Non-contributing to NRHP-listed district; not enough known about the zanja	Treffers and Howell-Ardila 2016

This segment was nominated to the NRHP, with the argument that while the Zanja Madre lacks integrity, this part conveys the significance of the resource as a whole (Taniguchi 2008). Unfortunately, the State Historic Preservation Officer found the nomination insufficient, responding, “In this case, the nomination must establish the segment as the only or best surviving element of the system and demonstrate that the segment retains the essential physical features necessary to convey the historic character of the resource. ... A discussion of all of the components that made up the Zanja Madre system, including the underground linear features, structures, and buildings associated with the system, and an analysis of the existing conditions of extant components would be necessary to understand the rarity of the segment” (Toffelmier 2009). The application was then withdrawn (Office of Historic Preservation 2022).

The segment unearthed during the development of Blossom Plaza was evaluated as a contributor to a CRHR-eligible district that was ineligible individually (Furnis and Gust 2015). It was demolished and attempts to remove and preserve an intact segment failed. The demolition was controversial (Hall 2014; Jao 2014) and the cumulative impact of destroying the large segment does not appear to have been considered.

Zanjas other than the Zanja Madre contributed significantly to the development of Los Angeles, but their histories are different and their appearances are often less striking than the brick-lined Zanja Madre. Zanja No. 3 was recognized by recordation in the Historic American Engineering Record (HAER) twice (Carias et al. 2015; Hotopp et al. 1986). The Bureau of Engineering treated Zanja No. 6-1 as eligible for

inclusion in the CRHR, preserving it in place, and marking it with both a decorative pavement and a bronze plaque (Dietler et al. 2009). Zanja No. 8-R parallel to Figueroa Street was determined by Caltrans to be ineligible for the NRHP or CRHR due to lack of integrity (Harper and Smith 2015).

The most thorough approach to the treatment of the zanja system is that displayed by Metro and the Federal Transit Administration on the Regional Connector Project (Metro 2012). As part of that project, the entire zanja system, including all its branches, was treated as eligible for inclusion in the NRHP. An archival discovery program identified zanja locations before construction began. The investigation included maps and city plans, and recognized segments that do not appear in most maps. Whenever possible, plans were redesigned and zanja segments were preserved in place. Those segments that could not be avoided were thoroughly documented, whenever feasible, with an HAER. This multifaceted approach will both preserve the resource and document all its components and associated structures.

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