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Drought & Climate Resiliency Solutions for Small Water Systems in LA County

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Prepared for the consideration of the LA County Department of Public Works (DPW) as a planning client

A comprehensive project submitted in partial satisfaction of the requirements for the degree Master of Urban and Regional Planning

DISCLAIMER

This report was prepared in partial fulfillment of the requirements for the Master in Urban and Regional Planning degree in the Department of Urban Planning at the University of California, Los Angeles.

It was prepared for the consideration of the LA County Department of Public Works (DPW) as a planning client. The report, however, does not contain official positions of the County or its agents. Rather, it will help inform DPW efforts related to the County Water Plan, associated task forces, and other planning efforts. The views expressed herein are those of the authors and not necessarily those of the Department, the UCLA Luskin School of Public Affairs, UCLA as a whole, or the client."

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Terms and Definitions

AB	Assembly Bill
APM	APM Research Lab
AVEK	Antelope Valley-East Kern Water Agency
AVIRWMP	Antelope Valley Integrated Regional Water Management Plan
AWIA	America's Water Infrastructure Act
AWWA	American Water Works Association
CA	California
CAL FIRE	California Department of Forestry and Fire Protection
CPUC	California Public Utilities Commission
CWA	California Water Association
CWP	County Water Plan
CWS	Community Water System
Cal Am	California American Water
Cal OES	California Governor’s Office of Emergency Services
Cal Water	California Water Service Company
CEC	Constituents of Emerging Concern
DAC	Disadvantaged Community
DDW	Division of Drinking Water
Del Rio	Del Rio Mutual Water Company
DEM	Digital Elevation Model
DPW	Los Angeles County Department of Public Works
DWR	California Department of Water Resources
DWSRF	Drinking Water State Revolving Fund
EBMUD	East Bay Municipal Utility District
El Rancho MHP	El Rancho Mobile Home Park
ENP	Emergency Notification Plan
EPA	Environmental Protection Agency
ERP	Emergency Response Plans
FEMA	Federal Emergency Management Agency
FEP	Fund Expenditure Plan
FHSZ	Fire Hazard Severity Zone
GBUAPCD	Great Basin Unified Air Pollution Control District
GIS	Geographic Information System
GPM	Gallons Per Minute
GSA	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plans
HMWC	Hemlock Mutual Water Company
HR2W	Human Right to Water
IOU	Investor-Owned Utility
LACWD 40	Los Angeles County Waterworks District 40
LADWP	Los Angeles Department of Water and Power
LAFCO	Local Agency Formation Commission
Lancaster Park MHP	Lancaster Park Mobile Home Park

Terms and Definitions

LARC	Los Angeles Regional Collaborative for Cities
LARC Ranch	Los Angeles Residential Community Foundation
LCID	Littlerock Creek Irrigation District
LPA	Local Primary Agency
MCL	Maximum Contaminant Level
MDD	Maximum Daily Demand
MHHI	Median Household Income
MVM	Mettler Valley Mutual
MWC	Mutual Water Companies
MWD	Metropolitan Water District
NFPA	National Fire Protection Association
NPO	Non-Profit Organizations
NWC	North Water Commission
OEI	Other Essential Infrastructure
PID	Palmdale Irrigation District
PSPS	Public Safety Power Shutoff
PWD	Palmdale Water District
PWS	Public Water System
QHWD	Quartz Hill Water District
RCSD	Rosamond Community Services District
RMWD	Rainbow Municipal Water District
SAFER	Safe and Affordable Funding for Equity and Resilience
SB	Senate Bill
SCV Water	Santa Clarita Valley Water Agency
SCVWC	Sleepy Valley Water Company
SDAC	Severely Disadvantaged Community
SDWA	Safe Drinking Water Act
SGMA	Sustainable Groundwater Management Act
SGVWC	San Gabriel Valley Water Company
SOI	Sphere of Influence
SWP	State Water Project
SWRCB	State Water Resources Control Board
TMF	Technical, Managerial, and Financial
TRI	Terrain Ruggedness Index
UCLA	University of California, Los Angeles
UNDRR	United Nations Office for Disaster Risk Reduction
USGS	United States Geological Survey
Village MHP	The Village Mobile Home Park
West Valley CWS	West Valley County Water District
Western Skies MHP	Western Skies Mobile Home Park
WRD	Water Replenishment District
WSRAR	Water System Restructuring Assessment Rule
WSS	Water Supply and Sanitation Services
WUI	Wildland-Urban Interfac

Report Executive Summary

This report encapsulates the work over the course of the 2024-2025 Academic Year of 12 UCLA Department of Urban and Regional Planning Master's students enrolled in the department's group "Comprehensive Project" course. This work was carried out under the supervision of UCLA Urban Planning faculty members and UCLA Luskin Center for Innovation scholars, Drs. Gregory Pierce and Edith de Guzman.

Client and Partnership: Los Angeles County Department of Public Works

The report focuses on "Drought & Climate Resiliency Solutions for Small Water Systems in LA County." This effort was undertaken for the consideration of the LA County Department of Public Works (DPW) as a planning client. The report does not contain official positions of the County or its agents and is purely advisory to DPW's efforts. However, it has and will help inform DPW efforts related to the County Water Plan, associated task forces, and other planning efforts, as described below.

DPW provides a range of services including water resource management, environmental services, transportation infrastructure, construction management, and environmental services. Its mission is to maintain modern infrastructure that uplifts all communities of Los Angeles County. It is one of the largest municipal public works agencies in the United States, providing vital infrastructure and essential services to more than 10 million people across a 4,000-square-mile regional service area.

We want to acknowledge not only the support and collaboration of our client DPW, but also additional partners and their active efforts to support communities served by small water systems in the County, including, but not limited to, the County's Chief Sustainability Office, Stantec Inc., and the County's Small Water Systems Task Force. This project would not have been possible without the data sharing, insights, and feedback of each of these groups.

Adjusting to the January 2025 Los Angeles Fires

We also wish to highlight that this effort was undertaken at a unique and challenging time for and within the County due to the January 2025 fires in Los Angeles. This climate change-fueled tragedy affected the authors personally and changed the content and urgency of our efforts focused on small water systems. We watched the growth of the Palisades fire from our classroom window on the evening of January 7, our first day of class for this project. Many of us were affected directly by the fires in a variety of ways, and had friends, family, and colleagues who were even more so. This inspired us to change part of the scope of our effort, as described below, to focus on fire risk and vulnerability.

More broadly, water systems were a focus of concern during the fires and their aftermath in the region. While much of the news has focused only on the Los Angeles Department of Water and Power's (LADWP) situation in the Palisades fire, at least 10 other water systems in Los Angeles County were directly affected by these fires — eight within the Eaton fire burn area and two others within the Palisades fire burn area. While some recovered quickly with minimal long-term damage, others remain in profound struggle and have open questions about the shape and timing of rebuilding.

Broader Report Motivation: Small Water System Challenges and Potential Solutions

Local water supply systems are the fundamental building blocks of water delivery that meet basic human needs and perform essential roles in providing household water supplies. They are critical intermediaries shaping community access to and managing safe, reliable, and affordable water. These systems face growing challenges from under-investment, aging infrastructure, resilience to climate events, and increasingly stringent regulatory standards in many contexts.

Fragmentation of local water supply systems has long been understood as a unique challenge for the U.S. water sector. Whereas the country counts 3,300 electric utilities and 2,600 internet service providers, there are more than 50,000 regulated community water systems providing drinking water services (Vedachalam et al. 2020). As a consequence, the vast majority of community water systems are small, with more than

80% serving fewer than 500 residents. The small size of these utilities, in turn, has important consequences for the systems, the entire sector, and most importantly, the communities served by these systems. Moreover, 10-15% of the U.S. population is served by private wells that are unregulated by the government (Hernandez and Pierce, 2023).

Regionalization or consolidation of local water supply systems has been shown conceptually to yield several positive outcomes and has been promoted for decades. Consolidation is defined here as merging some or all of the governance, management, and financial functions of water supply provision between two or more water providers or communities. There are many specific types of consolidation, especially governance models of a merged unit, which can be achieved with or without the physical interconnection of water infrastructure. Consolidation without physical integration is often called managerial consolidation.

As documented throughout this report, there are rarely easy solutions to support struggling or failing water systems. We consider a variety of potential solutions, but focus on estimating potential physical consolidation feasibility. We are not recommending consolidation as the only solution for a given system in any case, and we understand that a complex set of considerations must be realized for consolidation to succeed. We also consider other potential alternative solutions wherever possible. These alternatives to physical consolidation include water conservation strategies, drilling new wells, participating in water recycling projects, managerial consolidation, and other water system partnerships.

Still, our focus on consolidation is motivated by several factors. First, there is a major emphasis on multiple state efforts, which encourage and fund consolidation as a planning and policy measure. This emphasis is due to consolidation’s potential for being a truly long-term and permanent solution. We also found early on in our work, as detailed further in Chapter 1, that Los Angeles County has more physical consolidation potential than many other parts of the state. Moreover, methods for analyzing consolidation's physical potential and cost have been developed but have not been broadly applied. We are able to utilize these methods in the compressed timeline of our effort and apply them to a broader set of potential systems in need than previously done.

Small Water Systems and Support Efforts in Los Angeles County

Los Angeles County is not exceptional nationally or statewide in having a higher proportion of small, at-risk systems or domestic well owners. In fact, it is already more consolidated than most counties in California on a per capita basis. At the same time, it remains a large county with over 200 regulated systems and tens of thousands of people served by private wells, so it naturally still is home to a relatively high raw number of regulated systems and private wells of concern. This report focuses on the needs, vulnerabilities, and opportunities to enhance the service provision of the County's small, regulated water supply systems, of which there are over 100.

Broadly, this effort supports the DPW's planning and operations. More particularly, it builds on aims set out in the 2023 County Water Plan (including to reduce the number of "At-Risk" systems to zero, and to establish a Small Water Systems Task Force) and the landmark 2019 OurCounty Sustainability Plan (which is currently being updated) to better understand small-system and private well solution pathways and obstacles, including cost. This effort also parallels DPW's work to comply with and go beyond the requirements of the Drought Planning for Small Water Suppliers and Rural Communities effort at the State Department of Water Resources, as mandated by Senate Bill 552 (2021). Stantec Inc. is supporting the County's SB-552 compliance efforts and the ongoing Small Water System Task Force.

The work will also feed into broader efforts in California, which has been promoting and funding the consolidation of small water systems as one of a set of potential solutions. The State's efforts began in earnest in 2015 (Dobbin, McBride and Pierce, 2023) and more concertedly in 2020 with the formation of the SAFER (Safe and Affordable Funding for Equity and Resilience) unit at the State Water Board, which was made possible by the passage of Senate Bill 200 (2019).

Human Right to Water

In 2012, Governor Jerry Brown signed Assembly Bill 685, more commonly known as the Human Right to Water Act (HR2W), into law. The Human Right to Water Act recognizes that "every human being has the right to safe, clean, affordable, and accessible water" (SWRCB, 2025). Since 2015, the state has enacted a range of legislation to address water issues, improve water quality, and pursue consolidation, including Senate Bill 88 (System

Consolidation) and Senate Bill 200 (Safe and Affordable Drinking Water Fund). At the regional level, Los Angeles County has demonstrated support by adopting the OurCounty Sustainability Plan in 2019 and the LA County Water Plan in 2023.

Water Systems

Fragmentation of water supply systems is observable across the country, and California is no exception. At the regional level, Los Angeles County is managing better than most counties in California per capita. However, the County has over 200 water systems stemming from its fragmented and decentralized historical development of drinking water systems. The historical development legacy within the County and across the state has shaped the landscape of water systems, informing the legislation and planning process.

In the last decade, California has pursued consolidation by enacting legislation such as expanding the State Water Resources Control Board (SWRCB) consolidation authority and funding consolidation efforts, among other technical and managerial solutions. Consolidation has been identified as a potential solution for delivering quality drinking water and reducing the fragmentation of systems in Los Angeles County because consolidated systems could benefit from a larger system's economies of scale, infrastructure, and technical, managerial, and financial capacity.

Report Organization

The remainder of this report is organized in chapter form. While all chapters are related and focus on characterizing challenges and solutions for small water systems in the County, they can also be read as independent analyses conducted by sub-teams of our student team.

Chapter 1 sets the stage for the rest of the report. It documents a brief history of private wells and water system geography in the County dating back to the 19th century, with a special focus on the Antelope Valley, given its concentration of struggling small systems. It then outlines the general expectations and regulatory requirements around water supply systems and documents consolidation policies at the national, state, and county levels. It also includes the results of interviews conducted with water system managers and other planning stakeholders, and concludes by conducting a high-level thought exercise on consolidation potential in the County.

Chapter 2 focuses on wildfire risk to the operations of the County's water supply systems. The analysis first looks at existing standards and support mechanisms—and the lack thereof—for everyday and wildfire preparedness expectations and regulations for small water systems. It also synthesizes best practices in preparedness from other places and other sectors. The second half of the chapter devises and applies a novel methodology for characterizing existing fire risk and vulnerability for all water systems in the County, as well as those systems affected by the January 2025 fires in Los Angeles, and identifies systems of critical concern.

Chapter 3 focuses on drought water shortage risk of the County's small water supply systems, and then applies a solutions and cost analysis for a subset of systems identified as at critical fire and shortage risk. It first reviews drought preparedness requirements and risk assessment tools developed by the state, as well as performs a brief comparison to other states. It then devises and applies a methodology building on state efforts for characterizing existing drought water shortage risk for all water systems in the county, and identifies systems of critical concern. It then applies a solutions and cost analysis, again building on state methods, for 10 systems identified as at critical fire and shortage risk across the county. The emphasis is on consolidation potential, but other solutions to risk are also considered and estimated.

The last chapter provides case studies, using a common template, for the 10 systems and their potential receiving systems, which were identified as at critical fire and shortage risk across the County and analyzed in Chapter 3. The case studies focus on system background and history, drivers of risk or failure, obstacles to potential consolidation, open questions, and paths forward. This template could be refined and applied to other systems identified in our subsequent analyses as at critical risk, and could also be refined and applied more broadly.

In closing, we note that this report constitutes a relatively rapid effort to assess small water systems in the County. Throughout the report, we note numerous limitations, caveats, and future opportunities for analytical refinement and expansion beyond this effort. That being said, we are confident in and proud of the value of our work and its aim to support and realize a future of more reliable, safe, and affordable water supply for all of the County's residents.

Chapter 1 Executive Summary

Introduction

This chapter examines the historical development, governance dynamics, and policy landscape of water systems in Los Angeles County, with a focus on the fragmentation of community water systems and the challenges and opportunities for consolidation. Tracing over a century of institutional change, the chapter explores how public agencies such as LADWP and MWD emerged from early mutual systems, and how their dominance shaped water access across the region.

Using Antelope Valley as a case study, we contextualize how geographic isolation and historical underinvestment continue to affect small systems. It also reviews the state's growing legislative toolkit for system consolidation, including Senate Bill 88 (Systems Consolidation), Senate Bill 552 (DAC Systems Assistance), Senate Bill 403 (Drinking water consolidation), and the Safe and Affordable Funding for Equity and Resilience Program (SAFER), assessing their implementation and impact within the County.

Data and Methods

The study employs a mixed-methods approach. First, a historical and archival review draws on planning documents, state reports, and secondary literature to map out the institutional evolution of LA County’s water systems.

Second, a qualitative research design involved seven semi-structured interviews with stakeholders from mutual water companies, large public agencies, regulatory bodies, and community organizations. Interviews were transcribed and thematically coded to capture governance challenges, stakeholder attitudes, and consolidation incentives or barriers.

Third, spatial analysis was conducted using Geographic Information Systems (GIS) to identify fifteen high-capacity systems that could theoretically absorb nearby smaller systems. The analysis included proximity buffers, population data, and Maximum Contaminant Level (MCL) violation history to assess potential receiving system suitability.

Results

Historical analysis revealed that water system fragmentation stems from a legacy of decentralized governance, inequitable infrastructure investment, and the expansion of private and mutual water companies during rapid 20th-century urbanization. Despite large-scale infrastructure development, many smaller systems remain outside regional integration, particularly in rural and unincorporated areas.

The interview analysis identified a widespread tension between regulatory pressure and community autonomy. Mutual water companies expressed concern over regulatory mandates and rising costs, and many voiced strong resistance to forced consolidation. Larger public agencies, such as Palmdale Water District and Los Angeles County Waterworks District 40, reported openness to voluntary consolidation but emphasized the need for financial support and proximity-based feasibility.

Our spatial analysis found that 151 unique systems fall within a 1-mile buffer of the 15 largest potential receiving systems, and 170 within a 3-mile buffer. While this indicates strong theoretical potential for consolidation, results show that distance alone is not a predictor of feasibility—systems differ in governance type, infrastructure, and political readiness. In addition, small systems with no discernible performance concern are likely not candidates for consolidation unless the system voluntarily pursues it. Overall, this chapter's findings serve as a starting point for the consolidation potential in Los Angeles County, not a recommendation for consolidation. The following chapters in this report capture the dynamic challenges some small water systems experience, such as water shortage and fire vulnerability, that serve as more significant drivers for consolidation considerations.

Recommendations

Based on our analysis of the historical, governance, and spatial contexts of water system consolidation in Los Angeles County, we offer a selection of recommendations for Los Angeles County and water governance agencies.

Recommendations for Los Angeles County:

1. **Acknowledge the complex history of water development.** The County should recognize the complicated history of water system development spanning from the pre-1900s era to the present day. The historical developments of Los Angeles's drinking water system included periods of decentralized water access, governance system development, and urban expansion, among other elements. The development of such institutional and spatial change over time shapes the landscape of water systems, informing the present planning process.

2. **Recognize the greater high-level potential for physical consolidation than elsewhere in the state.** In theory, there is a high potential for physical consolidation in Los Angeles County based on the spatial exercise conducted. There are more than 200 water systems in Los Angeles County, yet the team findings indicate that the top 15 potential receiving systems, based on system population, could consolidate 151 systems within a 1-mile buffer and 170 systems within a 3-mile buffer. Although small systems with no performance concern should not be considered for consolidation unless they wish to, the exercise findings highlight the County's consolidation potential among the water systems.

3. **Leverage recent state legislation to support strategic consolidation at the County level.** The County should review and utilize existing legislative avenues and local frameworks, like the Small Water Systems Task Force or other programs, to facilitate or circulate information on grant applications or technical support. Since 2015, the State of California has introduced legislation to realize the HR2W goals of providing safe, clean, and accessible water. In particular, introducing tools and funding sources to support water systems, including consolidation efforts. Despite this enabling environment, consolidation in Los Angeles County has been slowed, with only six systems consolidated in the last few years.

Recommendations for Water Governance Agencies and the State Water Board:

4. **Foster mutual aid relationships with nearby systems.** Water systems can explore relationship building or initiate conservation with nearby systems to share information on challenges and lessons learned. An established relationship or initial engagement can facilitate collaboration or potential consolidation when challenges arise due to water quality, water shortages, fire, or other impacts.

5. **Explore solutions beyond consolidation more seriously.** The state can pursue developing deeper analytical methods for alternative solutions outside of consolidation, especially when those systems in need are facing drought and fire risks. This is necessary given the isolation of many systems outside of the County.

6. **Incorporate a more nuanced approach for water system consolidation.** The State and key decision-makers must continue to further understand and propose consolidation based on context-specific circumstances. Further consideration for administrator and managerial consolidation models and pathways are most needed.

Chapter 2 Executive Summary

Introduction

As California's wildfire risks intensify under the pressures of climate change, small water systems face unprecedented threats to their operational resilience and community safety. These systems—often under-resourced, isolated, and aging—lack the hydraulic capacity, backup infrastructure, and planning frameworks needed to support fire suppression during emergencies. Despite their critical support role in wildfire response, small systems remain overlooked in the current state and federal regulatory schemes. This chapter examines the intersection of wildfire exposure and small system vulnerability, highlighting systemic gaps in emergency preparedness, regulatory oversight, and infrastructure investment. Through policy analysis, case studies, and the development of a Fire Vulnerability Index for Los Angeles County, this chapter identifies high-risk systems and proposes actionable pathways to enhance resilience. It emphasizes the urgency of integrated planning, targeted funding, and statewide fire flow standards to address escalating wildfire threats and protect vulnerable communities.

Data & Methods

We used a two-part methodology to assess fire preparedness in small water systems. First, we conducted a qualitative review of Emergency Response Plans (ERPs) for small systems in Los Angeles County to identify fire-specific planning elements and gaps. Our analysis focused on the presence or absence of key components such as fire flow benchmarks, infrastructure resilience measures, coordination protocols with local fire agencies, and public communication strategies for wildfire events.

Second, we constructed a Fire Vulnerability Index (FVI) to assess each system's relative exposure and capacity. The index incorporates six variables: percent Wildland-Urban Interface (WUI), terrain ruggedness, system size, financial stability, proximity to other systems, and Disadvantaged Community (DAC) status. Importantly, exploratory GIS analysis of recent fire impacts during the index construction found that the Wildland Urban Interface metric was more spatially predictive of recent wildfire damage in Los

Angeles County than other metrics such as Fire Hazard Severity Zones and Treatable Landscapes. All variables were normalized to a 0–1 scale and weighted equally to produce a composite score for each system.

Results

The Fire Vulnerability Index found that high-scoring systems tend to be nearly universally small, financially struggling, and classified as Disadvantaged or Severely Disadvantaged Communities. Approximately half of the highest-scoring systems are spatially isolated and/or serve areas with significant WUI coverage. Very few Community Water Systems (CWS) in Los Angeles County serve rugged terrain, as most people live in relatively flat areas. However, two of the top 25 systems serve extremely rugged terrain, and one system serves moderately rugged terrain.

Although the FVI is experimental and exploratory, it provides a replicable framework for assessing which systems in Los Angeles County may require targeted support, investment, or policy attention regarding their exposure and vulnerability to fire.
Many high-risk systems lack wildfire-specific ERP components, including fire flow benchmarks, backup power provisions, and coordination with fire agencies. While most ERPs meet general regulatory requirements, few include concrete fire suppression strategies, minimum pressure thresholds, or inter-agency procedures. This reflects a broader pattern of underpreparedness for wildfire events.

Recommendations

Based on our analysis of the historical, governance, and spatial contexts of water system consolidation in Los Angeles County, we offer a selection of recommendations for Los Angeles County and water governance agencies.

1. **Centralize and standardize Emergency Response Plans (ERPs) with fire-specific requirements.** Require all small CWS to submit ERPs to a centralized state database with standardized wildfire-specific components. ERPs must include:
    a. Defined fire flow benchmarks and minimum operational pressure thresholds.
    b. Interagency coordination protocols with local fire and emergency management authorities.
    c. Clear emergency water prioritization strategies during fire events.

2. **Tie CalWARN participation and mutual aid preparedness to funding eligibility.** Require that all small CWS seeking wildfire-related state or federal funds must:

a. Be active participants in CalWARN or equivalent mutual aid networks.
b. Have formal mutual aid and emergency coordination agreements in place.
c. Conduct at least one annual joint wildfire readiness exercise with partner agencies.

3. **Establish a statewide wildfire water infrastructure audit program.** Create a mandatory wildfire infrastructure audit program for small community water systems in high-risk zones. The audit would:

a. Evaluate system vulnerability based on factors such as hydrant spacing, pipe diameter, storage capacity, elevation challenges, and power backup reliability.
b. Identify gaps in physical and operational readiness for wildfire response.
c. Be conducted every five years by certified third-party assessors or regional technical assistance providers.
d. Be used to develop prioritized improvement plans tied to funding eligibility and compliance timelines.

4. **The Fire Vulnerability Index in this report should be refined and updated.** The fire vulnerability index contained in this report is a novel, experimental measure and should be treated as such. Although we believe its findings to be a useful indication of CWS fire vulnerability, its accuracy and usefulness could be improved upon with better data and a more customized approach to the fire risk variable. More detailed spatial data on built and natural fuels in LA County–possibly using LIDAR or image analysis in a GIS–would lend greater accuracy to the fire risk variable. Additionally, any future analyses should use the most recent available data as the financial, demographic and geographic profiles of CWS will change over time.

5. **Create a dedicated wildfire technical assistance fund for small systems.** Even modest investments in infrastructure (eg., hydrants, backup generators, interties) can meaningfully improve outcomes during wildfires. A dedicated technical assistance fund would help small systems overcome financial barriers to enhance urban fire and wildfire resiliency.

6. **Mandate and fund the ability of small CWS in high-WUI areas to maintain backup pressurization measures.** Fires can disrupt electric pumps and leave systems unable to maintain flow. Systems in high-WUI areas should be required to maintain gravity fed tanks or backup pressurization measures, sized to meet an ideal minimum period of uninterrupted service. High-WUI can be defined as above 18% of service area coverage; no systems with less than 18% WUI coverage have experienced fire in their service area since 2015.

Chapter 3 Executive Summary

Introduction

This chapter assesses drought risk and consolidation feasibility for LA County's small CWS. After providing background about California's Senate Bill 552, which established drought-preparedness requirements for small CWS, the chapter presents a water shortage risk assessment, including a threshold of concern, and produces a list of systems that appear especially at risk of running out of water. It then analyzes the physical costs of consolidating these CWS with receiving systems that are more drought-resilient, and considers policy interventions beyond consolidation.

The chapter outlines the rationale and structure behind the threshold framework, which incorporates multiple risk indicators—including groundwater decline, intertie presence, supplier size, and source capacity violations—into a composite scoring system. Each indicator is weighted to reflect its contribution to water system vulnerability, and scores are rescaled to allow direct comparison. The chapter details the methodology for scoring, thresholds for risk classification, and definitions for critical, high, moderate, and low-risk systems.

The chapter then presents findings from the assessment, including the number of systems falling within each risk tier and the specific vulnerabilities driving their scores. Finally, the chapter performs a cost assessment to gauge the feasibility of physically consolidating these at-risk systems and offers suggestions for alternatives to consolidation.

Data and Methods

This section outlines the data sources, indicator selection, weighting, and scoring methods used to 1) develop the threshold of concern for small CWS and 2) assess the potential physical costs of consolidating systems of concern.

Chapter 3's background section draws on legislation, gray literature, news reports, and

peer-reviewed literature on recent drought impacts in California. It then analyzes county-level records and information to assess SB-552 compliance within LA County.
The threshold of concern is based on a composite risk score calculated from nine indicators, each representing a physical, environmental, or operational stressor. These include groundwater decline, presence of interties, emergency intertie availability, supplier size, source capacity violations, drought impact history, bottled water reliance, distribution outages, and surrounding land use. Indicators are drawn from multiple state datasets, including the Department of Water Resources (DWR) 2024 Vulnerability Assessment, the State Water Resources Control Board (SWRCB) SAFER Risk Assessment, and the 2023 Electronic Annual Report (eAR).

Each indicator is assigned a weight based on its relative impact on system reliability, with groundwater decline and interties weighted most heavily. Indicator values are normalized to a 0–100 scale to allow cross-indicator comparison and are multiplied by their weights to produce a composite score for each system. Systems with scores above 50 are categorized as critical risk, those between 40 and 49 as high risk, between 30 and 39 as moderate risk, and below 30 as low risk.

The analysis uses both continuous and binary scoring depending on the nature of each indicator. For example, groundwater decline is treated as a gradient, while intertie presence is scored as either 0 or 100. Missing data are noted, and systems lacking sufficient data for analysis are excluded but flagged for future review. The resulting scores provide a standardized basis for identifying high-risk systems and prioritizing further assessment or support.

The feasibility assessment largely draws from the State Water Resource Control Board (SWRCB)'s Cost Assessment and accompanying documentation for viability thresholds and cost estimates related to consolidation and alternative solutions for at-risk water systems.

Results

The background section found that small CWS have made moderate and uneven progress in complying with SB-552, though we note that this conclusion is based on incomplete data. In line with the law's timeline, LA County is in the early stages of meeting its SB-552 requirements and has established a task force for addressing CWS drought risk. UCLA’s work complements the County’s work on state smalls and domestic wells by analyzing drought risk for small CWS with fewer than 1,000 connections.

The threshold of concern analysis identified ten small community water systems (CWS) with composite scores of 50 or higher, classifying them as Critical Risk. These systems lack standard and emergency interties and often show evidence of groundwater decline, limited source capacity, or small supplier size. Thirteen additional systems were categorized as High Risk, with scores between 40 and 49. These systems also lack interties and often rely on bottled water or operate at limited scale, placing them at elevated risk despite the absence of documented capacity violations or outages.

Forty-three systems were classified as Moderate Risk, with scores between 30 and 39. These systems typically lack emergency interties and sometimes show signs of groundwater stress or agricultural land use pressure. Twenty-nine systems fell into the Low Risk category, scoring below 30 and demonstrating relatively stable conditions and some degree of interconnection. Seventeen systems were excluded from scoring due to missing or incomplete data and are recommended for future assessment.

The feasibility assessment found that eight out of ten systems of concern are feasible for physical consolidation with a receiving system: Lancaster Park Mobile Home Park, Los Angeles Residential Community Foundation, Western Skies, Mobile Home Park, El Rancho Mobile Home Park, Mitchell's Avenue E Mobile Home Park, Del Rio Mutual, and Hemlock Mutual Water Company. These CWS are within 3 miles of a receiving system identified as capable of consolidating. They are also within SWRCB-defined thresholds of financial viability. Six out of the 10 systems have estimated capital cost totals less than $50,000 per connection.

The two remaining systems of concern, Sleepy Valley Water Company and Mettler Valley Mutual Water Company, are not feasible candidates for physical consolidation under our methodology and should explore alternative solutions to drought and fire risk.

Recommendations

Based on the threshold of concern analysis, several policy recommendations are proposed to strengthen drought preparedness among small community water systems (CWS). We include a selection of them here.

1. **Recommend that counties assess drought risk and consolidation potential for small CWS**. SB 552 and associated regulations should urge counties to assess 1) drought and water shortage risk and 2) consolidation potential for state smalls/domestic wells and small CWS, as we have done here. The teams conducting these assessments should collaborate to the greatest extent possible to share lessons and methods.

2. **Develop stronger guidance around mutual aid participation for small CWS.** DWR should develop more robust guidance around being an active member of water system mutual aid organizations such as CalWARN. Meaningful membership in such a system could promote resilience in struggling systems for which consolidation is not an option due to cost and/or distance between systems.

3. **Establish a targeted auditing and compliance review process to identify small water systems with persistent data gaps in indicators such as groundwater decline and intertie infrastructure.** SWRCB should flag systems that consistently fail to self-report for technical assistance or regulatory follow-up to prevent data omissions from masking vulnerabilities that delay interventions. It should be noted that many of these systems are in disadvantaged area communities and may not have the resources or knowledge that they need to self-report. SWRCB and DWR should prioritize providing additional resources to these small systems. Having identified systems that lack the knowledge or capacity to self-report, SWRCB and DWR should enable non-profit consultants like the Rural Community Assistance Corporation (to a greater extent than they already have) to support these systems with training and technical assistance.

4. **Collect data on infrastructure costs over more diversified geographies.** More targeted data collection for connection fees and other geographically specific cost components can benefit feasibility studies. More research is warranted on the extremely wide range of connection fees.

5. **Invest in drought and fire preparedness for small CWS.** The state and federal government need to make significant investments to help prepare CWS for drought and fire events. At a minimum, small CWS of concern must receive assistance with emergency infrastructure construction and water metering installation.

Case Studies Executive Summary

Introduction

Water system consolidation efforts, historically driven by regulatory concerns about drinking water quality, have increasingly expanded to include risks from drought and wildfires. While programs like California's SAFER initiative have focused on quality-related failures, recent challenges—like the January 2025 wildfires in Los Angeles—highlight the urgency of addressing water supply shortages and other vulnerabilities.

The final section of the report is a collection of case studies focused on the 10 critical-risk water systems identified in our drought and fire risk analysis. The case studies will explore the history and context of the water systems, as well as evaluate the feasibility of consolidation or infrastructure upgrades. All 10 selected systems depend solely on groundwater and lack existing interconnections, underscoring their vulnerability. Each case study follows a standardized format, including system background, demographic context, risk status under state programs, high-level cost estimates, and a profile of potential receiving systems.

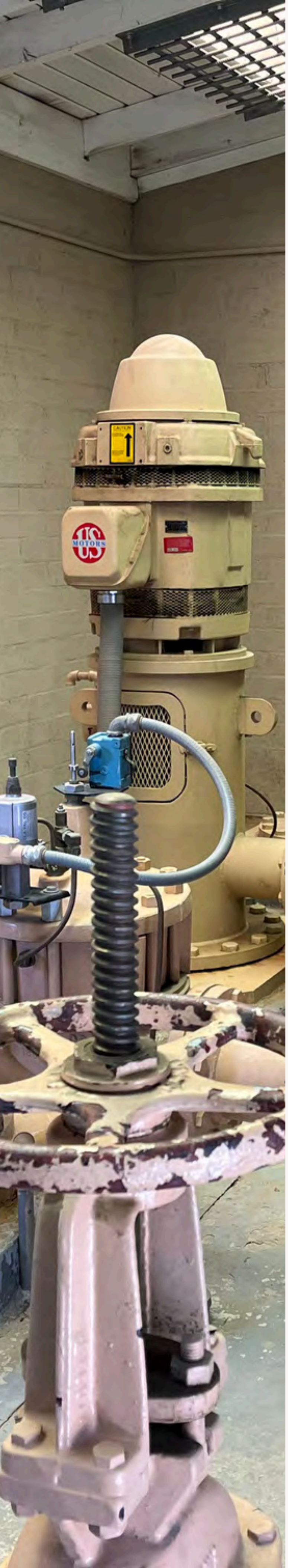
The studies do not provide full economic or engineering analyses but offer valuable insights for preliminary decision-making. While consolidation involves significant upfront costs, it often leads to long-term savings by avoiding emergency expenditures and unsustainable temporary fixes. Legal, governance, and affordability challenges are also considered.

Results

Table 1 (p.24) shares a brief overview of each case study and their respective vulnerabilities identified in Chapters 2 and 3.

Table 1: Top 10 Water Systems at Highest Drought/Fire Risk

Case Study ID	Case Study Name	UCLA Drought Composite Index Score	UCLA Drought Risk Classification	UCLA Fire Composite Index Score	UCLA Fire Risk Classification	SAFER Status	Population	Service Connections
CA1900520	The Village Mobile Home Park	65	Critical Risk	0.78	High	Failing	71	34
CA1900038	Lancaster Park Mobile Home Park	55	Critical Risk	0.67	High	Failing	60	21
CA1900062	Los Angeles Residential Community Foundation	60	Critical Risk	0.7	High	At-Risk	184	22
CA1900541	Western Skies Mobile Home Park	35	Moderate Risk	0.76	High	At-Risk	198	61
CA1900636	El Rancho Mobile Home Park	50	Critical Risk	0.65	High	Potentially At-Risk	215	76
CA1900785	Mitchell's Avenue E Mobile Home Park	50	Critical Risk	0.76	High	Failing	24	24
CA1900130	Del Rio Mutual	50	Critical Risk	0.58	Moderate	Potentially At-Risk	700	133
CA1910053	Hemlock Mutual Water Co.	50	Critical Risk	0.35	Low	Potentially At-Risk	686	208
CA1900903	Sleepy Valley Water Company	55	Critical Risk	0.3	Low	At-Risk	162	58
CA1900100	Mettler Valley Mutual	50	Critical Risk	0.57	Moderate	Failing	160	98



Chapter 1

From Sources to Systems: A Historical and Contemporary Policy Analysis of LA County's Water Supply Systems

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Background:
Power, Politics, and Pipelines-
The Evolution of Los Angeles' Water Systems

Introduction

Understanding the historical development of Los Angeles's drinking water systems is essential to addressing contemporary water governance challenges and infrastructure needs. The evolution of these systems—from scattered private wells and small utilities to expansive municipal and regional networks—reveals critical patterns in resource management, policy-making, and community adaptation to technical, financial, and environmental constraints. Central to this transformation are two pivotal entities: the Los Angeles Department of Water and Power (LADWP) and the Metropolitan Water District of Southern California (MWD).

The City of Los Angeles took control of its water supply in 1902 by purchasing the Los Angeles City Water Company, formally establishing a municipal utility that would later become LADWP (LADWP, 2023). This transition enabled long-term infrastructure planning and resource development. Under the leadership of William Mulholland, LADWP's first chief engineer, efforts to secure external water supplies culminated in the construction of the Los Angeles Aqueduct. Completed in 1913, the aqueduct transported water from the Owens Valley to Los Angeles, providing the capacity necessary for sustained urban growth (Los Angeles Aqueduct Centennial, 2013).

By the mid-twentieth century, however, reliance on the Owens Valley system proved insufficient to meet increasing demand. LADWP completed the Second Los Angeles Aqueduct in 1970, which extended northward into Mono County and increased supply capacity by 290 cubic feet per second. (LADWP, 2020). Recognizing the limitations of localized supplies, the City of Los Angeles initiated a broader regional water planning framework, forming the Metropolitan Water District of Southern California (MWD) in

1928. Originally composed of 11 cities, MWD established a cooperative agency tasked with securing imported water from the Colorado River and, later, Northern California through the State Water Project, which delivers water from the Sacramento-San Joaquin River Delta (Metropolitan Water District of Southern California, 2023).

This shift marked a critical transition from municipal-scale resource management to an inter-jurisdictional approach to mitigate local water supply conditions variability. Officially established in 1925, the Department of Water and Power (DWP) and Los Angeles voters approved a $2 million bond issue to fund engineering work for the Colorado River Aqueduct. In 1928, LADWP brought together cities in the region to form a state special district. The California State Legislature subsequently created MWD, with its original purpose being the construction of the Colorado River Aqueduct to supplement Southern California's water supply. In 1931, voters approved a $220 million bond issue for the project's construction, which would take ten years and transport water over 300 miles to the coast (LADWP, 2023). LADWP, managing its hydroelectric power facilities along the Los Angeles Aqueduct, plays a key role in securing federal approval for the project, which integrates flood control, water supply, and energy production for California, Nevada, and Arizona (Metropolitan Water District of Southern California, 2023).

A particularly illustrative case study in this historical trajectory is Antelope Valley, an arid region in the northern part of Los Angeles County, approximately 70 miles northeast of the City of Los Angeles. Historically reliant on groundwater due to its dry climate and geographical isolation (see Figure 1 for regional boundaries), Antelope Valley has experienced significant population growth in recent decades, adding further pressure to its water systems. The region's water history reflects broader trends in consolidation, governance, and the transition from self-sufficient water sources to integrated supply networks. Its experience and evolution highlight the ongoing challenges that semi-urban and rural communities face in securing reliable, high-quality water while balancing local autonomy with regional planning efforts. Examining these dynamics offers valuable insights into the persistent fragmentation of water systems and the equity challenges that continue to affect communities today.

Figure 1: Antelope Valley Regional Boundaries

Geographic extent of the Antelope Valley Integrated Regional Water Management Plan (IRWMP) region, spanning northern Los Angeles County and adjacent areas of Kern and San Bernardino counties. The map highlights Antelope Valley's hydrologic and administrative boundaries, illustrating its relative isolation and the planning challenges unique to its arid, inland context.

This chapter examines how Los Angeles County's water infrastructure evolved through significant historical transitions, focusing on the institutional development, infrastructural expansion, and changing governmental structures. Beginning with the municipal acquisition of the Los Angeles City Water Company in 1902, we trace the emergence of public water utilities and their ambitious infrastructure projects. The chapter details William Mulholland's pivotal role in developing the Los Angeles Aqueduct and how water access enabled the region's unprecedented growth. We examine how increasing demands necessitated additional supply systems, including the Second Los Angeles Aqueduct, the Colorado River Aqueduct, and State Water Project integration. The formation and evolution of key institutions—particularly the Los Angeles Department of Water and Power (LADWP) and Metropolitan Water District of Southern California (MWD)—receive special attention as we analyze their lasting influence on regional water governance. Complementing this historical infrastructure trajectory is the evolution of policy and legislation that has increasingly recognized the limitations of fragmented water governance. A key component of this shift has been the development of regulatory frameworks to support the consolidation of small and underperforming community water systems. These efforts trace back to the 1974 Safe

Drinking Water Act and have expanded through state-level policies, including the Human Right to Water Act, Senate Bill 88, and the Safe and Affordable Funding for Equity and Resilience (SAFER) program. These tools have strengthened state authority to mandate consolidations and offer financial and technical support to at-risk systems, particularly those serving disadvantaged communities.

Despite the state's enabling environment for consolidation, recent efforts in Los Angeles have been slow, prompting this chapter's review of policies and county-level strategies to advance consolidation. In addition to reviewing legislative tools and funding mechanisms, we conduct a high-level spatial exercise identifying potential receiving systems in Los Angeles County—larger, better-resourced systems capable of absorbing smaller ones. This policy and systems analysis frames consolidation as a technical or economic fix and a political and community-driven process. Our findings from this exercise underscore that while consolidation can address longstanding challenges in service delivery, water quality, and affordability, it must be approached with attention to governance dynamics, infrastructure feasibility, and local engagement. While historical analysis and quantitative data provide a foundational understanding of Los Angeles County's water systems, we recognize that consolidation efforts involve complex social, political, and governance considerations that cannot be captured by technical metrics alone. To address this gap, our research will provide semi-structured interviews with key stakeholders across water governance entities, regulatory bodies, and community advocacy organizations. These interviews will supplement our historical research by developing a more nuanced understanding of contemporary perspectives on consolidation barriers, institutional relationships, and community sentiment.

Data & Methods

Introduction

Understanding the feasibility and challenges of consolidating small water systems requires more than quantitative metrics. Instead, it necessitates a deep exploration of stakeholder perspectives, community sentiment, incentives, and barriers to consolidation, whether at the community, institutional, or state level. While numerical data identifies failing systems and assesses cost-effectiveness, it is possible, if not likely, to miss the often complex social, political, and regulatory dynamics that influence consolidation efforts.

Water system consolidation is a deeply contextual process influenced by governance structures, historical relationships, and public trust. Many small water systems have long-standing autonomy, and decisions about consolidation often involve political negotiations, financial trade-offs, and community acceptance. Qualitative data helps uncover stakeholder attitudes about consolidation, specifically their concerns, enthusiasm, and, at times, resistance.

This chapter also incorporates spatial and quantitative analysis to contextualize recent and potential water system consolidations in Los Angeles County. The identification of recent consolidation systems using SWRCB and recent research alludes to barriers to consolidation despite supportive state legislation. In comparison, identifying potential receiving systems using GIS serves as a basis for consolidating potential in the county without considering community sentiments and political barriers.

By integrating qualitative data, this study moves beyond a purely technical analysis and offers a nuanced, stakeholder-driven assessment of consolidation feasibility. This approach ensures that consolidation efforts are economically viable, politically feasible, and socially acceptable, increasing the likelihood of successful implementation.

This study employs a qualitative research approach to examine the consolidation of community water systems. Our methodology is structured around three key components: stakeholder interviews, interview data analysis, and collaborative integration of interview findings into broader research chapters.

Archival and Policy Document Review

The Historical Development of Drinking Water Systems in Los Angeles County

Sources for the historical analysis of Los Angeles County and Antelope Valley drinking water systems involved extensive archival research. Historical maps, planning documents, municipal records, and government reports provided key insights into the evolution of these water systems from their inception to the present day. Local archives, digital repositories, and historical databases offered detailed accounts of infrastructural developments, regulatory changes, and governance practices. Additionally, historical books written by contemporaries of significant developmental periods enriched the analysis with firsthand accounts and perspectives. However, some historical information particularly about early water systems and river locations during and immediately after colonial periods proved challenging to locate due to limited documentation. To address these gaps, historical newspaper articles and official reports provided essential context regarding milestones, management shifts, and persistent challenges, enabling a comprehensive understanding of how past decisions continue to shape contemporary drinking water system vulnerabilities and capacities in Los Angeles County and Antelope Valley.

Community Water System Consolidation Policy Context and Review Process

A contemporary policy context and review was conducted by gathering and exploring various sources, starting with the comprehensive reading list assembled by the project advisors. The reading list included foundational readings about water systems, academic articles, consolidation options, case studies, and SWRCB reports. In particular, the reading list was fundamental in understanding consolidation. However, independent research through the reading list references, online academic articles, leading scholars' work, and SWRCB reports informed the analysis of the sections on community water systems and consolidation.

Researching the federal, state, and county policy context relied heavily on each level of government’s respective website and resources. For example, the EPA web pages and resources help provide federal context on water quality, compliance, and the different levels of government roles and responsibilities. At the state level, the team gathered resources and information from the California Legislative Information website, the SWRCB online pages and reports, and even a few references to the California Health and Safety Code. On the other hand, county-level details relied on local plans, context-specific political and administrative processes, and articles and reports discussing county policies. The team replicated our top-down research approach in analyzing our sources because it served as a roadmap in setting the federal political landscape and narrowing it down to be context-specific to Los Angeles.

Qualitative Research Design

Stakeholder Interviews

A core qualitative research component involved semi-structured interviews with representatives from various water governance and management entities. All in all, we conducted 6 Interviews (Appendix 1A.5) after reaching out to over 18+ water systems and or agencies. Participants were selected based on their roles in water system governance, regulatory oversight, historical research, and community advocacy. The study aimed to include diverse perspectives, ensuring a holistic understanding of the consolidation landscape. The selection criteria prioritized:

- Large and small water systems: Representatives from both small and large community water systems to understand operational challenges, financial sustainability, and receptiveness to consolidation.
- Local government agencies: City officials and County Supervisorial districts are responsible for infrastructure planning and regulatory compliance.
- Regulatory bodies: Members of the Local Agency Formation Commission (LAFCO) and state-level agencies involved in overseeing consolidation efforts.
- Historians and academic researchers: Experts on the historical evolution of water system governance in Los Angeles County, particularly in Antelope Valley.
- Non-Profit Organizations (NPOs): Groups advocating for water access and equity, providing insights into community concerns and engagement strategies.

Selected Systems for Outreach

We conducted outreach to a carefully curated group of water systems and agencies to ensure a comprehensive understanding of the dynamics surrounding community water systems. These included:

- Antelope Valley-East Kern Water Agency: A major regional wholesale water supplier, critical for understanding the broader infrastructure and water supply dynamics that affect multiple smaller systems.
- California Water Service Company (Cal Water): As a large investor-owned utility, Cal Water provides insight into private-sector involvement in water system management and consolidation.
- Los Angeles County Waterworks: Represents one of the largest public water providers in the region, offering a government perspective on system management, regional planning, and regulatory challenges.

Our outreach to water districts focused on capturing both large and small-scale operations. We conducted outreach to:

- Palmdale Water District: A significant municipal water district that plays a key role in urban water supply, infrastructure investment, and policy decisions related to consolidation.
- Quartz Hill Water District: A smaller district that adds perspective on the challenges and benefits of consolidation for mid-sized water providers.

To understand the agricultural dimension, we contacted:

- Littlerock Creek Irrigation District: Represents agricultural water interests, which is crucial for understanding the balance between urban and rural water needs in consolidation efforts.

Finally, we directed a significant portion of our outreach toward mutual water companies, including:

- Antelope Park Mutual Water Company
- Averydale Mutual Water Company

- El Dorado Mutual Water Company
- Green Valley Mutual Water Company
- Lake Elizabeth Mutual Water Company
- Land Projects Mutual
- Landale Mutual Water Company
- Shadow Acres Mutual
- Sundale Mutual Water Company
- Sunnyside Farms Mutual Water Company
- Westside Park Mutual Water
- White Fence Farms Mutual Water

Each interview followed a structured protocol while allowing flexibility for respondents to elaborate on key issues. Questions focused on:

- Governance and financial challenges affecting small water systems.
- Previous experiences with consolidation efforts, including successes and failures.
- Perceived barriers and incentives related to consolidation's regulatory, financial, and operational aspects.
- Community attitudes and trust toward potential consolidation initiatives.

Data Sorting and Analysis Methods

All interviews were audio-recorded (with participant consent) and transcribed for detailed review. We conducted a thematic analysis to identify recurring patterns, concerns, and recommendations. This involved:

- Transcription and Data Preparation – We transcribed each interview to ensure accurate documentation of participant responses.
- Coding and Categorization – We systematically coded the transcripts to identify recurring themes, using a combination of deductive coding (guided by research objectives) and inductive coding (emerging organically from stakeholder responses).
- Theme Identification – We grouped the codes into broader themes that reflected critical aspects of consolidation feasibility, challenges, and stakeholder perspectives.
- Cross-Comparison – We compared perspectives from different stakeholder groups (e.g., water system operators, regulatory agencies, community representatives) to identify points of consensus and divergence.

- Synthesis and Interpretation – We synthesized thematic findings into key takeaways that informed policy recommendations and consolidation feasibility assessments.

Recent and Potential Consolidations: Spatial and Quantitative Methods

Identifying Recent Consolidation Systems in Los Angeles County

The California Water Partnerships online interactive map and the dataset from the *Panacea or Placebo? The Diverse Pathways and Implications of Drinking Water System Consolidation* (2023) informed the identification of the recent water system consolidation in Los Angeles County within the past five years. We identified six consolidated systems through the interactive map, five of which also appeared in the dataset. The sixth system, the Sativa Water System, was determined using the online map and included in the analysis.

We assembled a brief water system profile to provide a snapshot of the system's characteristics. These characteristics include system name, city, date of merger, number of connections, population size, issue summary, and whether physical or managerial consolidation occurred. In addition, secondary sources, including news articles, archival documents, and meeting notes, supplemented the profile and narrative for one selected system.

Identifying Potential Receiving Systems in Los Angeles County

This study employed a high-level exercise to identify the top 15 potential receiving systems in Los Angeles County. The identified systems serve as a potential basis for water systems consolidation. The primary criteria for determining the systems include system population and maximum contaminant level (MCL). This study conducted spatial analysis using ArcGIS Pro after identifying the system. This study used ArcGIS Pro to determine the number of systems within a 1-,3-,5-, and 10-mile buffer among the top 15 potential receiving systems. This initial GIS process resulted in systems appearing multiple times across the identified systems. The next step required manual cleaning of the top 15 system list by removing duplicate values using Excel's conditional formatting to find the number of unique systems within a 1- and 3-mile buffer. This cleaning process highlighted a few potential receiving systems that could consolidate with nearby water systems within a 1-to 3-mile buffer in Los Angeles County.

Results: Historical & Contemporary Policy Analysis

Introduction

This chapter presents findings from four integrated analysis components to assess the feasibility and challenges of water system consolidation in Los Angeles County. First, it traces the historical development of the region's drinking water systems to contextualize present-day governance and infrastructure disparities. Second, it reviews the contemporary policy and regulatory framework guiding community water system consolidation, identifying key legislative tools, institutional roles, and funding mechanisms. Third, it draws on insights from stakeholder interviews with mutual water companies, public agencies, and regulators to capture on-the-ground perspectives regarding consolidation barriers, incentives, and governance trade-offs. Finally, it conducts a high-level spatial analysis identifying potential receiving systems across the county, offering a geographic perspective on consolidation feasibility based on system capacity and proximity. Together, these components provide a comprehensive understanding of the technical, political, and equity dimensions shaping consolidation outcomes in Los Angeles County.

The Historical Development of Drinking Water Systems in Los Angeles County

The historical development of Los Angeles County's drinking water systems reflects the complexities of supplying water to a rapidly growing and geographically diverse region. Over the past century, urbanization and population growth have substantially altered the county's natural hydrological cycles, making groundwater replenishment increasingly challenging and necessitating a significant reliance on imported water. Today, the City of Los Angeles imports approximately 73% of its water from the Metropolitan Water District, which conveys water from the Colorado River and the State Water Project. It receives an additional 15% from the Los Angeles Aqueduct and 10% from local groundwater, with 2% from recycled water (LADWP, 2022).

Los Angeles County as a whole sources roughly 60% of its water from imported supplies and 40% from local sources such as groundwater, recycled water, and stormwater (Los Angeles County Public Works, 2023). However, these local sources face mounting pressures, including saltwater intrusion in coastal aquifers due to historical over-extraction, contamination, and reduced recharge rates resulting from increased impervious surface cover (UCLA, LARC, Liberty Hill, & BuroHappold, 2018). Additionally, seasonal snowmelt from the San Gabriel and San Bernardino Mountains has historically contributed to the water supply, though climate variability and prolonged drought have diminished its long-term reliability. Understanding this historical evolution, including periods of intense infrastructure expansion, environmental conflict, and fragmented governance, is critical to addressing today's water equity challenges and preparing for a more suitable and climate-resilient future in Los Angeles County and beyond.

The historical eras' characterization presented in this analysis were developed through a review of planning documents, archival sources, and secondary literature, emphasizing identifying major shifts in water governance, infrastructure, and regional priorities. While the periodization is interpretive and may be subject to debate, it reflects a logical progression of institutional and spatial change over time. The Pre-1900s era captures decentralized water access and early governance systems. The Early-Mid 1900s (1900s-1950s) marks the rise of large-scale infrastructure projects, including the Los Angeles Aqueduct and the formation of the Metropolitan Water District. The Mid-Late 1900s (1950s-1980s) focuses on the urban expansion and the continued role of mutual water companies. The Late 1900s-Present highlights contemporary efforts toward water system consolidation and climate resilience in response to growing sustainability and equity challenges.

Early Water Access and Governance: Pre-1900s

Thousands of years before European settlement, Indigenous peoples, including the Tongva in the Los Angeles Basin and the Nüümü (Northern Paiute) in the Owens Valley, relied on local rivers, groundwater springs, and seasonal streams within their ancestral homelands (Mendoza, 2019). Water has always been essential for drinking, fishing, rrigation, daily life, and cultural practices. However, successive waves of Spanish, Mexican, and later white American colonization of the Los Angeles River Basin and surrounding lands drastically disrupted Indigenous communities, severing their access to traditional water sources and altering the local ecology of these water bodies (Mendoza, 2019).

The Spanish settler establishment of El Pueblo de Nuestra Señora la Reina de Los Ángeles in 1781 brought significant changes to the region's land use and water management. The Spanish introduced a rudimentary water system, using a "toma," or brush dam, to divert water from the Los Angeles River through the Zanja Madre ("Mother Ditch") (Los Angeles County, n.d.). Ownership of the river's water was granted to the Pueblo in perpetuity by King Carlos III of Spain. This historical decree would later significantly shape the legal foundation of water rights in Los Angeles (LA River Master Plan, 2022). Upon incorporation in 1850, the City of Los Angeles, with a population of just over 1,600 people, would retain all of the original Pueblo water rights, including exclusive control over the Los Angeles River (Los Angeles County, n.d).

By 1854, the City of Los Angeles' water system had grown enough to require oversight, leading to the appointment of the first "Zanjero" or water overseer. In 1860, the Los Angeles City Water Company built the City of Los Angeles's first formal water system, marking a shift toward a more organized distribution network (Los Angeles Department of Water and Power [LADWP], n.d.). However, when William Mulholland joined the Los Angeles City Water Company in 1878, a private entity had already leased the system. Over the years, the City of Los Angeles' water infrastructure evolved from crude ditches and hollowed logs to a domestic service system with reservoirs, water mains, and pumping plants. Mulholland became superintendent in 1886, overseeing 300 miles of mains, six major reservoirs, infiltration galleries, and pumping plants. As the population skyrocketed—from 5,728 in 1870 to 102,479 by 1900—the need for a larger, more sustainable water supply became increasingly urgent (LADWP, n.d.).

Water Access Challenges for Small Communities and Rural Areas

During the mid-nineteenth century, Los Angeles was not alone in its struggle to secure a challenges, often relying on local groundwater wells and rudimentary distribution systems (Pincetl et al., 2016). The Gold Rush of the mid-1800s dramatically altered water governance in the state. Before the Gold Rush, California followed the traditional riparian rights system inherited from Eastern U.S. states, which granted water usage rights only to those who owned land adjacent to a water source (Pincetl et al., 2016). However, as miners flocked to California in search of gold, they developed a new system of appropriative rights subject to the restriction of “beneficial use”–allowing them to divert water from rivers and streams for use elsewhere even if they did not own land adjacent to the water source (Pincetl et al., 2016). As mining declined, local water development became more structured. Communities experimented with private collectives, known as mutual water companies (MWCs), which managed water resources collectively (Pincetl et al., 2016). Ownership in these companies was often proportional to the acreage served by the system, creating a more formalized approach to water management (Pincetl et al., 2016).

By the late nineteenth century, cities across California, including Los Angeles, developed local water systems to serve their rapidly growing populations. In 1887, the Wright Act enabled agricultural communities to build canals and form irrigation districts, which became the first “special districts” in the state, designed to provide specific public services within defined boundaries (Pincetl et al., 2016). Unlike nonprofit mutual water companies, these special districts were publicly governed and overseen by either appointed or elected officials (Pincetl et al., 2016). In 1888, California also established the first charter cities, allowing municipalities in Los Angeles County to create constitutions and finance large projects through municipal bonds (Kahrl, 1982).

By 1902, the California Supreme Court had granted Los Angeles exclusive rights to the Los Angeles River and its watershed, formalizing its municipal water system and strengthening its regional water control (Pincetl et al., 2016). The following year, Los Angeles officially became a charter city, further solidifying its ability to finance and control large-scale infrastructure projects, including its water supply (Pincetl et al., 2016). However, these changes primarily affected the City of Los Angeles rather than the broader Los Angeles County region, where many smaller water systems continued to operate independently.

The Rise of Large-Scale Water Infrastructure (1900s-1950s)

Securing Owens Valley’s Water: Expansion and Controversy

Under the leadership of William Mulholland, the City of Los Angeles faced mounting water shortages due to rapid population growth and sporadic but impactful drought episodes. In 1902, the City of Los Angeles acquired the Los Angeles City Water Company for $2 million, municipalizing its water system (LADWP, n.d.). At the time, Los Angeles' population exceeded 100,000, prompting Mulholland to raise concerns regarding its ability to sustain its water supply. His 1902 annual water report documented that Los Angeles was consuming approximately 26 million gallons per day, with per capita usage reaching 306 gallons per day, a rate deemed unsustainable (LADWP, n.d.). By 1904, intermittent drought conditions across California exacerbated concerns that Los Angeles would soon surpass the capacity of its limited existing water resources. In response, City of Los Angeles officials initiated efforts to secure external water sources to facilitate continued urban growth. Frederick Eaton—former mayor of Los Angeles, engineer, and longtime advocate for water development—was instrumental in this process, leveraging his political influence and his close relationship with Mulholland to identify a new water supply (LADWP, n.d.).

While Eaton publicly presented his land acquisitions in Owens Valley as private investments, historical analyses suggest that he acted on behalf of Los Angeles throughout the process (Kahrl, 1982). By the time Owens Valley farmers realized the full extent of the acquisitions, Los Angeles had already secured a significant portion of their water rights (Libecap, 2004). Still, many historians argue that Mulholland significantly underestimated the long-term availability of Owens Valley's water supply, particularly given Los Angeles's unprecedented population growth (Kahrl, 1982). This miscalculation compelled LADWP to continuously expand its reach, as water demand consistently outpaced supply. Many scholars argue that city officials municipalized LADWP not simply to serve the public interest, but to promote private business and generate revenue for the rapidly growing City of Los Angeles (Mendoza, 2019).

The tactics to secure Owens Valley's water rights were often opaque and coercive. Farmers and ranchers in Owens Valley were frequently misled into selling their land to William Mulholland's associate, Fred Eaton, under false pretenses, unaware of the full consequences of the planned water diversions (Kinsey, 1928). Scholars note that city officials often conducted these transactions under duress, pressuring landowners to accept below-market compensation by instilling fear that refusing to sell would leave them without water (Libecap, 2009). While many have documented the struggles of white settlers in Owens Valley, these narratives often obscure how government actors excluded Indigenous communities, who had relied on these water sources for centuries, from land negotiations and erased their water rights without acknowledgement (Mendoza, 2019).

The Los Angeles Aqueduct and Early Regional Water Conflicts

Shortly after, in 1907, Los Angeles voters overwhelmingly approved a $23 million bond to fund the construction of the Los Angeles Aqueduct. This 233-mile-long infrastructure project would divert water from the primarily LADWP-controlled Owens Valley to Los Angeles (Deverell & Hise, 2011). Los Angeles leaders–particularly Mulholland and his allies–further ensured the erasure of Indigenous water rights by framing water expansion as an unquestionable public good. Through carefully crafted messaging, City of Los Angeles officials and private interests convinced Angelenos that securing Owens Valley's water was essential for the City of Los Angeles's future, omitting the reality that these projects primarily served the financial interests of a small group of oligarchs who controlled water access (Mendoza, 2019). Consequently, voters approved the bonds that funded the Los Angeles Aqueduct and subsequent water projects, believing they were securing prosperity for all, unaware that their votes enabled the dispossession of Indigenous communities and the expansion of water monopolies. Nevertheless, it is essential to recognize that despite these profit-driven motives and significant social costs, importing water was crucial for enabling the unprecedented population growth and economic expansion of Los Angeles City and County, developments that would have otherwise been impossible. This imbalance has shaped water access in Los Angeles County and beyond for generations (Mendoza, 2019).

The aqueduct's completion in 1913 marked a turning point in Los Angeles's control over regional water resources. Soon after, in the 1920s, Los Angeles and the Owens Valley would face severe water shortages (LADWP, n.d.). The City of Los Angeles lacked proper storage facilities to regulate the flow of the Owens River, and groundwater depletion in the valley led to growing tensions. By 1924, tensions between farmer communities in Owens Valley and the LADWP had escalated to a critical point, culminating in acts of resistance in which disenfranchised residents dynamited portions of the Los Angeles Aqueduct in protest of the ongoing diversions (Kinsey, 1928). Despite these efforts, Los Angeles successfully maintained its control over Owens Valley's water supply, and by 1926, Los Angeles owned 90% of Owens Valley's land and water rights (LADWP, n.d.). Today, the City still maintains that ownership, and in fact, the City owns more acreage in the Owens Valley than the entire footprint of the City of LA. Owens Lake had desiccated mainly due to the groundwater pumping by LADWP, producing severe ecological and economic consequences for the region (Great Basin Unified Air Pollution Control District [GBUAPCD], n.d.). Many historians characterize LADWP's strategies as exploitative, arguing that acquiring Owens Valley's water resulted in irreversible environmental degradation and economic decline (Kahrl, 1982).

The Rise of Regional Water Planning and Management and the Metropolitan Water District

With water demand escalating, Los Angeles County increasingly moved toward a more coordinated and expansive approach to water management. This shift became especially evident in 1915, when the City of Los Angeles annexed the San Fernando Valley, not only to accommodate growth but more strategically, to gain direct control over the water imported via the Los Angeles Aqueduct from the Eastern Sierra (Zetland, 2008). The San Fernando Valley, as the aqueduct’s terminus, offered access to the transported water and extensive groundwater basins for storage. While the Owens Valley Aqueduct secured a critical new supply for Los Angeles, other parts of Southern California faced mounting shortages due to excessive groundwater pumping and a growing population (GBUAPCD, n.d.). Recognizing the need for a more unified regional strategy, William Mulholland proposed forming a regional water authority to pool resources and finance large-scale water imports, an idea that ultimately laid the foundation for the Metropolitan Water District of Southern California (Zetland, 2008).

Los Angeles and 12 other cities officially established MWD in 1928, and voters finalized the district in 1931 (Zetland, 2008). Although its founders intended the agency to function as a cooperative effort, Los Angeles played an outsized role in shaping its policies and securing its long-term supply. Many neighboring cities joined reluctantly, viewing Los Angeles as a "water imperialist" due to its aggressive strategies and control over regional water sources (Zetland, 2008). Cities such as Beverly Hills, Santa Monica, and Pasadena refused to join, wary of Los Angeles’ influence (Zetland, 2008). Despite this skepticism, MWD moved forward, initially operating primarily with Los Angeles' interests at the forefront. Political deals between the City of Los Angeles and surrounding municipalities secured support for infrastructure projects, most notably the Colorado River Aqueduct, by offering financial assistance to support the aqueduct’s construction (Zetland, 2008).

The 1973 extension of the State Water Project bolstered the Metropolitan Water District’s (MWD) supply by expanding a vast system of canals and dams transporting water from the Sacramento-San Joaquin River Delta into Southern California. Managed by the

California Department of Water Resources, the expansion further cemented MWD’s role as the region’s primary wholesale water provider. Today, MWD serves 26 member agencies, with voting power allocated in proportion to each member’s financial contribution, primarily through property taxes and infrastructure investments, resulting in disproportionately greater influence for larger cities like Los Angeles (Pincetl, 2016). This structure has significant policy implications, shaping regional priorities for supply investments, conservation, and distribution equity.

While MWD focused on securing large-scale imports, Los Angeles County simultaneously worked to strengthen local water management. In 1935, the County established its first Waterworks District (District No. 21, Kagel Canyon) to serve unincorporated areas and communities lacking the technical and financial capacity to manage their supplies (Los Angeles County Public Works, n.d). In subsequent decades, additional WWDs were established directly by the County or in partnership with local governments to provide reliable service to suburban and rural communities outside of city boundaries. These districts are now administered by the Los Angeles County Department of Public Works and remain critical for managing localized systems not integrated into larger municipal utilities (Los Angeles County, n.d.). Meanwhile, the completion of the Colorado River Aqueduct in 1941 expanded the region’s imported supply, reducing dependency on Owens Valley water and reinforcing Southern California’s long-term reliance on external sources (Zetland, 2008).

Together, these developments reshaped water governance in Los Angeles County. MWD's formation ensured a steady supply of imported water, primarily initially benefiting the City of Los Angeles. At the same time, the County Waterworks Districts attempted to address a dispersed set of very local water supply challenges. While MWD provided a stable source of imported water for Los Angeles and its neighboring cities, many smaller communities and rural areas remained outside this centralized system. These areas relied on fragmented and decentralized water management models, including local groundwater wells and privately managed Mutual Water Companies (MWCs). Even as Los Angeles rapidly expanded, water supply and access across the county remained uneven, leading to stark contrasts between municipal service areas and independent water suppliers. This disparity set the stage for a prolonged expansion, consolidation, and ongoing tensions over governance in Los Angeles County's water system.

Urban Expansion and Consolidation of Water Systems (1950s – 1980s)

While the Metropolitan Water District (MWD) provided a centralized and large-scale approach to water imports, many smaller communities in Los Angeles County continued to rely on decentralized water systems and purely local sources. These included privately-managed groundwater wells, private water companies, and Mutual Water Companies (MWCs)—small, cooperative entities formed by property owners to manage shared water resources (Pincetl et al., 2019). Unlike the LADWP-managed municipal system, MWCs functioned independently of local governments, giving member-owners complete control over rates, quality standards, and infrastructure investments (McBride, 2022).

As Los Angeles expanded in the early to mid-twentieth century, the fragmented nature of these smaller water systems created growing disparities in water access, service quality, and affordability. Some private MWCs evolved into Investor-Owned Utilities (IOUs)—for-profit entities regulated by the state but controlled by shareholders rather than the residents they served (Dobbin et al., 2022). This shift led to service quality and pricing inconsistencies as regulatory oversight varied across different jurisdictions. These disparities became even more pronounced following World War II, when Los Angeles entered a period of rapid population growth, and water demand skyrocketed.

By 1950, the City of Los Angeles' population had surpassed two million, prompting LADWP to expand its infrastructure further to meet increasing demand. The expansion included the construction of additional reservoirs, hydroelectric stations, and a second aqueduct to supplement the Los Angeles Aqueduct (LADWP, n.d.). By the 1970s, the City of Los Angeles' water system had grown to include 105 reservoirs, and the completion of the Second Los Angeles Aqueduct expanded water capacity by 50% (LADWP, n.d.). While these large-scale projects helped secure a more stable water supply for Los Angeles proper, many smaller, unincorporated areas remained outside the municipal system, relying on aging, independently managed systems that often lacked long-term sustainability.

Recognizing the growing need for groundwater management and sustainability, voters approved the establishment of the Water Replenishment District (WRD) in 1959 to oversee regional groundwater resources and protect against overdraft (Water

Replenishment District, n.d.). While WRD introduced a more structured approach to groundwater conservation, many independent water agencies, such as the Covina Irrigating Company (1882), California Domestic Water Company (1889), Sunny Slope Water Company (1895), and Valley View Mutual Water Company (1907), remained autonomous (Pincetl et al., 2019). The fragmented nature of these systems reflected the challenges of consolidation—geographic isolation, financial constraints, and regulatory hurdles prevented seamless integration into municipal water districts (Dobbin et al., 2022).

Persistence of Mutual Water Companies Amid Urban Expansion

As Los Angeles County continued to expand in the mid-twentieth century, MWCs remained a crucial part of the region's water landscape, particularly in unincorporated and agricultural areas where municipal services did not reach. These community-run systems allowed property owners to purchase shares, granting them direct control over their water supply. However, as LADWP and municipal water agencies expanded their infrastructure to accommodate rapid urbanization, MWCs faced increasing pressure to modernize and integrate into larger public water systems (McBride, 2022). Despite this, many continued to operate independently, particularly in historically underfunded and segregated communities, where governance structures often prioritized landowners over tenants, reinforcing disparities in water access (McBride, 2022).

By the 1980s, as suburban development accelerated, MWCs and investor-owned utilities (IOUs) faced increasing pressure to consolidate with municipal and county water agencies to ensure reliable service, standardized water quality regulations, and improved infrastructure (LADWP, n.d.). Although consolidation successfully integrated many smaller water systems, independent MWCs persisted, especially in rural and unincorporated areas where infrastructure and financial barriers complicated municipal oversight (McBride, 2022). In particular, MWCs in the Los Angeles County communities of Maywood and Cudahy became focal points of governance conflicts due to their problematic governance structures and susceptibility to corruption. Residents facing discolored and contaminated water organized community-based campaigns and attempted to consolidate MWCs into municipal oversight to enhance accountability and water quality. Despite these efforts, entrenched leadership in some MWCs in Southeast Los Angeles leveraged complex legal structures, financial self-interest, and limited state intervention to maintain their positions, preventing effective community oversight

(McBride, 2022). According to McBride (2022), this resistance was deeply connected to the legacy of racial capitalism, enabling systemic disenfranchisement of primarily renter and Latinx communities from decisions regarding their water infrastructure.

Consequently, unresolved governance disputes, infrastructural neglect, and systemic inequities continued, leaving significant disparities in these communities' water access and service quality.

Given these persistent governance and equity challenges, consolidating smaller water systems into larger municipal frameworks presents a valuable opportunity. Such integration can enhance accountability, improve infrastructure investments, and strengthen water resilience, ultimately supporting equitable access to safe and sustainable water resources across Los Angeles County and beyond.

Modern Era: Water Sustainability and Climate Resilience (1990s-Present)

In recent decades, Los Angeles County has faced growing challenges in sustaining a reliable water supply, exacerbated by rapid urbanization, recurring droughts, and the escalating impacts of climate change. Notable droughts—including the six-year drought from 1987 to 1992, the two-year drought from 2007 to 2009, and the four-year drought from 2012 to 2016, have underscored the region’s vulnerability due to its heavy dependence on imported water sources. The 2012-2016 event was among the most severe and hottest in state history (Public Policy Institute of California, 2021). Water imported through systems like the Los Angeles Aqueduct, the Colorado River Aqueduct, and the State Water Project is increasingly uncertain due to diminishing snowpack, over-allocation, and competing regional demands (APM Research Lab, 2023).

Historically, rainwater in Los Angeles County flowed through natural channels and seeped into underground aquifers. However, widespread urban development has led to a proliferation of impervious surfaces, significantly reducing groundwater recharge capacity (UCLA, LARC, Liberty Hill, & BuroHappold, 2018). Coastal areas that once relied on groundwater have experienced saltwater intrusion from over-extraction. At the same time, mountain-fed snowmelt from the San Gabriel and San Bernardino ranges has become increasingly unreliable in the face of prolonged drought (UCLA, LARC, Liberty Hill, & BuroHappold, 2018). These overlapping hydrological pressures have driven the County to reevaluate its long-term water strategies.

Recognizing the need for a more resilient water future, both the City and County of Los Angeles have diversified and decentralized water supply solutions. The City of Los Angeles, through LADWP's Stormwater Capture Master Plan, aims to increase annual stormwater capture by 68,000 to 114,000 acre-feet per year over the next two decades by implementing a combination of centralized infrastructure projects (LADWP, 2015). Concurrently, Los Angeles County collaborated with the U.S. Bureau of Reclamation on the Los Angeles Basin Stormwater Conservation Study, which modeled climate change scenarios and proposed operational improvements to increase stormwater storage, bolster resilience, and guide future infrastructure investments (Los Angeles County Flood Control District & U.S. Bureau of Reclamation, 2015).

Building on these efforts, Los Angeles County developed the Los Angeles County Water Plan (CWP), which sets ambitious targets to increase local water supply sources by 580,000 acre-feet annually by 2045 (Los Angeles County Public Works, 2023). Strategies include large-scale investments in stormwater capture, water recycling, groundwater recharge, and demand reduction (Los Angeles County Public Works, 2023). These efforts signal a countywide shift toward integrated water management and local self-reliance in the face of climate uncertainty.

As the region grows, water agencies are deploying new infrastructure strategies to reduce reliance on imported water and build long-term climate resilience. Investments in advanced wastewater recycling are now central to regional water planning. Today, Los Angeles County aims to increase its local water supply from 40% to 80% by 2045, a goal outlined in the County Water Plan (de Guzman & Pierce, 2024). Major initiatives such as Pure Water Southern California and other regional recycled water programs support this shift by advancing efforts to transform Los Angeles County into a self-sufficient water region under California's Direct Potable Reuse framework (de Guzman & Pierce, 2024). In the Antelope Valley, water supply challenges persist due to groundwater depletion and variability in imported water deliveries through the State Water Project. While the Antelope Valley-East Kern Water Agency (AVEK) provides imported water to the region, allocations fluctuate annually based on climate conditions and statewide availability, constraints faced by many areas reliant on imported water (Pincetl et al., 2019).

Achieving local supply targets will require sustained investment, interagency collaboration, and governance structures prioritizing equity and climate resilience.

Ensuring a reliable and sustainable water future for Los Angeles County will ultimately depend on integrating infrastructure expansion with inclusive, long-term planning.

Deeper Dive: Antelope Valley's Local Water System Formation and Present-Day Situation

The Antelope Valley presents a unique case amid countywide efforts to reduce reliance on imported water. Its geographic isolation, extreme climate, and dependence on groundwater have shaped a distinct path toward water system development and consolidation. Antelope Valley is 40 miles north of Los Angeles and part of the southwestern Mojave Desert. The region has an arid climate with low precipitation and high evapotranspiration rates (Siade et al., 2015). The region contrasts with the broader urbanized Los Angeles area, with a Mediterranean climate marked by hot, dry summers and cool, wet winters. Long-term climate records indicate that between 1917 and 1972, the average annual precipitation in the Antelope Valley was 5.10 inches, compared with an average for Downtown Los Angeles of 14.77 inches (Western Regional Climate Center, n.d.). More recent data from 1974 to 2016 show an increase to 7.39 inches, still about half of what the City of Los Angeles receives (Western Regional Climate Center, n.d.). The region experiences low humidity, with most precipitation occurring between October and March (Western Regional Climate Center, n.d.).

The Antelope Valley Groundwater Basin spans 1,580 square miles and lies surrounded by the San Gabriel Mountains, Garlock Fault, and San Andreas Fault (USGS, n.d.). The Antelope Valley is a closed basin; water percolates into the aquifer, evaporates, or flows toward dry lakes (Los Angeles County Department of Public Works, 2019). Groundwater is the primary water source for the Antelope Valley, accounting for 50% to 90% of the region's water portfolio in an average year (Siade et al., 2014). The Antelope Valley relies on groundwater extraction, raising concerns about overdraft and aquifer depletion (Los Angeles County Department of Public Works, 2014).

Due to geologic barriers and limited surface water flow, the Mojave River Basin has minimal influence on the Antelope Valley's water supply (Templin et al., 1995). Until the 1970s, groundwater extraction was the sole water source, supplemented marginally by mountain-front underflow and ephemeral stream infiltration (Siade, Nishikawa, & Martin, 2015).

Before municipal water agencies emerged, early settlers primarily relied on mutual water companies and private wells for their water supply. Local settlers and landowners established small mutual water companies to access creeks, springs, and groundwater wells, ensuring they had water in an arid and resource-limited environment. In the late 1800s, the Palmdale Water Company dug a 6.5-mile irrigation ditch from Littlerock Creek to provide water for agriculture (Palmdale Water District, n.d.). By 1895, settlers had formed the South Antelope Valley Irrigation Company to construct the Palmdale Dam, which created Lake Palmdale for water storage (Palmdale Water District, n.d.). The Antelope Valley's first artesian well was drilled in 1883 near the Lancaster railroad to supply locomotives with water (City of Lancaster, n.d.).

In the early 1900s, the Palmdale Water Company and the Littlerock Creek Irrigation District (LCID) acquired some smaller mutual water systems. Their combined efforts in 1918 led to the formation of the Palmdale Irrigation District (PID), which financed and managed large-scale dam construction on Littlerock Creek (Palmdale Water District, n.d.). In the early twentieth century, agriculture was the primary water user in Antelope Valley, depending solely on groundwater extraction for crop production (Templin et al., 1995). The region's lengthy, hot, and dry growing season required substantial irrigation for farming success (Bloyd, 1967). By 1919, annual groundwater pumping reached 29,000 acre-feet, escalating to 480,000 acre-feet by 1953 as irrigated farmland expanded to 71,200 acres (Templin et al., 1995; Bloyd, 1967). This extraction far exceeded natural recharge rates, causing water tables to drop by 100–200 feet in some areas, increasing pumping costs, and triggering land subsidence exceeding six feet near Edwards Air Force Base and Lancaster (Siade et al., 2014). By the mid-twentieth century, the economic shift from agriculture to industry reduced groundwater demand but did not resolve the overdraft issue.

The rising population in the twin cities of Lancaster and Palmdale directly translates to surging water demand, forcing significant water infrastructure and policy upgrades. As part of the 1957 California Water Plan, the California Department of Water Resources proposed and initiated the State Water Project (SWP) development to address statewide supply challenges (DWR, n.d.). Following the passage of the Burns-Porter Act in the 1960s, the SWP became the largest state-funded water infrastructure initiative in U.S. history, transporting surface water from the Sacramento-San Joaquin Delta to Southern California to reduce reliance on local groundwater (DWR, n.d.).

Founded in 1959 via California state legislation, the Antelope Valley-East Kern Water Agency (AVEK) was designed to improve regional water access by importing water from the State Water Project (SWP) to augment local groundwater supplies. In 1962, AVEK entered into a contract with the California Department of Water Resources to play a key role in the State Water Project, becoming the third-largest contractor in California (AVEK, n.d.). In 1972, the arrival of imported water supplies to Southern California allowed local agencies to diversify their water sources, with the Palmdale Water District and Quartz Hill Water District becoming primary beneficiaries of this new supply (DWR, California State Auditor, n.d., 2014). By 1979, AVEK was importing about 70,000 AF/year of SWP water, primarily to supply irrigation needs and some municipal demand (Duell Jr., 1987). After regular imports began, groundwater pumping in the valley dropped sharply, with total pumpage in the early 1980s falling to nearly half of its 1950s levels (Templin et al., 1995).

The region's dependence on imported water has steadily increased since the construction of the California Aqueduct. In the 1970s, imported State Water Project (SWP) water served as a relatively small supplement, primarily used "in lieu" of groundwater pumping to help sustain aquifer reserves (Templin et al., 1995). However, as urban populations expanded in the 1980s and beyond, the demand for potable water exceeded what the local aquifer could sustainably provide. As a result, imported water became a major component of the municipal supply. By the mid-2000s, some local water districts obtained more than half of their water from the California Aqueduct. For example, in 2020, Los Angeles County Waterworks District 40, which serves Lancaster and parts of Palmdale, sourced approximately 68% of its total water supply from imported State Water Project (SWP) water purchased through the Antelope Valley–East Kern Water Agency (AVEK), while about 31% came from local groundwater sources and 1% from recycled water (Los Angeles County Department of Public Works, 2021). In contrast, nearly all water was drawn locally during the mid-twentieth century, whereas imported water accounts for most of the municipal supply today.

As the dependence on groundwater and imported water grew, worries about overdraft have prompted legal action. In 1999, a coalition of public and private water users initiated the Antelope Valley Groundwater Adjudication case to tackle groundwater rights and overdraft concerns. This case, which included more than 4,000 public and private water users, culminated in a 2015 court settlement establishing the Antelope Valley Watermaster to oversee groundwater use and implement sustainability policies (Superior Court, 2015). The settlement established the basin's sustainable yield at 110,000 acre-feet per year and mandated that excessive groundwater pumpers compensate for their extractions with imported water (Superior Court, 2015; Antelope Valley Watermaster, n.d.).

While the adjudication provided a legal framework for groundwater management, much broader statewide concerns over overdraft led to the passage of the Sustainable Groundwater Management Act (SGMA) in 2014 (California Department of Water Resources (DWR), 2025). SGMA applies mainly to medium- and high-priority groundwater basins, mandating the formation of Groundwater Sustainability Agencies (GSAs) and the development of Groundwater Sustainability Plans (GSPs) (DWR, 2025). The Antelope Valley is designated as a very low-priority basin. It is therefore exempt from these requirements, given that it is already under court-enforced groundwater management due to adjudication (DWR, n.d.). However, the Watermaster submits annual reports to ensure compliance with SGMA’s sustainability objectives, detailing groundwater levels, extractions, and storage changes (DWR, 2020; Antelope Valley Watermaster, 2023).

As Antelope Valley navigates the challenges of long-term groundwater sustainability, water system consolidation has surfaced as an effective strategy to enhance water quality and lessen dependence on a singular supply source.

Antelope Valley Water System Consolidation Trends

As further discussed throughout this report, Los Angeles County is home to more than 200 water systems, many established in the late nineteenth and early twentieth centuries. Northern Los Angeles County, particularly the Antelope Valley, is served by a complex water supply system network that includes public agencies, mutual water companies, private utilities, and special districts. These systems vary widely in governance, with some operated by cities, investor-owned utilities (IOUs), or special districts like county waterworks and mutual water companies. In the Antelope Valley, major public water agencies include the Antelope Valley-East Kern Water Agency (AVEK), Los Angeles County Waterworks District No. 40 (LACWWD 40), the Palmdale Water District (PWD), the Quartz Hill Water District (QHWD), and the Rosamond Community Services District (RCSD). These entities deliver water to cities like Lancaster and Palmdale and several smaller unincorporated communities.

Northern Los Angeles County's water systems vary significantly, serving anywhere from a few hundred to tens of thousands of customers. The Los Angeles County Waterworks District No. 40 (LACWWD 40), the largest provider in the Antelope Valley, serves approximately 162,000 residents through 53,000 service connections (Antelope Valley Regional Water Management Group, 2019). It manages 923 miles of water mains, 46 wells, and 59 water storage tanks. Other systems in the area serve smaller populations. The PWD maintains over 26,000 service connections and draws water from imported sources, local groundwater, and Littlerock Reservoir (Antelope Valley Regional Water Management Group, 2019). The QHWD serves a much smaller area, with around 4,099 acre-feet of imported water and 1,348 acre-feet of groundwater pumped annually (Antelope Valley Regional Water Management Group, 2005). For even smaller systems, the Littlerock Creek Irrigation District (LCID) provides water to just 1,200 active service connections. At the same time, the RCSD covers 31 square miles with a mix of imported and groundwater sources. Overall, the service connections in Northern Los Angeles County range from small systems serving a few hundred residents to large public water agencies supplying over 150,000 customers (Antelope Valley Regional Water Management Group, 2019; Appendix 1C).

Community Water System Consolidation Policy Context and Review

Following our historical review of systems in Los Angeles County, a broad policy review was conducted to introduce an understanding of community water systems, the ways they are regulated to perform, and consolidation standards and planning efforts to date. We highlight the federal framework governing local water systems, knowledge of existing consolidation benefits and limitations, and state policies that try to advance consolidation.

Federal and State Standards

1974 Safe Drinking Water Act

The United States Congress established the Safe Drinking Water Act (SDWA) in 1974 to safeguard public health by regulating the public drinking water supply. Congress subsequently amended and reauthorized the SDWA in 1986 and 1996, mandating enhanced monitoring measures to protect drinking water and its sources (U.S. Environmental Protection Agency [EPA], 2004). Under the framework of the SDWA, the U.S. Environmental Protection Agency (EPA) sets national drinking water standards and monitors emerging contaminants. The EPA enforces compliance to ensure water systems meet the necessary health-based criteria (EPA, 2004). However, since water systems vary in scale and complexity across the country, direct regulatory oversight is often delegated to state agencies, except in the case of Wyoming (Pierce et al., 2019). States may assume Primary Enforcement Authority (primacy) under the SDWA if they effectively enforce federal drinking water regulations. States can adopt rules as stringent as federal standards, maintain enforcement authority, and implement programs for monitoring, compliance, and emergency response (EPA, 2024).

In California, the State Water Resources Control Board (SWRCB) is the primary enforcement authority in enforcing the SDWA to ensure standards related to monitoring, reporting, and maximum contaminant level requirements are met and do not violate water quality standards (Pierce et al., 2020). For instance, the California Safe Drinking Water Law, Health & Safety Code §116365(a) directs SWRCB to adopt primary drinking water standards for contaminants to align with the Office of Environmental Health Hazard Assessment's public health goal and the national primary drinking water standard for containment. In addition, the State Board adopts drinking water standards set at a "technologically and economically feasible" level to protect public health (SWRCB, 2025).

The Division of Drinking Water (DDW) within the State Water Resources Control Board enforces federal and California Safe Drinking Water Acts, oversees public water systems (PWSs), and supports water recycling, treatment, and security initiatives (SWRCB, 2023). To address the unique challenges of smaller and rural water systems, the SWRCB collaborates with Local Primary Agencies (LPAs), which provide more targeted oversight and technical assistance to ensure safe water delivery in underserved communities (SWRCB, 2023). The State Board is also the operating authority to direct water systems' dissolution or consolidation (Pierce et al., 2020).

Community Water Systems Definitions and Small System Challenges

Community Water Systems (CWS) are a type of public water system serving at least 15 connections used by residents year-round or regularly serving at least 25 year-round residents within the system's area (SWRCB, 2025). They are essential for delivering water to California’s households. However, they encounter challenges related to under investment, aging infrastructure, and strict regulatory standards (Pierce et al., 2020). Specifically, small water systems (less than 3,000 service connections) have limitations that result in poor quality, accessibility, and water affordability, violating the Safe Drinking Water Act (Pierce et al., 2020). In California, these shortcomings also violate the 2012 Assembly Bill 685 – Human Right to Water (HR2W), which recognizes that “every human being has the right to safe, clean, affordable water” (Pierce et al., 2020). These limitations disproportionately impact low-income, rural, and Indigenous communities, exacerbating racial and social inequities (Dobbin et al., 2023).

Expanding on these challenges, small water systems are 13 times more likely to violate the Safe Drinking Water Act than larger systems due to fragmentation and existing limitations (Dobbin et al., 2023). The fragmentation of community water systems in the United States is unique and prominent compared to other utility services. While more than 50,000 community water systems serve the same people year-round, there are fewer electric utilities (3,300) and internet service providers (2,600) (Vedachalam et al., n.d.). The consequences of this fragmentation are also felt the most in small water systems' quality and services for various reasons, including governance limitations, technical and managerial capacity, and financial constraints. Limited trained staff and capacity of volunteer boards result in inefficient operations (McFarlane et al., 2018). For instance, constrained volunteer boards and leadership gaps result in delayed decisions on infrastructure upgrades and compliance issues, ultimately extending project implementation. Limited technical and managerial capacity further compounds these challenges.

The lack of sufficiently trained, certified operators prevents many small water systems from ensuring proper operation and addressing water quality concerns. Similarly, insufficient managerial capacity may fail to monitor and comply with water quality sampling and reporting regulations. A lack of monitoring and reporting violations indicates poor management, operation, and governance, heightening the risk of poor water performance and quality (McFarlane et al., 2018).

Financial constraints are another challenge for small water systems. Unlike large water systems, they cannot leverage economies of scale for water infrastructure, supply availability, allocation capacity, and billing practices (SWRCB, 2024). Their inability to realize economies of scale or tap into a strong fiscal base further leads to water quality, affordability, and accessibility inequities (Pierce et al., 2015). Additionally, insufficient funding results in poor system maintenance and repairs, aggravating the decline of the water system (McFarlane et al., 2018). These financial constraints further limit the resources required to hire essential technical staff to oversee project implementation and apply for financial assistance (SWRCB, 2024).

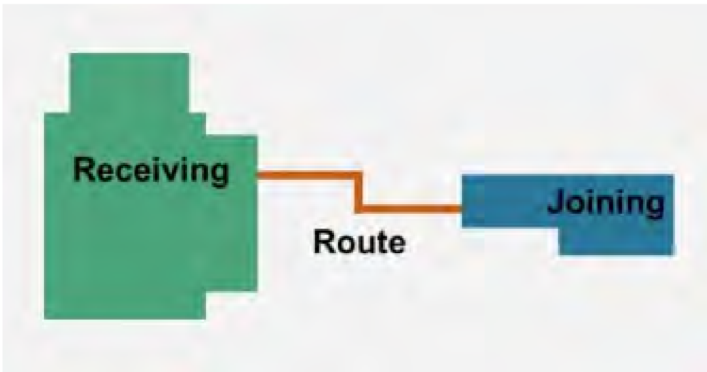
Consolidation as part of the Solution Set

Consolidation is joining two or more public water systems, either physically or managerially, to unify governance, management, and finance operations (SWRCB, 2024). It is a potential solution to address the limitations of some small water systems and advance the Human Right to Water outcomes of clean, affordable, and accessible water. Small systems could benefit from consolidating with larger systems by leveraging economies of scale for distribution, treatment technologies, and technical and managerial capacity. Consolidation could support the delivery of safe drinking water, specifically among isolated, rural, and disadvantaged communities disproportionately served by small systems (Vedachalam et al., n.d). Since smaller systems often experience a higher unit cost, consolidating enables the systems to access large-scale infrastructure operating at a lower unit cost (Dobbin et al., 2023). System consolidation also allows systems to access trained, certified operators who can address quality concerns and managerial staff who comply with reporting regulations. Collectively, consolidation can further reduce the risk associated with drought, impacts of climate change, and unpredictable events (Mullin, 2020).

Data collected in California further highlights some of the presumed consolidation benefits. Since 2015, 250 water systems have merged successfully in California (Dobbin et al., 2024). A recent survey circulated in 2024 received responses from 78 water systems that completed consolidations or are implementing one. The survey reports that the most common benefits from consolidation were improvements in infrastructure (82%), water quality (74%), and water supply (72%) (Dobbin et al., 2024).
Although consolidation appears promising, recent research in California indicates that the median distance for physical consolidation is 0.174 miles, whereas managerial consolidation is 0.751 miles (Dobbin et al., 2023). This is critical because it indicates that policymakers and water systems must target consolidations among closely-located systems and consider exploring other solutions when systems are not neighboring each other.

Figure 2: Illustration of Physical Consolidation in Tulare County

(A)



(B)

Source: 2024 Drinking Water Needs Assessment Supplemental Appendix: Physical Consolidation Cost Estimate Methodology and SWRCB's Water Partnership Success Stories

(A) Illustration of physical consolidation. (B) In Tulare County, Orosi High School and its systems consolidated with Orosi Public District through a master meter connection.

Governance, Financial, and Equity Considerations for Consolidation

Water system consolidation is a strategic approach to improving water quality, financial stability, and long-term sustainability. However, careful planning is required to ensure successful outcomes. The Case Studies section of this report examines real-life examples of these considerations.

Different governance structures grant varying levels of authority, which affects how consolidated entities manage services beyond water provision, such as wastewater treatment and fire protection. Additionally, financial models differ—publicly owned utilities must comply with Proposition 218's cost-based rate-setting requirements. In contrast, investor-owned utilities (IOUs) require California Public Utilities Commission (CPUC) approval for rate changes and have different financing mechanisms.

Generally, consolidation should prioritize strengthening technical, managerial, and financial (TMF) capacity, ensuring newly integrated systems have the resources and expertise to provide reliable service without adding unnecessary administrative complexity. Stakeholders should also consider the new governance model's long-term flexibility, as some consolidation approaches, such as Joint Powers Authorities (JPAs), allow for shared oversight while maintaining local control.

In addition to governance and financial factors, consolidations must carefully address affordability, transparency, and equitable access to water services. Infrastructure investments or governance shifts may increase rates, creating financial strain for lower-income communities. Consolidation efforts should explore available state and federal funding sources, such as Safe and Affordable Funding for Equity and Resilience (SAFER) grants or low-income rate assistance programs, to mitigate these impacts. Public engagement is also crucial, as transparency in decision-making fosters trust and ensures that affected communities, especially historically marginalized groups, have a voice in the process. Considering representation, structures can vary, with publicly owned entities bound by transparency laws like the Brown Act, while IOUs are subject to regulatory oversight but lack direct community governance.

Lastly, consolidation can present a significant opportunity to enhance climate resilience by diversifying water sources and modernizing infrastructure to withstand environmental stressors. A well-planned consolidation effort should balance efficiency, affordability, and sustainability while prioritizing equitable access to safe, reliable drinking water for all residents.

Limitations to Consolidation

The existing literature illustrates that consolidation is an avenue for addressing small community water systems' limitations in providing safe, affordable, and quality drinking water. However, several scholars have argued that policymakers and agencies must take a more nuanced approach when prescribing consolidations, considering their limitations and barriers (Dobbin et al., 2023). For example, both consolidated and receiving systems are small and may not effectively reach the economies of scale to realize such benefits. Instead, consolidation may pose a burden to the merged system. Additional considerations include water rights or supply limitations, which may hinder consolidation efforts. Other factors beyond distance and water capacities are community interests, political boundaries, and water rights boundaries. Stakeholders' reluctance to consolidate further heightens such considerations (SWRCB, 2021). Therefore, system consolidation efforts must consider specific cases, contexts, political dynamics, and intended goals.

In certain circumstances, consolidation may not be a feasible solution. Although the 2021 Drinking Water Needs Assessment Geographic Information System and Database

Methodologies find consolidation favorable for distances less than one mile, potentially feasible between one and three miles, and not viable beyond three miles. The median distance of physical consolidation of less than 0.2 reveals a different reality (Dobbin et al., 2023). In fact, the Drinking Water Needs Assessment initially deemed 40% of the state's failing systems as potentially feasible for consolidation. The distance constraint prevents consolidation from being viable, prompting the exploration of alternative solutions (Dobbin et al., 2023). However, when physical and managerial consolidations occur, they require substantial resources and time. There are high up-front costs when initiating and implementing the consolidation process because planning, studies, coordination, and staff capacity increase expenses. The process can take five to ten years and cost upward of $1 million (Norriss et al., 2021).

Two examples in Los Angeles County illustrate the expensive consolidation process. In 2016, California American (Cal Am) Water Company acquired Adams Ranch Mutual Water Company for $2.4 million. The acquisition added approximately 175 new service connections to Cal Am (American Water, 2016). Meanwhile, the Sativa Water System consolidation effort required more substantial resources. In 2018, Los Angeles County Public Works served as the temporary Administrator following the dissolution of the Sativa County Water District (Glickfeld et al., 2021). The county spent 8 million dollars addressing critical issues after a year of obtaining temporary management (Glickfeld et al., 2021). In 2020, the county received a grant of $1.77 million to address interconnection and implement various improvements. In 2022, Suburban Water Systems acquired the former Sativa County Water District for $11.8 million,four years after the system's dissolution (California Public Utilities Commission, 2022). Suburban anticipates investing over $13 million in infrastructure improvements in the upcoming years (Truth From The Tap, 2024). These two examples illustrate how time-consuming and resource-intensive consolidation is and how it may even exceed a potential receiving system's financial resources.

Additional barriers include community resistance and the water system landscape. Competing stakeholder interests, the legal landscape of mergers, governance complexities, and infrastructure and operational challenges may further constrain consolidation efforts. In addition, large receiving systems may lack the staffing, infrastructure capacity, or financial flexibility to absorb small systems. Large systems are concerned about slow funding processes, reimbursement lags, and conflicts with local ordinances and master plans, discouraging participation in Safe and Affordable Funding for Equity and Resilience (SAFER) supported consolidations (SWRCB, 2024).

From a resident's perspective, cost may be a barrier to consolidation (Pieper et al., 2022). In North Carolina, participants expressed concern about the associated costs and their ability to pay (Lockhart et al., 2020). Residents' concerns about higher water bills following consolidations may discourage other communities from participating (Pieper et al., 2022).

In addition to financial concerns, residents' perceptions of water quality influence their acceptance of consolidation. Residents' tap water consumption in Orleans, New York, increased as their perception of the drinking water supply improved (Pieper et al., 2022). However, three out of four residents who filed complaints reported an unpleasant chlorine taste following the transition from private wells to municipal water (Pieper et al., 2022). The residents' complaints align with the dominant cause of consumer dissatisfaction regarding tap water, which is the taste and odor of chlorine (Mackey, 2004).

Another consideration is how decision-makers promote consolidation in achieving equity and water access for disadvantaged communities. Although consolidation is often motivated to realize increases in safe drinking water by reducing at-risk and failing water systems, several scholars have not found evidence that consolidation significantly increased service to low-income communities of color (Dobbin et al., 2023). Low-income communities are consolidating at lower rates than communities with higher homeownership rates, white residents, and median household income (Dobbin et al., 2023). Therefore, decision-makers and key stakeholders must explore and understand how consolidation can be utilized effectively to advance equity, especially in low-resource communities that have historically experienced racial and social inequities and disinvestments.

State Legislative Tools for Consolidation

In 2012, California's governor signed Assembly Bill 685, more commonly known as the Human Right to Water Act, which recognizes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" (SWRCB, 2025). Since 2015, California has adopted legislation to advance this goal by establishing a set of legislative tools for addressing water quality (Dobbin et al., 2023). Notably, the tools promote consolidation efforts (see Table 1 on p. 63).

Over the last decade, California has implemented several legislative measures to strengthen water system consolidation and improve access to safe drinking water, particularly in disadvantaged communities. Senate Bill 88 (2015) granted the State Water Resources Control Board (SWRCB) the authority to require the consolidation of failing water systems with larger, compliant systems (California Legislature, 2015). Before its passage, consolidations were voluntary, resulting in numerous small communities relying on unsafe and unreliable water supplies (California Water Boards, 2016).

By establishing a framework for mandatory consolidation, SB 88 gave the SWRCB the ability to intervene when a system repeatedly failed to meet drinking water standards. In Matheny Tract, a disadvantaged community in Tulare County, residents depended on a small water provider that failed to comply with state and federal water quality standards. Efforts to connect Matheny Tract to a reliable water source have been impeded for years by capacity concerns and unsuccessful negotiations (Environmental Protection Agency, 2022). The enactment of SB 88 mandated the City of Tulare to assume control of the deficient water system, ensuring residents access to safe and reliable drinking water (Environmental Protection Agency, 2022; Figure 3).

Figure 3: City of Tulare & Pratt Mutual Water Company Mandatory Consolidation

Source: EPA's Water System Partnerships Case Studies

Under SB 88, the City of Tulare assumed control of the water system. The picture below shows a Matheny Tract resident celebrating the opening of a water valve that will deliver safe drinking water to the community.

To further prevent the proliferation of unsustainable systems, Senate Bill 1263 (2016) introduced permit regulations requiring feasibility studies for new public water systems, prioritizing connections to existing infrastructure over the creation of potentially unviable systems (California Legislature, 2016a). SB 88 addressed existing system failures, whereas SB 1263 emphasized preventative oversight to ensure that new systems are sustainable.

Subsequent legislation expanded state oversight and intervention tools to improve consolidation processes. Senate Bill 552 (2016) expanded the SWRCB's authority by permitting mandatory consolidation for disadvantaged communities previously excluded from state intervention (California Legislature, 2016b). Assembly Bill 2501 (2018) further strengthened consolidation authority by allowing SWRCB to oversee failing water systems in incorporated areas and appoint administrators when direct consolidation was not feasible (California Legislature, 2018a). Similarly, Assembly Bill 1577 (2018) addressed financial mismanagement in failing districts, as seen in the state intervention in the Sativa-Los Angeles County Water District, where administrative oversight stabilized service operations (California Legislature, 2018c). While SB 552, AB 2501, and AB 1577 aimed to expand regulatory authority, financial constraints often hindered implementation. Senate Bill 200 (2019) established the Safe and Affordable Drinking Water Fund to address this, providing grants and technical assistance to underperforming systems, supporting consolidation efforts, and long-term sustainability (California Legislature, 2019).

Despite progress, challenges remain in implementing water system consolidation. Senate Bill 403 (2021) expanded state authority to mandate consolidation before a system fails, but its success depends on early risk detection and strong enforcement (California Legislature, 2021a). Limited funding and administrative capacity continue to slow oversight efforts, especially in communities hesitant to give up local control. The failure of Assembly Bill 272 (2017), which aimed to support consolidation in Southeast Los Angeles County, highlights the difficulties of reforming fragmented water systems (California Legislature, 2017). While California has improved water access, further action is needed to strengthen enforcement, secure long-term funding, and address local resistance to consolidation.

Table 1: Recent Community Water System Oversight and Support Legislation

Bill	Year	Bill Description
SB-552 (Drought Planning for Small Suppliers)	2021	Enhances drought preparedness by requiring small water suppliers to create Water Shortage Contingency Plans and mandating counties to establish drought task forces (California Legislature, 2021b).
SB-403 (Drinking water Consolidation)	2021	Authorizes the SWRCB to consolidate at-risk water systems based on risk assessments, rather than waiting for failures. It prioritizes communities historically affected by environmental injustice and pollution (California Legislature, 2021a).
SB- 200 (Safe and Affordable Drinking Water Fund)	2019	Creates the Safe and Affordable Drinking Water Fund to support underperforming water systems in disadvantaged communities. The bill allocates funding from the Greenhouse Gas Reduction Fund and other sources to support water system improvements, consolidation, and long-term sustainability while also requiring the State Water Resources Control Board to develop a comprehensive expenditure plan and map high-risk aquifers to address contamination issues (California Legislature, 2019).
AB-1577 (Water System Administration)	2018	Addresses financial mismanagement in the Sativa Water District by mandating an SWRCB-appointed administrator, disbanding the district's board, and requiring financial audits. The bill ensures oversight of the district's transition to an investor-owned utility (California Legislature, 2018c).
SB-606 (Conservation)	2018	Establishes long-term water efficiency standards and reporting requirements to improve drought resilience. Identifies at-risk water suppliers and directs agencies to develop countywide drought contingency plans (California Legislature, 2018b).
AB-2501 (Drinking Water Administration & Consolidation)	2018	Expands the State Water Board's consolidation authority to incorporated areas and failing domestic wells in disadvantaged communities. It also ensures that local educational agencies serving disadvantaged students can consolidate to secure reliable access to safe drinking water (California Legislature, 2018a).
SB-552 (DAC Systems Assistance)	2016	Expands the SWRCB's authority to consolidate or extend services to disadvantaged communities lacking safe drinking water, particularly in mobile home parks. It also allows the SWRCB to appoint administrators to manage failing public water systems, ensuring affordable and reliable water access while preventing fraud, waste, and abuse (California Legislature, 2016b).
SB-1263 (Public Water System Permits)	2016	Strengthens regulations for new public water systems by requiring applicants to submit a preliminary technical report and demonstrate the feasibility of sustainable water supplies before receiving a permit. The bill also prohibits cities and counties from issuing building permits for new residential developments relying on temporary water sources, such as water haulers or bottled water, to ensure long-term water reliability and safety (California Legislature, 2016a).
SB-88 (Systems Consolidation)	2015	Authorizes the California State Water Resources Control Board (SWRCB) to order the consolidation of failing Public Water Systems and extend services to disadvantaged communities lacking safe drinking water (California Legislature, 2015).

Source: California State Legislature

The Safe and Affordable Funding for Equity and Resilience (SAFER) Program

The Safe and Affordable Funding for Equity and Resilience (SAFER) program was established in 2019 through Senate Bill 200 (Monning, 2019) to provide long-term solutions for disadvantaged communities (DACs) struggling with unsafe or unaffordable drinking water. The program aims to ensure that all Californians have access to clean, safe, and affordable drinking water regardless of location or socioeconomic status. Administered by the State Water Resources Control Board (SWRCB), SAFER is a set of tools, funding sources, and regulatory authorities designed to ensure that one million Californians who currently lack safe drinking water receive safe and affordable drinking water as quickly as possible (California State Water Resources Control Board, n.d.).

SAFER is operationalized as a proactive approach to water system challenges by identifying at-risk water systems, evaluating their financial and operational viability, and funding necessary infrastructure improvements. As SAFER prioritizes communities that have historically faced water insecurity, contamination, and financial instability, SAFER helps facilitate water system consolidation by offering financial incentives and technical support for systems willing to merge or extend services to disadvantaged communities. In Porterville, California, SAFER played a critical role in integrating the struggling water systems of East Porterville with the larger, more reliable City of Porterville system, benefiting 900 homes in the process. This consolidation was part of a broader effort funded by SAFER, which has invested over $830 million in water projects to address drinking water crises in communities across California, particularly those most impacted by droughts and contaminated water sources (SJV Water, 2024).

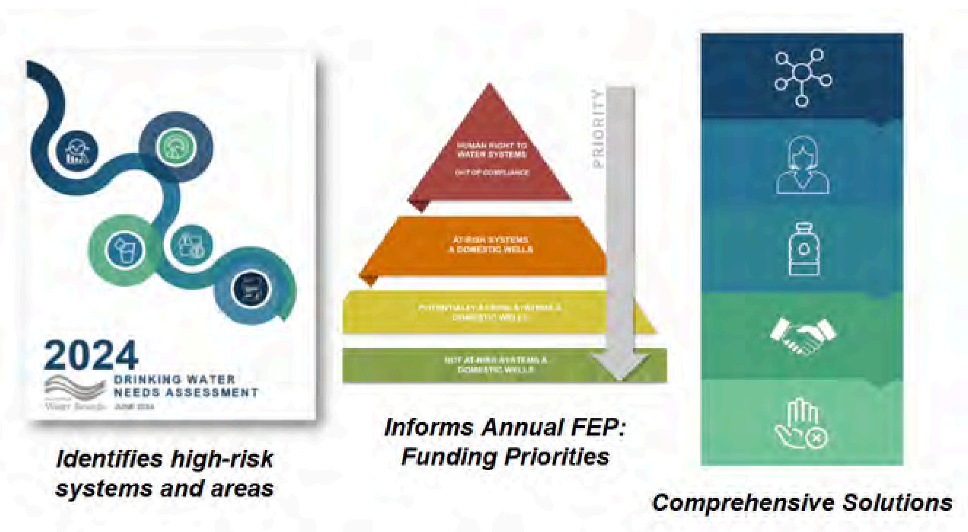
A core component of the SAFER program is its annual publishing of a Drinking Water Needs Assessment, which systematically identifies failing systems or those at risk of failure (California State Water Resources Control Board, n.d.). The results from this assessment help prioritize funding and technical support for the most vulnerable communities through the Fund Expenditure Plan (FEP). Foremost among the SAFER tools is the Safe and Affordable Drinking Water Fund, which provides up to $130 million annually through 2030 (California State Water Resources Control Board, n.d.). As the FEP outlines funding priorities, implementation strategies, and measurable outcomes for improving water access and quality, drawing on data and analysis from the Needs Assessment, the SADW Fund enables the SWRCB to develop and implement sustainable solutions for underperforming drinking water systems. Thus, SAFER emphasizes sustainable solutions beyond immediate infrastructure repairs, including managerial and operational enhancements, technical assistance, and long-term planning.

Complementing SAFER's efforts, in 2024, the U.S. Environmental Protection Agency (EPA) proposed the Water System Restructuring Assessment Rule (WSRAR) to strengthen the sustainability of public water systems (PWSs), which continues to progress at the time of writing this report. WSRAR allows states to mandate restructuring assessments for struggling water systems, helping to identify solutions such as shared management, debt restructuring, interconnections, mergers, or operational improvements (U.S. Environmental Protection Agency [EPA], n.d.). However, while states can require assessments, participation in restructuring remains voluntary unless mandated by state laws. The proposed WSRAR aligns with SAFER's vision of providing sustainable and long-term solutions by emphasizing tailored restructuring plans that consider socioeconomic, technical, and geographic factors. States with primary enforcement authority (primacy) must report annually on restructuring assessments and plans, ensuring accountability and oversight. The proposed WSRAR also promotes transparency and community engagement by requiring public meetings and accessible reports before restructuring decisions.

System Association Concerns Regarding SAFER Consolidation Approach

Despite SAFER's toolkit and funding sources, mutual water companies (MWCs) expressed their concerns to SWRCB following a letter many systems received regarding consolidation. In 2021, the SWRCB distributed letters to water systems statewide, including 335 MWCs, "encouraging" consolidation (SWRCB, 2021). The letter emphasized consolidation to systems by encouraging them to explore consolidation efforts, install interties, and even initiate discussions with nearby systems on partnerships, consolidation, and regionalization efforts. Despite the MWC's pro forma understanding, some water systems experienced exclusion from resources and changes to processes regarding grant approval and funding within two years following the letter distribution (California Association of Mutual Water Companies, 2023). California Association of Mutual Water Companies sent a response letter to SWRCB highlighting the 2022 CalMutals Member Consolidation Survey results and outlining 14 recommendations for SWRCB consideration. In the letter, the MWCs expressed their consolidation concerns, such as its impractical implementation given geographic barriers and the existing well-performing system, the associated cost of consolidation, which exceeds the amount noted in the SAFER Needs Assessment, and the overall sentiment of having a sense of pride and local control in their communities (California Association of Mutual Water Companies, 2023).

Figure 4: SAFER Program Components



Source: California State Water Resources Control Board

The SAFER program entails an annual Drinking Water Needs Assessment to inform the Fund Expenditure Plan (FEP) funding prioritization. Funded solutions include technical, managerial, and financial (TMF) support to at-risk water systems.

Under these circumstances, CalMutuals prepared a list of recommendations for SWRCB and called for small systems to be viewed as partners. These recommendations include developing a comprehensive consolidation framework open to public comment, developing guidance and resources for voluntary consolidation, and incorporating a new risk category into the SAFER Needs Assessment. Specifically, the new category must reflect systems working toward consolidation instead of the existing “Failing” or “At Risk” designated categories.

Other recommendations call for SWRCB's timely response to systems interested in consolidating or requesting technical assistance, as well as identifying financial resources, eligibility, and processes specifically for small water system consolidation efforts.

Overall, CalMutuals and MWCs seek to engage with SWRCB as partners and with the understanding that consolidation is a nuanced and potential solution instead of the only path forward. CalMutuals and MWCs partnership could potentially strengthen and improve if it is feasible to improve and expand SAFER strategies.

County-Level Strategies for Consolidation

Recent California policy supports consolidation, as evidenced by Senate Bill 88 (2015), allowing the state to mandate consolidation when public health is at risk, and the SAFER Program, which funds consolidation. Despite the various state-level policies, consolidation efforts on the county level are progressing slowly, as evidenced by the six systems consolidated in Los Angeles County in the last nine years. One explanation for the slow pace of consolidation is the resistance from different stakeholders, including small systems, receiving systems consultants, and contractors (Nylen et al., 2018). Local officials and residents' hesitation also prolongs consolidation efforts (Pierce et al., 2019). However, despite these challenges, county-level policy tools must be used to consolidate systems and further support the goal of delivering safe drinking water to residents (Pierce et al., 2019). The following section examines strategies for facilitating water system consolidation and improving water quality in Los Angeles County.

County General Plans & County Development Approval Regulations

California requires all counties to have a General Plan that serves as the blueprint for future growth and the community's development goals (Governor's Office of Planning and Research, 2025). It serves as the framework for local planning commissions, city councils, or the board of supervisors to make land use decisions, including drinking water systems (Governor's Office of Planning and Research, 2025). However, Los Angeles County's General Plan and 27 of California's 58 counties do not include any consolidation guidance (Pierce et al., 2019). Therefore, the County should incorporate consolidation goals and policies in its next update. For instance, it can follow Placer County's lead by stating in the General Plan that consolidation should be pursued for systems failing to meet standards (Placer County General Plan, 2013).

In the interim, the County can refer to development approval regulations to help address the gap between land use development and water planning (Lai, 2017). The 2002 Senate Bills 610 and 221 enhanced the link between land use decisions and water supply availability by improving coordination between the local government and water suppliers (Lai, 2017). Although these tools have limited water system sprawl, it is evident that the issue remains at the County level, given the recent water system legislation (Lai, 2017).

The County can also consult the Los Angeles Countywide Sustainability Plan adopted by the Board of Supervisors in 2019. The plan includes 12 goals for envisioning a more sustainable county. Goal 1, "Resilient and healthy community environments where residents thrive in place," includes Strategy 1E, which supports small water systems to obtain state funding, repair water infrastructure, or incentivize consolidation (Los Angeles Countywide Sustainability Plan, 2019).

Board of Supervisors

The Board of Supervisors can also directly accelerate the process of consolidation. While they may not be directly involved, they can exert their power and intervene in publicized cases, as illustrated by the Sativa County Water District (Pierce et al., 2019). For years, residents reported brown, sediment-filled water. In 2018, after public outcry and media coverage, Los Angeles County took control (UCLA Luskin Center for Innovation, 2021). The Board of Supervisors directed Los Angeles County Public Works to temporarily manage and rehabilitate the system until a new service provider could assume management. In the meantime, LA County Public Works repaired the system's infrastructure by renovating Sativa's wells and building new water mains to deliver customers safe, clean, and reliable water. In 2021, the County transitioned management to the Suburban Water Systems (County of Los Angeles, 2023). In the wake of the January 2025 Los Angeles fires, we note that there are renewed calls and potential interest from the Board of Supervisors to potentially intervene and directly facilitate consolidation among a limited number of affected systems.

Local Area Formation Commission (LAFCO)

Local Area Formation Commissions (LAFCO) are a local planning tool for consolidation among California-only counties (Pierce et al., 2019). They are regional planning and regulatory agencies responsible for coordinating government boundaries, conducting special studies to streamline governmental structure, and preparing a sphere of influence (SOI) for each city and special district for their respective counties (Dobbin et al, 2024). Since LAFCOs regulate and approve the SOI for cities, they serve as critical actors in the water system consolidation process (Dobbin et al., 2024). Their involvement in evaluating municipal service reviews, such as SOI, enables them to participate in informal cooperation and negotiation with cities, allowing them to advocate for consolidation (Pierce et al., 2019).

The Los Angeles LAFCO approaches water consolidation with a strong preference on community-initiated efforts, rather than top-down mandates. LAFCO only gets involved when small systems face operational distress, or when they proactively ask for assistance. Its authority is largely limited to transferring service responsibility to public water agencies, with an emphasis on coordination between local governments, mutuals, and the State Water Resources Control Board (Appendix 1A).

Local Primary Agencies (LPAs)

Local Primary Agencies (LPAs) operate within a county's public health department that oversees small community water systems (Lai, 2017). Although Senate Bill 1263 (SB 1263) shifted their approval power to the State Water Board, LPAs continue managing system applications, granting permits, conducting inspections, and monitoring water quality for small systems ideal for consolidation (California Legislature, 2016). They must coordinate with the State Water Board's district engineers to identify small water systems that fail to comply with safe drinking water standards and acquire a mutual voluntary consolidation agreement between consolidating systems (Lai, 2017). Although their influence is confined, LPAs can be integrated with other actors, like the Board of Supervisors, to advocate for consolidation (Lai, 2017). However, most recently, Los Angeles has become a non-LPA county since the county returned its responsibilities to the state (SWRCB, 2024).

2023 LA County Water Plan and Small Water Systems Task Force

The first edition of the Los Angeles County Water Plan was introduced in 2023, which serves as a roadmap for enhancing water resilience in the region. It is a collective vision informed by over 200 agencies responsible for water management in the county to ensure a shared path to realizing safe, clean, and reliable water for Los Angeles County (County of Los Angeles, 2023). The plan focuses on four key areas: "Small, At-Risk System Resilience and Drinking Water Equity." Its goal of "Reducing at-risk systems by 100%" provides support for vulnerable systems by identifying at-risk systems with

technical, managerial, and financial needs to facilitate support programs through the establishment of a Small Water Systems Task Force, which this current report is supporting (County of Los Angeles, 2023).

Snapshot Interview Analysis

Introduction

Following the policy review of community water system governance and consolidation frameworks, stakeholder interviews were conducted to capture local perspectives on consolidation efforts. These interviews offer insight into how water system operators, regulatory agencies, and community representatives interpret regulatory mandates, navigate operational challenges, and evaluate the practical and political feasibility of consolidation across Los Angeles County (see Table 2 on page X).

Table 2: Stakeholders’ Background and Opinions on Consolidation

Stakeholder	Governance Type	Background & Challenges	Consolidation Stance & Alternatives
Shadow Acres	Mutual Water Company (MWC)	• Volunteer-run, very small system • Regulatory compliance is expensive • Contractor shortages post-COVID • Limited technical and financial capacity	• Strongly opposed to consolidation • Fear of inheriting others’ problems • Prefers informal coordination and mutual support
Sunnyside Farms	Mutual Water Company (MWC)	• Small mutual, small customer base • Faces rising compliance costs despite being “Not At-Risk” • Challenged by capital demands and lack of grant access	• Not actively seeking consolidation • Feels overwhelmed by one-size-fits-all regulations • Supports scaled, tailored oversight and technical help
Lincoln Avenue	Mutual Water Company (MWC)	• Well-managed legacy system in Altadena • Hit hard by wildfire (60% of customer base lost) • Maintains robust infrastructure, but stretched by crisis	• Open to discussion, but no current plans • Emphasizes shareholder equity and governance issues • Strong community identity; favors interties and emergency aid
Palmdale Water District	Public Water Agency	• Large, well-resourced • Active infrastructure investment • Logistical limits to expansion • Must protect existing customers	• Supports voluntary, case-by-case consolidation • Cautious about forced mergers • Prefers collaboration and shared planning
Waterworks District 40	Public Water Agency	• Largest county water district, formed from past consolidations • Frequently works with state on struggling systems • Infrastructure, distance, and supply limits affect expansion	• Actively consolidates when feasible • Prioritizes protecting existing customers • Supports state-led, engineering-backed partnerships
Los Angeles Local Agency Formation Commission (LAFCO)	Regulatory Body	• Advisory role, limited authority • Gaps in interagency coordination • Transparency issues with MWCs • Reactive visibility of small systems	• Support when systems are failing • Respect well-run mutuals • Push early planning, not emergency fixes • Promote shared staffing, cooperation

Source: Adapted from stakeholder interviews conducted during the policy review of community water system governance and consolidation frameworks in Los Angeles County.

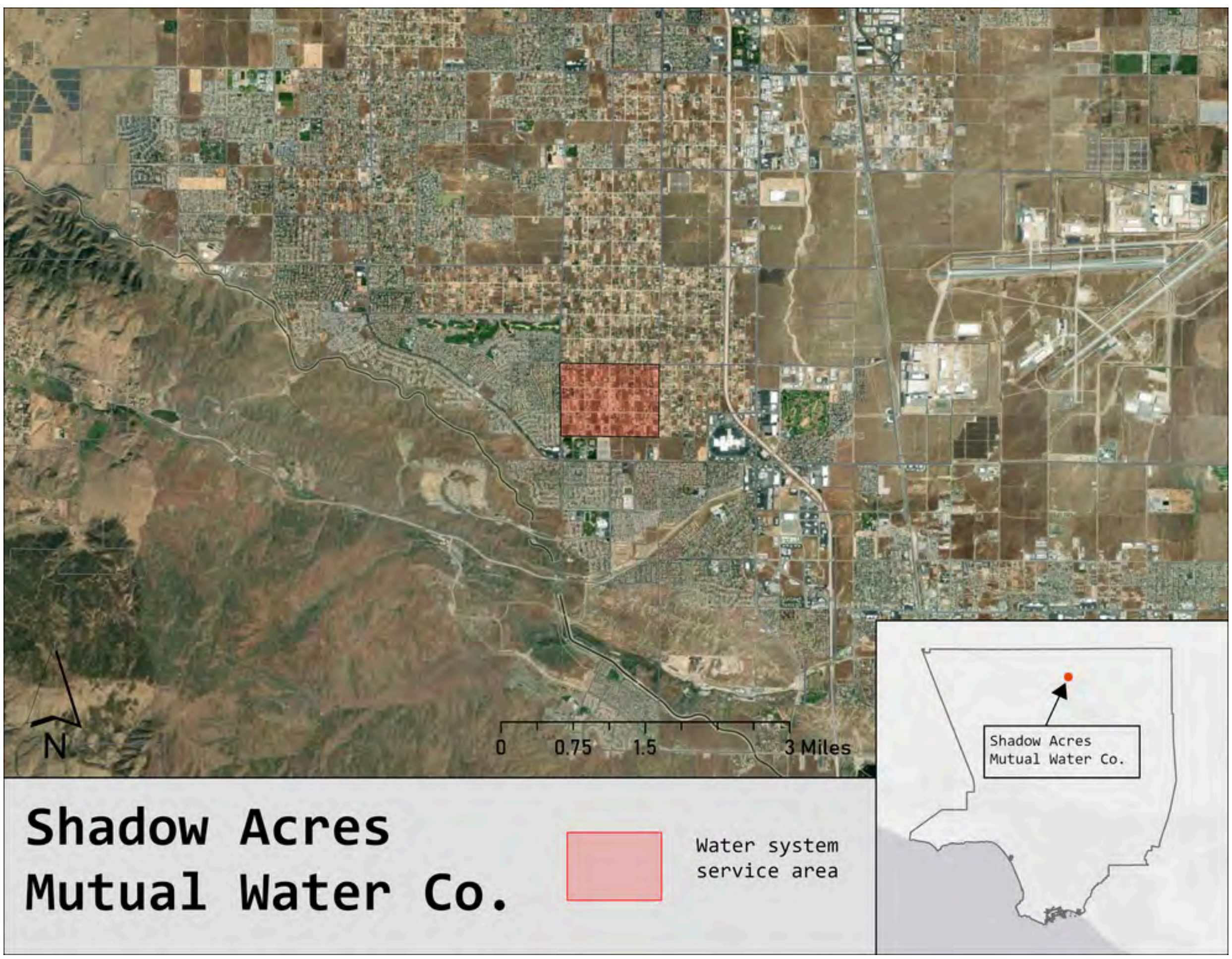
Table 2 summarizes each stakeholder's governance type, challenges, and stance on consolidation or preferred alternatives to illustrate the diversity of viewpoints and institutional conditions shaping these perspectives.

Shadow Acres Mutual Water Company (Antelope Valley)

Background & Operations

Shadow Acres Mutual Water Company is a small, volunteer-run system serving 186 connections over a one-square-mile area. It operates two wells and supplements with imported water from AVEK in the Antelope Valley. Governed by a community-based board and maintained by part-time contractors, the company embodies the typical structure of small, rural Mutual Water Companies (MWCs).

Figure 5: Shadow Acres Mutual Water Company's Service Area



Regulatory and Financial Challenges

Shadow Acres faces severe pressure from state regulations that do not scale to its size. New mandates, such as backflow prevention and service line inventory requirements, impose significant financial burdens: "That's going to cost us $20,000… we have to raise rates to cover that," noted the interviewee. The company also struggles to retain specialized contractors post-COVID, further straining its capacity.

"[There is a] Much smaller number of contractors who do specialty work in small water systems," they said. With only a few people maintaining the system, the time burden is considerable: "Keeping up with the regulations takes a lot of time. The bigger thing is the huge price tag."

Consolidation Perspectives

Shadow Acres is clear in its opposition to consolidation. "When I hear the word consolidation, I cringe… nobody wants to consolidate unless necessary." The interviewee pointed to logistical problems, including infrastructure sizing and the cost of new interconnections. The system's designers tailored the infrastructure specifically for Shadow Acres, making any retrofit to accommodate another system both expensive and unnecessary unless a critical failure occurs.

The governance model—volunteer-run, community-based—also discourages consolidation: "We're just volunteers because we live in the community. What group of volunteers wants to take on another neighborhood's problems?" There's skepticism about state motivations: "They just look at a map and see all these mutuals… why don't they just get together?"

Collaborative Models or Alternatives

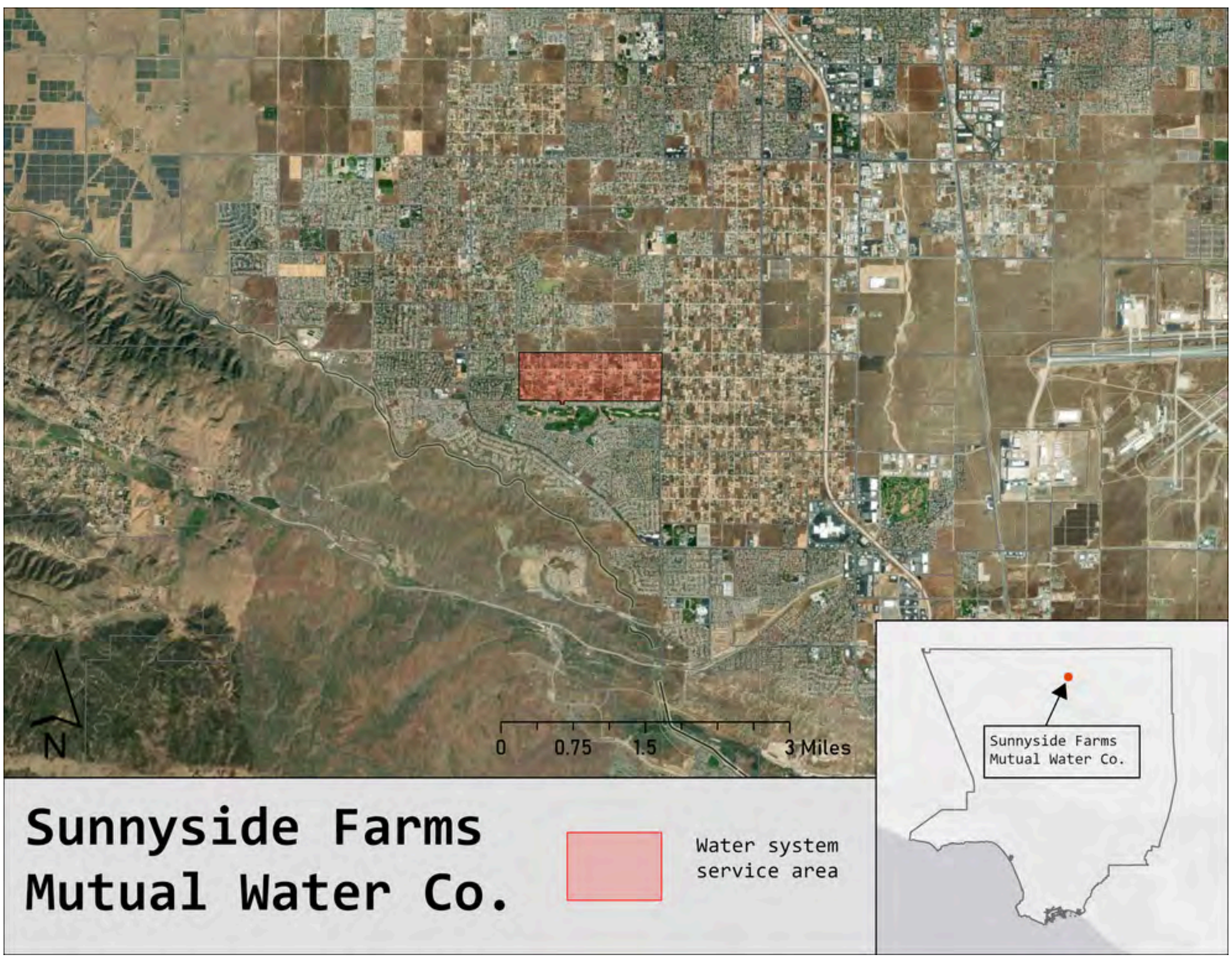
Before COVID, Shadow Acres participated in monthly meetings with other mutuals to share regulatory updates and best practices. These networks, though informal now, suggest potential for low-stakes, cooperative solutions. "We still talk to people," they said, indicating a preference for information exchange over consolidation.

Sunnyside Farms Mutual Water Company

Background & Operations

Sunnyside Farms Mutual Water Company, established in 1951, is a nonprofit mutual water provider serving approximately 326 residents in Palmdale, California. The company sources its water from a combination of groundwater wells and treated surface water purchased from the Antelope Valley-East Kern Water Agency (AVEK).

Figure 6: Sunnyside Farms Mutual Water Company's Service Area



Regulatory and Financial Challenges

Sunnyside Mutual offered a stark critique of regulatory overreach. The representative highlighted that recent state oversight has imposed the same paperwork and infrastructure mandates on small MWCs as on large municipalities. “It’s the amount of paperwork and the lack of funding,” they said, describing a requirement for onsite power generation that would cost $350,000. They already have a reliable alternate source, making the state’s mandate feel disconnected from operational reality.

They argue that the transfer of oversight from County Health to the State failed to consider small systems: “The State does not have any accommodation for people who serve less than 300 households.” While they work with the California Association of Mutual Water Companies for support, the overwhelming sense is that regulation has become detached from practical and financial feasibility.

Consolidation Perspectives

Sunnyside does not currently see consolidation as necessary or appropriate for their system. Their stance reflects a broader resistance among mutual water companies that are functioning independently and meeting basic service standards. They argue that state regulations are not scaled to system size.

Collaborative Models or Alternatives

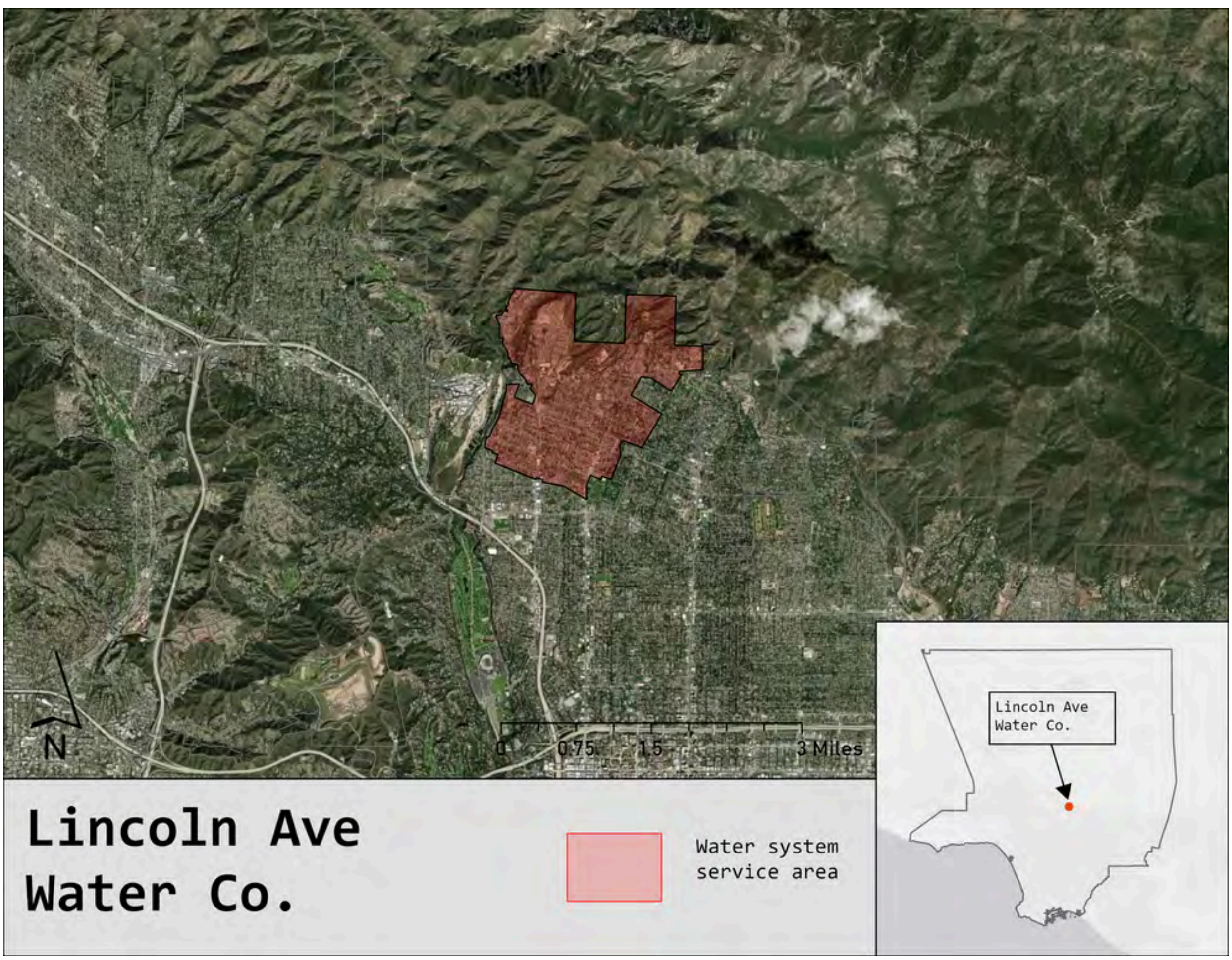
Sunnyside’s preferred path is not structural consolidation, but rather tailored oversight and regulatory flexibility that acknowledges the resource constraints of small systems. Access to grant-writing support, engineering resources, and compliance help could relieve pressure without requiring a merger. Currently, their ability to access state and federal support is limited by staffing and time.

Lincoln Avenue Water Company (LAWC)

Background & Operations

LAWC is a long-standing mutual water company located in Altadena. Incorporated in 1896 and rooted in serving the community from agriculture to today's residential needs, a five-member board oversees LAWC, which operates as a nonprofit owned by shareholders—property owners in the service area. LAWC draws water from three primary sources: local groundwater (Monk Hill Basin), imported water (Metropolitan Water District), and surface water (treated canyon runoff). With over 4,500 service connections pre-fire, LAWC serves around 16,000 residents.

Figure 7: Lincoln Avenue Water Company's Service Area



Regulatory and Financial Challenges

Before the wildfire, LAWC faced regulatory and financial challenges common to small but well-managed mutual water systems. Despite its small size, LAWC is required to comply with the same state-level water standards as larger urban utilities. While expected to reduce water use during drought mandates, LAWC lacked enforcement authority and could only request cooperation. Lastly, though LAWC had a solid reserve and emergency fund, mutuals often lack the capacity and time to apply for grants and resources.

The 2025 wildfire introduced significant operational and financial strain. The wildfire was a defining moment for LAWC, resulting in the loss of approximately 2,600 homes, nearly 60% of its customer base. The impacts were twofold: severe revenue loss and massive operational demands. The company had to stabilize and repressurize its system, manually shut off water to hundreds of properties, and comply with strict water quality mandates to lift a “do not drink” order. LAWC took over 450 water quality samples, flushed every service line to damaged properties, and cleared hydrants and mains. Despite being a small utility with only 11 full-time staff (7 in the field), they operated on rotating 12-hour shifts to maintain and restore service. Despite their resource limitations during disasters, LAWC operated to the best of their ability and demonstrated their intense local commitment.

Consolidation Perspectives

Consolidation has been a “topic of consideration” at LAWC for years, but there is no immediate plan to pursue it. The recent wildfire has reignited some of these conversations, but leadership remains cautious. LAWC views consolidation not as a necessity, but as a nuanced, long-term possibility.

Notably, shareholder equity and fairness are major barriers. Because water stock in mutual companies is privately held and varies in value across systems (e.g., Lincoln Avenue vs. Rubio Canyon or Las Flores), consolidation would require complicated valuation and compensation efforts to ensure all shareholders are “made whole.”

Governance implications are significant. Each company currently has its own board and election processes. Consolidation would reduce the number of board seats and shift decision-making power away from local hands.

Operational differences like rate structures could create friction. Different MWCs have different operating costs and service models, which affect water rates, complicating equitable unification.

Positive consolidation outcomes could include increased operational efficiency and shared resources, especially for emergency mutual aid and infrastructure investments. LAWC already provides water to the neighboring Las Flores Water Company due to interconnections built initially for emergencies.

Fire Preparedness & System Resilience

It is important to note that LAWC had prepared for wildfire risk. The system had implemented wildfire mitigation protocols like maintaining defensible space, removing combustible materials near facilities, and engineering redundancies to maintain water distribution even if a key reservoir failed. Given the 10.5 million gallons of storage and tits gravity-fed distribution system, LAWC could move water within its infrastructure. Still, the fire scale tested their preparedness to the extreme, highlighting the need for robust emergency planning and flexibility in infrastructure design for MWCs in fire-prone areas.

Collaborative Models or Alternatives

Despite operating independently, LAWC has interconnections with neighboring agencies (e.g., Pasadena and Las Flores), allowing emergency water sharing. During the recent fire, LAWC supplied water to Las Flores after losing its reservoir—a demonstration of interoperability and the benefits of regional collaboration, even without formal consolidation. These pre-existing mutual aid systems can serve as models for more mutual aid, where systems remain independent but share resources during emergencies.

Community Ties and Local Control

A powerful theme that emerged was deep-rooted community connection. The manager highlighted how LAWC's staff, shareholders, and board members are local residents, several of whom lost their homes in the fire. The company maintains strong personal ties, with customers visiting in person to pay bills or calling directly to speak with staff. The manager framed this community closeness as an asset and explained that many may resist consolidation out of fear of losing local control and small-town identity.

Palmdale Water District (PWD)

Background & Operations

Palmdale Water District, formed in 1918, serves over 126,000 people through 27,000 connections. It operates significant infrastructure, including surface water sources like Little Rock Dam, and is a state water contractor. The interviewee cited major investments in pipeline replacement, dropping annual leaks from 800 to 11 since 2010. “We’re in a pretty good spot,” he said, thanks to aggressive master planning.

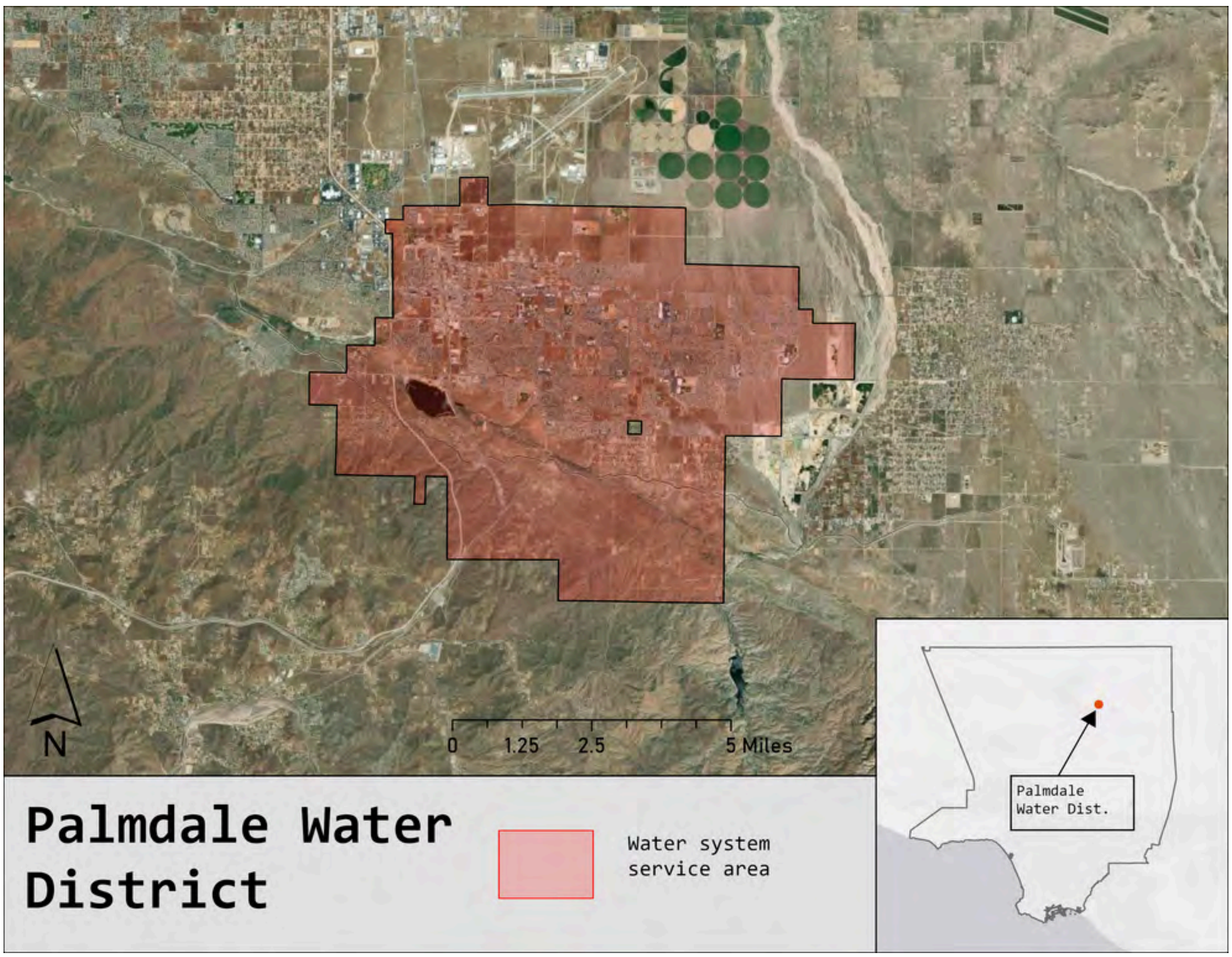


Figure 8: Palmdale Water District's Service Area

Regulatory and Financial Challenges

While Palmdale Water District didn't identify any system-wide compliace or financial strain, the interviewee stressed the importance of planning and rate-setting under Prop 218. As Prop 218 requires a formal rate-setting process, Palmdale Water District emphasizes that any decision to consolidate smaller systems must not negatively affect its current ratepayers.

Consolidation Perspectives

PWD is open to serving as the receiving system in voluntary consolidation. It is currently working with the State Water Board to absorb a private mobile home park and has recently been approached by a small 40-acre mutual. “The benefit is that people have a reliable, safe water supply,” said the interviewee, particularly in cases where small systems have failing infrastructure or no leadership succession.

However, they raised concerns about mandates: “I’d be concerned about forced consolidations... if the organization is doing the job, why force consolidation?” They added that many Antelope Valley mutual water companies are active in water adjudication and are “doing a good job.” They also expressed geography as a constraint; noting that many mutuals are remote and challenging to interconnect.

Collaborative Models or Alternatives

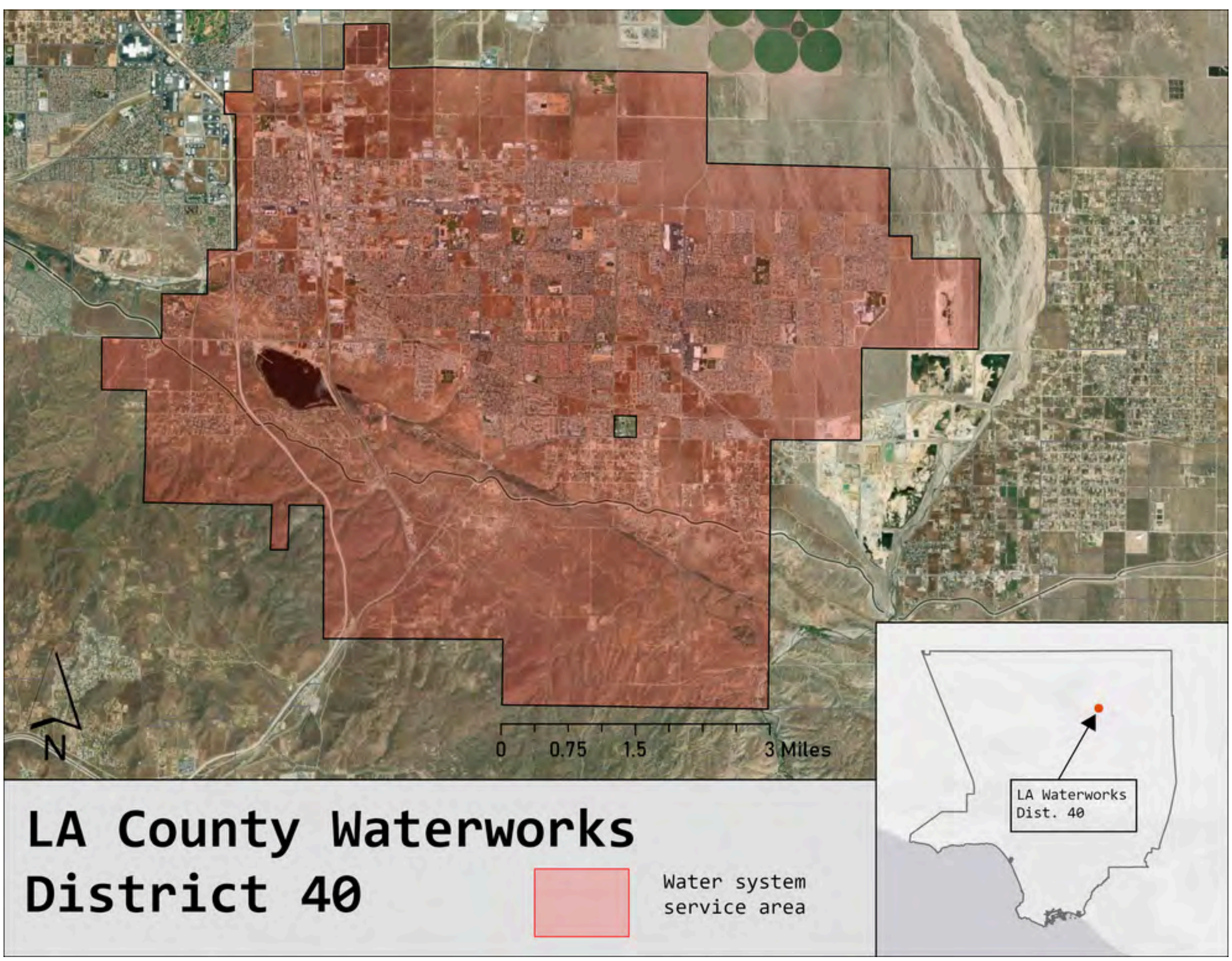
PWD emphasizes the importance of community involvement and regulatory compliance. Their rate-setting is transparent under Proposition 218, and they follow a robust water supply planning process. PWD views consolidation as a last resort, suitable for systems with clear violations or leadership failures. The interviewee cautioned: “Don’t just look at the number of systems... look at whether they’re keeping up with what they need to do.”

Los Angeles County Waterworks District 40 (WWD40)

Background & Operations

Los Angeles County Waterworks District 40 (WWD40) is the largest of five county-operated waterworks districts, with over 40,000 connections and a customer base spanning approximately 280,000 people across all districts. It serves a wide swath of the Antelope Valley and is the county's largest district by land area, infrastructure, and population. Notably, WWD40 results from a historical consolidation: multiple smaller districts were merged in the early to mid-1980s to form a unified system. “The original districts are now regions,” the interviewee explained, noting that the decision to consolidate was made by the Board of Supervisors to increase resource efficiency and service equity across the regions.

Figure 9: Los Angeles County Waterworks District 40's Service Area



Regulatory and Financial Challenges

WWD40, like the aforementioned systems, is also tasked with meeting state and federal regulations. As a district frequently approached by the State Water Board to evaluate and consolidate at-risk systems, it faces additional pressure, especially when integrating smaller systems with existing compliance gaps. Integrating distant or low-demand systems raises regulatory concerns about water quality, particularly pipeline stagnation.

Consolidation Perspectives

Key considerations for consolidation include the proximity of a small system to WWD40 infrastructure, available water supply, and cost-effective integration. “If we already have infrastructure that can serve them, that’s one thing that allows us to move faster,” the interviewee noted. However, geographically isolated systems or those too small to sustain regular demand present technical challenges, such as water stagnation. “If their demand isn’t high enough, there’s a potential for stagnation in the pipe infrastructure.”

With support from the state’s SAFER program, WWD40 engages in risk-based discussions about consolidation. The district is often asked to work with state consultants to evaluate the required infrastructure upgrades. The representative mentioned several systems under evaluation for consolidation, including Clear Skies, Terra Nova, El Rancho, and Mitchell’s MHP.

Emergency Response and Wildfire Preparedness

WWD40 plays a critical role in regional resilience. “Being able to provide nearby water systems the benefit of mutual aid has been critical in combating droughts, structural fires, and wildfires,” said the official. While emergency interconnections are valuable during crisis events, the interviewee noted that these solutions do not resolve long-term water quality or compliance issues that some small systems face. “Those tend to be more complicated and have to be taken on a case-by-case basis.”

Collaborative Models or Alternatives

Since that original consolidation, WWD40 has continued to absorb smaller water providers, including mutual water companies (MWCs) and mobile home parks (MHPs). "We've worked with quite a few smaller water mutuals and mobile home parks," said the representative, with the most recent being Palm Desert MHP. These smaller systems often face serious challenges: "inadequate water supply, lack of resources," and growing regulatory burdens. Consolidation, in these cases, is often initiated through collaboration with the State Water Board when systems are at risk of failure.

Los Angeles Local Agency Formation Commission (LAFCO)

Background & Operations

The Los Angeles Local Agency Formation Commission (LAFCO) plays a coordinating and advisory role in the water system landscape of Los Angeles County. Though not a water provider itself, LAFCO oversees boundary changes and interagency relationships. The interviewee, with experience working previously for the county, brought a unique perspective on how mutual water companies (MWCs), city systems, investor-owned utilities (IOUs), and county water agencies intersect in terms of jurisdiction, responsibility, and emergency response.

Regulatory and Financial Challenges

The most prominent challenge described was the increasing regulatory burden on all small water systems—mutuals and public agencies alike. The official highlighted how new standards around contaminants (such as changes to Maximum Contaminant Levels, or MCLs) can destabilize small systems that rely on limited blending strategies or have aging wells. This issue compounds when smaller systems lack capacity: "If you're a small water system with 3 employees, you don't have the 35 or 40 hours to apply for those grants and loans."

Financial precarity is also a concern, especially with aging infrastructure. "At some point, you have a repair that's very, very expensive and needs to be done quickly," such as well failures or major pipe replacements. The economic fragility of socioeconomically disadvantaged communities in both the AV and urban LA exacerbates the issue, as it is often difficult to raise rates to match investment needs. "Your pipes are old, your water district is old, your tech is old."

Consolidation Perspectives

LAFCO takes a facilitative stance toward consolidation, especially when approached by failing or struggling systems. The agency can support annexation into county districts or municipal water providers, but cannot assign service territory to IOUs—that authority rests with the State Water Resources Control Board.

The interviewee emphasized that consolidation should not be pursued if a mutual is performing adequately: “If a mutual can provide quality water to their residents, then consolidation should not be on the table.” That said, many MWCs are showing signs of outdated practices. LAFCO was involved in a recent case where residents of a trailer park hired engineers to facilitate annexation into District 40, recognizing they were struggling. “That’s the first application from a trailer park that connects to District 40... they recognized they were too small and needed help.”

Transparency and communication remain issues. Following a 2012 law requiring MWCs to submit maps to LAFCO, many did not comply. They were very, very secretive,” the official said, noting a wide range in the quality of submissions—from professional engineering diagrams to hand-highlighted parcel maps.

Collaborative Models or Alternatives

LAFCO strongly supports the principle of mutual aid and regional cooperation as a model for water resilience. The interviewee offered an example of Pasadena Water and Power purchasing water from the much smaller Kinneloa Irrigation District to solve a short-term service disruption. This reversal of expected roles highlights the value of agile, localized support networks in contrast to larger consolidation efforts.

The agency also recommends earlier communication between state and local water authorities. “LAFCO, the Water Resources Control Board, and some of the water districts need to do a better job of talking to each other... because when there’s an emergency, it’s too late.” That sentiment underscores the need for proactive planning and clear interagency collaboration mechanisms, particularly around data sharing, grant access, and shared staffing models.

Limitations

This analysis is based upon six in-depth qualitative interviews with mutual water companies, public water agencies, and regulatory bodies across Los Angeles County. While all of these interviews yielded strong, firsthand insights into water system challenges, regulatory pressures, and consolidation, the final sample size fell short of the original goal of 7-10 interviews. Based on our outreach experience, several factors limited our ability to secure more interviews.

Many smaller systems operate with minimal staff(sometimes volunteer boards), making them less responsive to external engagement and more difficult to reach. In some cases, MWCs were hesitant to participate over concerns about consolidation efforts and a lack of capacity to engage in policy discussions. Timing and scheduling challenges, competing operational and maintenance commitments, and limited availability among our intended interviewees. That said, even our limits in securing more interviews reflect a larger pattern in small water system management. Limited capacity, time constraints, and regulatory demands limit the time and scope of small water systems to participate in activities outside of day-to-day operations.

Dominant Themes

These six interviews, spanning mutual water companies, public agencies, and a regional regulatory authority, reveal distinct but interconnected perspectives on the operational realities and governance constraints shaping small water system resilience in Los Angeles County. While system size, institutional structure, and resource availability varied widely, several dominant themes emerged.

Regulatory and Financial Pressures on Small Systems

All MWCs expressed concern about the State’s “one-size-fits-all” regulatory model, which imposes costly mandates (e.g., backup power generation, service line inventories) regardless of system size. Shrinking contractor pools, limited grant access, and a lack of institutional support compound these challenges.

Mixed Views on Consolidation

MWCs broadly support voluntary consolidation—especially when a system is failing, or its leadership is retiring—but widely reject forced consolidation. MWCs are cautious about equity issues, particularly shareholder compensation, governance shifts, and rate harmonization. Public agencies like Palmdale Water District are open to absorbing systems but emphasize that success depends on trust, geography, and apparent need.

Wildfire Resilience and Emergency Response

The 2023 wildfire that devastated large portions of Lincoln Avenue's service area exemplifies the dual burden of operational and financial disruption during emergencies. Their response—drawing over 450 water samples, repairing pipes, shutting off contaminated mains, and diverting water from existing connections to other agencies—demonstrates local resilience's value and limits. Chapter 2 of this report explores these issues in much more detail. Interconnections used to support neighboring systems point to "soft consolidation" models through regional collaboration, as discussed in the remainder of this report.

Alternative Solutions and Regional Cooperation

Stakeholders highlighted the importance of informal collaboration, mutual aid agreements, and regional planning efforts to strengthen resilience without formal mergers or consolidation. These models allow systems to remain independent while collectively addressing capacity and emergency needs.

Strong Community Ties and Local Control

MWCs like Lincoln Avenue and Shadow Acres emphasized a deep commitment to community governance. Boards and staff are often residents themselves, and this proximity fuels both trust and resistance to structural change. For many, consolidation raises fears of losing autonomy and becoming subordinate to larger, less responsive entities.

Recent and Potential Consolidations: Spatial and Quantitative Findings

Finally, the research team in this chapter examines recent and potential water system consolidation through quantitative and spatial analysis. The review of recently consolidated systems illustrates similar trends prompting consolidation. Concurrently, identifying receiving systems is a starting point for consolidation potential in Los Angeles County.

Recent Consolidation Efforts in Los Angeles County

The State of California has adopted legislation, established funding mechanisms, or initiated efforts to advance water system consolidation through various policy instruments in the last decade. As of 2021, California has 2,880 community water systems, with over 200 in Los Angeles County (State Water Resources Control Board, 2021). Despite the state facilitating consolidation efforts, Los Angeles County had only six systems consolidated in the last nine years (see Appendix 1B). Table 3 identifies the consolidated system and its key attributes.[1]

1 Approximately six Santa Clarita Valley water system divisions (ex. Newhall & Pinetree) voluntarily consolidated with the Santa Clarita Valley Water Agency to maximize use of existing resources (SWRCB, 2025)

Table 3: Recently, Consolidated Systems in Los Angeles County

System Name	City	Date of Merger	Connections	Population	Receiving Water System	Issue Summary	Physical or Managerial Consolidation
Sativa County Water System	Willowbrook	Jun 2021	1643	6837	Suburban Water Systems	Operational Challenges	Managerial
Gorman Elementary School	Gorman (unincorporated LA County)	Dec 2020	4	98	Golden Valley Municipal Water District	Quality	Physical
Mesa Crest Water Company	La Cañada Flintridge	Apr 2020	704	2323	Liberty Utilities - Mesa Crest	None	Managerial
Rurban Homes Mutual Water Company	El Monte	Sep 2019	304	1200	San Gabriel Valley Water Company -El Monte/Whittier	TMF Capacity	Physical
Environmental Care Industries-VLY Crest	Los Angeles	Nov 2017	4	100	Los Angeles Department of Water and Power	Quality	Physical
Adams Ranch Mutual Water Company	Rosemead	Mar 2016	117	500	California American (Cal Am) Water Company - San Marino	TMF Capacity	Physical

Source: Panacea or Placebo? The Diverse Pathways and Implications of Drinking Water System Consolidation? By Kristin B. Dobbin, Justin McBride, Gregory Pierce, and the California State Water Resource Control Board's California Water Partnerships Map

The table includes characteristics of recently consolidated systems in Los Angeles County in the last decade.

As Table 3 illustrates, six systems throughout Los Angeles County have recently undergone consolidation. Adams Ranch Mutual Company, Rurban Homes Mutual Water Company, and Sativa County Water District experienced technical and managerial financial (TMF) or operational difficulties. Environmental Care Industries - Valley Crest and Gorman Elementary School noted quality issues. Mesa Crest Water Company is the only exception that did not report an issue summary. Although Mesa Crest Water Company's system infrastructure is working correctly and has no deficiencies, the family-operated system chose to sell the system due to the state's strict water regulations and rising costs of infrastructure improvements (Cardine, 2019).

Concerning the issue summary, systems facing technical challenges often lack certified operators who can manage system operations and performance regarding water quality. Those constrained by managerial capacity fail to comply with water quality sampling regulations or report violations (Pierce et al., 2020). Therefore, key actors or stakeholders facilitate systems' physical and managerial consolidation into capable receiving water systems to address these issues. This general trend is evident in Los Angeles County, specifically among the Adams Ranch Mutual Water Company and Rurban Homes Mutual Water Co., which consolidated in light of their shared issue summary of constrained technical, managerial, and financial capacity.

Consolidation is a potential solution for small water systems because it enables them to achieve economies of scale in technical, managerial, and financial capacity and improve water infrastructure to comply with water quality regulations (Dobbin et al., 2023). Consolidation could address the limitations of small water systems by improving water quality and serving as a potential avenue to deliver safe, reliable, affordable, and accessible water to communities. The Adams Ranch Mutual Water Company illustrates potential consolidation benefits such as expanded infrastructure and services for community members.

Recently Consolidated System: Adams Ranch Mutual Water Company

Adams Ranch Mutual Water Company is located in Rosemead, California, and serves residential customers and one commercial connection. The system operated one well built in 2001 and had a connection with California American Water (Cal Am). In 2015, the company had revenues of $77,946 and expenses of $132,996, leading to a net loss for the year. The company's total assets were $642,816, and there were minimal liabilities (ProPublica, 2015).

In June 2015, Cal Am announced a deal to buy Adams Ranch Mutual Water Company's assets to integrate the system into its Los Angeles County District (WaterWorld, 2015). In 2016, the California Public Utilities Commission approved the acquisition (California Public Utilities Commission, 2016). The State Water Resources Control Board (SWRCB) confirmed that Adams Ranch's water system was in good shape and had no reported water quality problems during the acquisition despite facing past TMF challenges (California Public Utilities Commission, 2016). Nonetheless, consolidation allowed Adam Ranch's customers to join the 28,000 homes and businesses served by Cal Am, benefiting from certified staff and operators experienced in water and wastewater treatment and distribution (WaterWorld, 2015). The acquisition also provided customers access to several services, including Cal Am's conservation programs, multilingual customer service, and a low-income discount program (California Water Association, 2015), illustrating how consolidations can enable smaller systems to tap into a receiving system's economies of scale and improve services.

High-Level Identification of Potential Receiving Systems in Los Angeles County

Building on the perspectives gathered through stakeholder interviews, the analysis concludes with a high-level exercise to assess the geography of water systems in Los Angeles County and identify potential receiving systems across the County. The identified receiving systems are presented as potential candidates for consolidating other systems based on their size, basic competency, and proximity to other systems. This exercise is different from the consolidation analysis in other chapters because it provides a starting or reference point for consolidation potential in Los Angeles County; it is not by any measure a recommendation for consolidation.

Indeed, we note that a 2020 study scored nearly half of the 200 systems in the County as having "no apparent cause performance concern" (Pierce et al., 2020), and any small system with no apparent performance concern should likely not be considered for consolidation unless desired by that system. The other chapters of this report focus on the dynamic challenges some small water systems encounter, such as water shortage in the last decade and, most recently, fire vulnerability, evident by the 2025 Los Angeles fires, which serve as more direct causes for consolidation consideration.

In this exercise, system population and maximum contaminant level (MCL) are the two primary criteria for identifying the top 15 potential receiving systems among the 200 water systems in Los Angeles County. System population was selected because it helps identify large community water systems, which have over 30,000 service connections and a population of over 100,000 (SWRCB, 2024). The primary criterion, system population, helped identify the first 15 potential receiving systems, as ranked in Table 4 (see Appendix 1B).[2]

Maximum contaminant level (MCL) violations in the last ten and five years helped determine if the system performs with basic competence and is thus capable of serving as a receiving system. Maximum Contaminant Level (MCL) violations are health-related violations of pollutants such as arsenic, nitrate, and other constituents required in SDWAS and at the state level (Pierce et al., 2020). Among Los Angeles County CWSs, arsenic and coliform are the most common MCL violations (Pierce et al., 2020). Based on the collected data, three systems have had at least one MCL violation in the last ten years, while the Los Angeles Department of Water and Power (LADWP) had another MCL violation in the past five years. Nonetheless, it is important to note that it is easier for larger systems to incur violations that may only affect a small part of their population for a short period. Thus, violations may be effectively over-weighted. In any case, these systems illustrate their basic competency through their minimal violations in the last few years, which is the basic standard for potential consideration as a receiving system by the SAFER program (SWRCB, 2024).

2 Although Table 4 identifies the first 15 potential receiving systems, this list does not indicate that such systems are the only candidates to serve as potential receiving systems. For example, Las Virgenes Municipal Water District, ranked #25 on the list by population size, serves a population of 72,602 and has had zero MCL violations in the last five and ten years (SWRCB, 2024).

Table 4: MCL Violations of the County's Top 15 Potential Receiving Systems

#	System Name	Population	# of MCL violations in the last 5 years	# of MCL violations in the last 10 years
1	Los Angeles Department of Water & Power	3,856,043	1	1
2	Long Beach Utilities Department	458,222	0	0
3	Golden State Water Company (GSWC) - Southwest	277,740	0	1
4	San Gabriel Valley Water Company - El Monte	246,000	0	0
5	Los Angeles County Waterworks District 4 & 34 - Lancaster	204,673	0	0
6	City of Glendale Water & Power	188,784	0	0
7	Suburban Water Systems - San Jose	168,843	0	0
8	Pasadena Water & Power Department	164,342	0	0
9	California Water Service Co. - ELA	152,217	0	0
10	City of Pomona Water Resources Department	151,713	0	0
11	California Water Service Co. - Dominguez	143,632	0	0
12	Palmdale Water District	126,804	0	0
13	Azusa Light & Water	110,044	0	0
14	City of Downey Water Department	109,934	0	1
15	Santa Clarita Valley Water Agency	108,813	0	0

Sources: SAFER Dashboard (system population size) and the Water Atlas Update 2024 (MCL violations)

The table illustrates the Top 15 Potential Receiving Systems in Los Angeles County based on populations and the number of MCL violations in the last five and ten years.

Figure 10: Map of the Top 15 Potential Receiving Systems in Los Angeles County

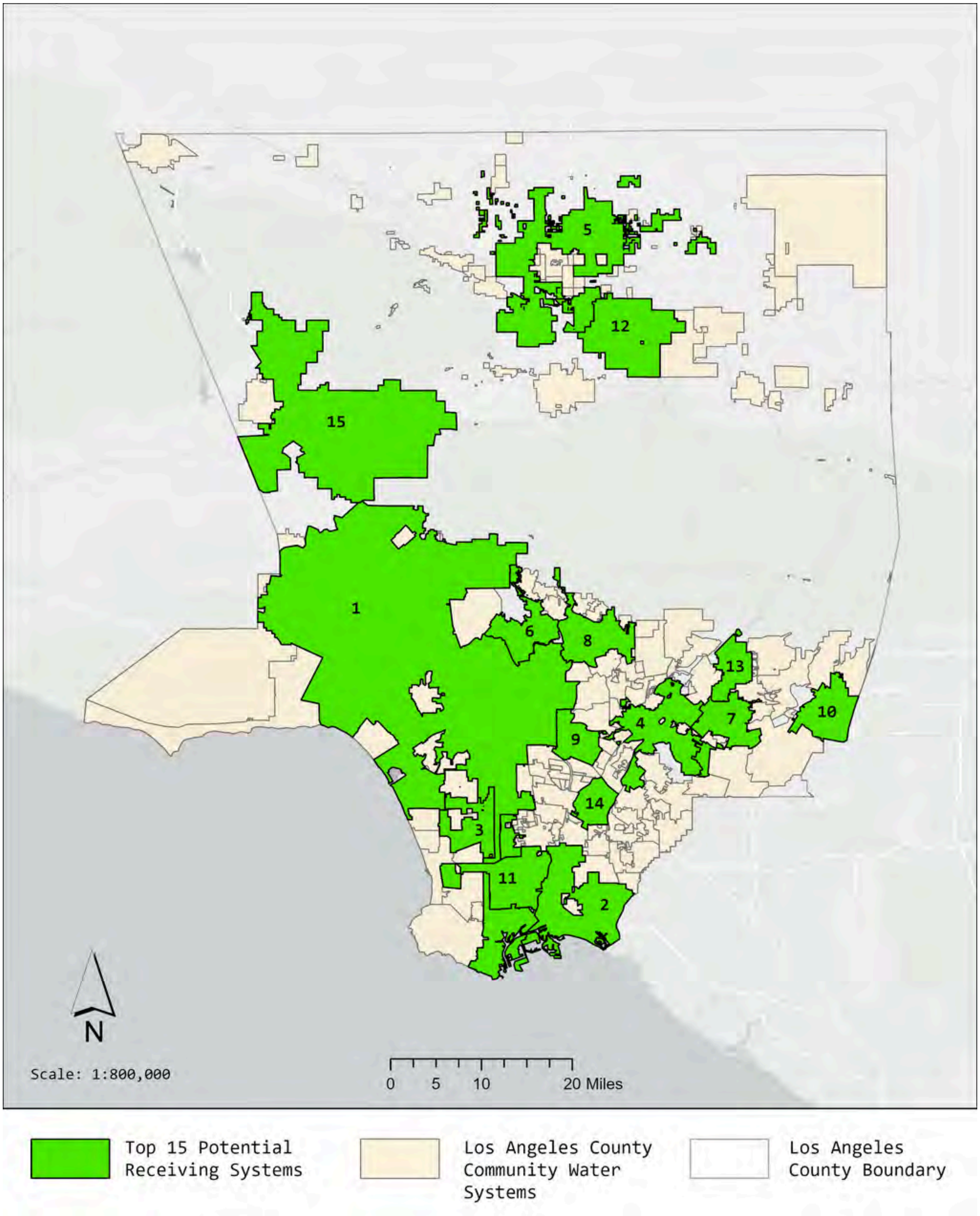


Table 5 (p. 95) shows the Top 15 Identified Systems and the number of surrounding water systems within a 1-, 3-, 5-, and 10-mile buffer. The initial 1-, 3-, 5-, and 10-mile buffer captures duplicates among the top 15 identified systems. The team then evaluated and cleaned the data to determine the number of unique systems within a 1- or 3-mile buffer. (see Appendix 1B). The first two columns record the unique system counts.

Based on Table 5, specifically reviewing unique system counts, a few large receiving systems across Los Angeles County are potential and intuitive candidates for absorbing the most nearby systems. Such systems include the Los Angeles Department of Water and Power (LADWP), which could, in theory, absorb 34 unique systems, and Los Angeles County Waterworks District 40, Region 4 & 34 in Lancaster, with 33 unique systems within a one-mile buffer pending on geographic barriers, governance type, and community sentiments.

However, the principal finding in this exercise is that 151 systems could be consolidated among the top 15 systems within a 1-mile buffer and 170 systems within a 3-mile buffer in theory; this is a much higher proportion than statewide. If consolidation were to occur, these systems could maximize consolidation efforts by tapping into state policy instruments and utilizing county-level strategies, potentially benefiting from the larger system's economies of scale, infrastructure, and TMF capacity to deliver quality drinking water and reducing the fragmented nature of systems in Los Angeles County. This exercise does not by any means represent a recommendation, or near term possibility, but shows the potential for physical integration county-wide.

Table 5: Systems Within Buffer Zones of Top 15 Potential Receivers

		Number of Unique Systems Within Buffer		Number of Total Systems Within Buffer			
#	System Name	1 mi	3 mi	1 mi	3 mi	5 mi	10 mi
1	Los Angeles Department of Water & Power	34	48	41	61	79	111
2	Long Beach Utilities Department	11	13	15	27	38	65
3	Golden State Water Company (GSWC) - Southwest	2	0	13	21	37	60
4	San Gabriel Valley Water Company - El Monte	25	33	31	46	67	100
5	Los Angeles County Waterworks District 4 & 34 - Lancaster	33	42	34	43	51	68
6	City of Glendale Water & Power	2	4	6	12	15	44
7	Suburban Water Systems - San Jose	5	8	13	25	36	70
8	Pasadena Water & Power Department	8	2	17	21	21	59
9	California Water Service Co. - ELA	6	1	15	31	42	92
10	City of Pomona Water Resources Department	5	5	7	13	16	31
11	California Water Service Company - Dominguez	0	0	9	21	30	59
12	Palmdale Water District	6	3	8	17	22	48
13	Azusa Light & Water	3	0	8	16	25	52
14	City of Downey Water Department	5	0	20	37	50	81
15	Santa Clarita Valley Water Agency	6	11	7	12	19	29
Total		**151**	**170**				

Note: The table shows the number of unique systems within a 1-,3-buffer and the total number of systems within a buffer. The Selection by Location tool calculated the number of total systems within a 1,3,5,10 mile buffer. The team used Excel to manually clean and review the data and identify the number of unique systems among 1-and 3-mile buffers.

Conclusion

This chapter has explored the historical, institutional, and political landscape of water system consolidation in Los Angeles County, focusing on the challenges and opportunities posed by its fragmented water governance. We first provided a historical analysis, situating the county's current fragmentation within a broader legacy of water governance, infrastructural inequities, and regulatory evolution. The historical section traced the evolution of drinking water systems from localized, self-supplied sources to sprawling regional networks shaped by political and infrastructural power. This included an overview of early water access patterns, the rise of large-scale infrastructure like the Los Angeles Aqueduct, and the emergence of regional water management bodies. Antelope Valley was examined as part of this broader history, highlighting how geographic isolation and population growth have shaped its reliance on groundwater and its evolving relationship to regional planning. Moreover, identifying a disconnect between legislative intent and local execution highlights critical barriers rooted in stakeholder uncertainty, governance complexities, and community concerns about autonomy.

We also analyzed California's efforts over the past decade to address persisting water issues through a range of legislation—such as SB 88 (Systems Consolidation), SB 552 (DAC System Assistance), SB 200 (Safe and Affordable and Drinking Water Fund), and SB 403 (Drinking Water Consolidation)—designed to address failing and at-risk systems by enabling and incentivizing consolidation. These policies reflect a growing recognition at the state level that structural change is needed to ensure the long-term sustainability, affordability, and equity of drinking water access, particularly for disadvantaged communities. Los Angeles County is pivotal in translating state-level water policy into actionable outcomes, yet the pace of consolidation efforts remains limited. Despite a favorable legislative environment, governance fragmentation, jurisdictional complexity, and limited integration of consolidation goals into existing planning frameworks often hinder local implementation.

Crucially, the absence of explicit consolidation language in foundational documents like the County General Plan and the county's recent return of LPA authority to the state has contributed to a policy gap, weakening institutional alignment around system integration. At the same time, tools such as the Countywide Sustainability Plan and the 2023 Los

Angeles County Water Plan and its associated tasks force and efforts demonstrate emerging alignment between water resilience, equity, and consolidation goals. Together, these findings suggest that while consolidation authority and funding may originate at the state level, county agencies play a decisive role in enabling or inhibiting progress.

Both literature and interviews suggest that while consolidation holds promise for enhancing technical, managerial, and financial (TMF) capacity, especially among small and struggling systems, it is not a one-size-fits-all solution. Many small systems, particularly mutual water companies, have operated independently for generations. For these entities, consolidation often represents not only a technical shift but also a loss of historical identity and community self-determination. Through interviews with stakeholders from diverse water governance entities—including large public agencies, small mutual water companies, and other governing bodies—it became clear that consolidation is a deeply contextual and politicized process. Across interviews, there was a consistent emphasis on the need for flexibility, trust-building, and local relevance in any consolidation strategy.

For example, stakeholders from systems such as the Lincoln Avenue Water Company and Shadow Acres Mutual Water Company expressed a strong commitment to community ownership and a wariness toward external mandates. While these systems face increasing regulatory and financial pressures, particularly under expanding state-level requirements, their leadership conveyed that voluntary cooperation and targeted assistance, rather than forced mergers, are more likely to foster successful integration. These perspectives reveal how deeply rooted local identity and autonomy shape attitudes toward consolidation. They underscore the importance of flexible, community-driven approaches that consider the unique histories, governance models, capacities of small water systems, and most critically, the people behind them.

Finally, a high-level spatial exercise identified fifteen CWS in Los Angeles County as potential receiving systems for future consolidation efforts. The system selection criteria are population size and performance, specifically the absence of recent Maximum Contaminant Level (MCL) violations and their proximity to surrounding smaller systems. Systems such as the Los Angeles Department of Water and Power (LADWP) and Los Angeles County Waterworks District 40 show dozens of smaller systems within a one- to three-mile radius, suggesting a potential logistical basis for regional consolidation. However, as the data show, many nearby systems vary significantly in governance structure, service capacity, and operational health. Physical distance is just one dimension of feasibility, and consolidation must also consider political will, infrastructure compatibility, and community readiness.

Thus, while the spatial data provide a valuable baseline, successful implementation depends on layered, context-sensitive planning incorporating technical, institutional, and social variables. While not a recommendation for consolidation, this analysis provides a geographic reference point to understand where consolidation may be most logistically feasible. It complements other chapters that focus on more urgent drivers of consolidation, such as system vulnerability to water shortages and wildfire impacts.

Building on these findings, our recommendations outline practical and policy-informed strategies to advance consideration of water system consolidation efforts in Los Angeles County. The recommendations below provide key stakeholder groups and policymakers with a feasible pathway to advancing equity and resilience across the region’s water systems by prioritizing case-by-case flexibility.

Recommendations

Here we list several policy recommendations based on our research and findings.

Recommendations for Los Angeles County:

1. **Acknowledge the complex history of water development.** The County should recognize the complicated history of water system development spanning from the pre-1900s era to the present day. The historical developments of Los Angeles's drinking water system included periods of decentralized water access, governance system development, and urban expansion, among other elements. The development of such institutional and spatial change over time shapes the landscape of water systems, informing the present planning process.

2. **Recognize the greater high-level potential for physical consolidation than elsewhere in the state.** In theory, there is a high potential for physical consolidation in Los Angeles County based on the spatial exercise conducted. There are more than 200 water systems in Los Angeles County, yet the team findings indicate that the top 15 potential receiving systems, based on system population, could consolidate 151 systems within a 1-mile buffer and 170 systems within a 3-mile buffer. Although small systems with no performance concern should not be considered for consolidation unless they wish to, the exercise findings highlight the County's consolidation potential among the water systems.

3. **Leverage recent state legislation to support strategic consolidation at the County level.** The County should review and utilize existing legislative avenues and local frameworks, like the Small Water Systems Task Force or other programs, to facilitate or circulate information on grant applications or technical support. Since 2015, the State of California has introduced legislation to realize the HR2W goals of providing safe, clean, and accessible water. In particular, introducing tools and funding sources to support water systems, including consolidation efforts. Despite this enabling environment, consolidation in Los Angeles County has been slowed, with only six systems consolidated in the last few years.

4. **Continue supporting voluntary consolidation.** Continue supporting locally driven efforts by encouraging voluntary consolidation rather than imposing top-down mandates, which can provoke resistance and undermine trust. Policies should emphasize voluntary, incentive-based paths that allow systems to explore consolidation at their own pace. This approach fosters trust and encourages more sustainable long-term partnerships.

5. **Preserve local governance elements in consolidation agreements to the extent practicable.** Many MWCs in Los Angeles County are supported by a small staff and some are volunteer-run. To maintain community trust, preserving some form of local governance, such as advisory boards or representation on regional councils, would ensure residents maintain a voice in decisions affecting water access, rates, and quality.

6. **Update the Los Angeles County General Plan to include water system consolidation guidance.** The County should explore and consult with key stakeholders on incorporating consolidation guidance and standards for struggling communities and failing systems in the next iteration of the general plan to align with recent water legislative efforts. Currently, the Los Angeles County General Plan does not include any water system consolidation guidance or county-specific strategies agencies and systems can pursue. As a starting point, the County can review Placer County's General Plan, which lists consolidation as a strategy for failing systems. By providing guidance, key actors can coordinate and act accordingly to maintain water quality and resiliency among systems and communities.

7. **Create more case studies and lessons learned from recent consolidation efforts in Los Angeles County in coordination with the Stater Water Board.** The County can assemble or reference case studies highlighting conditions, resources, and lessons learned to serve as an example to navigate context-specific challenges. These case studies could supplement the Designing Water Systems Consolidation Projects Considerations for California Communities.

8. **Delegate Local Primary Agencies (LPA) authority to Los Angeles County.** The County could regain LPA authority from the State to acquire regulatory oversight and recoup responsibilities to help advance consolidation progress. In the last decade, the County has had approximately six consolidations. However, regaining LPA authority can support consolidation efforts by managing system applications and inspecting and monitoring small water systems that may be ideal candidates for consolidation. Although Senate Bill 1263 shifted approval power to SWRCB, confining LPAs influence, LPAs can still provide targeted oversight and technical assistance, potentially streamlining consolidation efforts.

Recommendations for Larger Water Systems:

1. **Provide technical and financial assistance to small systems where possible.** Small water systems can often lack the financial and technical capacity to meet constantly updating state and federal standards. Allocating dedicated funds, technical assistance, and workforce development to support water system assessments, planning, engineering, and compliance upgrades could reduce strain and encourage more mutual aid between small local systems.

2. **Foster mutual aid relationships with nearby systems.** Water systems can explore relationship building or initiate conservation with nearby systems to share information on challenges and lessons learned. An established relationship or initial engagement can facilitate collaboration or potential consolidation when challenges arise due to water quality, water shortages, fire, or other impacts.

Recommendations for the State of California:

1. **Explore other solution considerations outside of consolidation more seriously.** The State can pursue developing deeper analytical methods for alternative solutions outside of consolidation, especially when those systems in need are facing drought and fire risks. This is necessary given the isolation of many systems outside of Los Angeles County.

2. **Improve processes to make consolidation easier for receiving systems.** The State can encourage receiving systems to participate in SAFER programs by addressing significant system pain points, such as accelerating the funding and reimbursement process and providing guidance on conflicts between local ordinances and master plans. Addressing pain points removes barriers and streamlines the process for systems interested in pursuing consolidation.

3. **Incorporate a more nuanced approach for water system consolidation.** The State and key decision-makers must continue to further understand and propose consolidation based on context-specific circumstances. Further consideration to administrator and managerial consolidation models and pathways is most needed.

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Chapter 2

Fire Risk, Preparedness, and Ways Forward for Small Water Systems

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Background

Introduction

California’s increasing wildfire risk, intensified by climate change, poses a growing threat to communities across the State. This is especially true for those served by small water systems, as described in Chapter 1 and more broadly in a recent series of reports by U.S. water sector experts (Pacific Institute, 2025). The State’s Mediterranean climate, characterized by prolonged dry seasons, high temperatures, dense flammable vegetation, and strong seasonal winds, creates ideal conditions for frequent and fast-moving wildfires. As fires become more intense and encroach further into populated areas, small water systems—often under-resourced and operating with aging or undersized infrastructure— are more likely to struggle to meet the extreme water demand required during emergencies. These systems were not originally designed to withstand the combined pressures of prolonged drought, high fire suppression needs, and infrastructure damage caused by wildfire events. Understanding how wildfire risk intersects with the limitations of small water systems is critical to improving emergency preparedness, protecting public health, and building long-term system resilience.

While water systems are not the only entity responsible for extinguishing wildfires, and their role is commonly misunderstood as was certainly the case in the January 2025 LA wildfires, they play a vital support role within the broader wildfire suppression toolkit, alongside aerial firefighting, defensible space, and emergency response coordination (Pierce et al., 2025). However, small community water systems often lack the infrastructure, pressure, and operational capacity to meet emergency water demands. According to the NFPA, fire flow is “the flow rate of a water supply measured at 20 psi residual pressure that is available for firefighting” (Mahoney, 2022). Even larger urban systems often struggle to deliver fire flow during large-scale wildfires (Pierce et al., 2025), so it is naturally an order of magnitude larger challenge for small water systems, particularly in rural and semi-rural areas, which often struggle with basic fire flow for structural fires. Their limitations in pressurization, storage, and backup energy supplies can become critical barriers during emergencies, leaving homes and responders without support when it is most vital.

Fire Suppression and System Strain

One of the biggest challenges is how small and large water systems perform during wildfires. Fire hydrants are a key component and the frontlines of ground-based fire suppression infrastructure, yet their availability and performance vary widely depending on system size and design. Fire hydrants are specifically designed and maintained to provide fire flow for urban structural fires, but not for wildfires, which typically exceed the scale and demands these systems were built to handle (UCLA Newsroom, 2025). In small water systems—particularly those serving rural and semi-rural areas—hydrants are often absent due to the cost and complexity of meeting the required fire-flow standards (U.S. EPA, 2002). When installed, hydrants may be spaced too far apart or connected to undersized distribution mains that cannot deliver adequate pressure or volume during an emergency. In such cases, aerial resources such as helicopters play a vital role by delivering water or retardant to active fire zones, particularly in areas with limited ground access or insufficient infrastructure (USFS, 2020).

National guidelines recommend hydrant spacing of no more than 600 feet in residential areas, and 1,000 feet in rural contexts, although many small systems fall short of these targets (U.S. EPA, 2002). Recent spatial analysis in Santa Barbara revealed that, under California's more stringent 500-foot requirement for residential areas, the average spacing was 561 feet, with only 52% of areas in compliance. In undeveloped areas, where both state and national standards align at 1,000 feet, only 52% met the requirement (Wildfire Resilience Initiative, 2025). This lack of infrastructure severely limits the capacity of small systems to support the fire suppression efforts.

Even in fire-prone communities with hydrant access, systems often experience high strain not only from firefighting demands but also from residents using water from sprinkler systems and roofsprays in an attempt to protect their homes and property (Pierce et al., 2025). These actions create spikes in simultaneous demand that can overwhelm the system, particularly in hilly or mountainous areas where water must be pumped uphill (Pierce et al., 2025). Fires can also damage distribution pipes, leading to significant leaks that reduce pressure in unaffected areas (Pierce et al., 2025). Moreover, electric power needed to maintain pump-driven pressurization instead of gravity-driven pressurization is often lost during wildfire events, forcing systems to rely on backup generators or batteries that may only support very limited operations (McCallum, 2018). These factors illustrate why system design, elevation, and operational resilience are key vulnerabilities for small and urban water systems during wildfires.

Traditional Standards for Urban Fires

Typical urban fire suppression relies on consistent and sufficient water pressurization to reach higher areas, penetrate deeper into burning materials, and overcome intense smoke and heat layers (APX Data, n.d.). Water typically comes from fire hydrants surrounding the area, but can also come from other approved sources, such as a private tank, pond, or fire department tanker shuttles can also supply it in small amounts from further away (NFPA, 2022).

Fire flow should meet NFPA guidelines for effective suppression. However, it is a building-specific value calculated based on the area of the building, type of construction, occupancy, and presence or absence of fire sprinklers. According to the NFPA, for one- and two-family dwellings, the minimum fire flow cannot be less than 500 gallons per minute (GPM), while for larger buildings, fire flow cannot be less than 1,000 GPM (NFPA, 2024). The minimum allowable fire flow for community water systems is 1,000 GPM for at least two hours for structures less than 3,600 square feet (NFPA, 2024). In practice, this standard becomes legally enforceable only when NFPA is formally adopted by the local Authority Having Jurisdiction (AHJ). Once adopted, systems must deliver the required flow at a residual pressure of at least 20 psi, either through the public network or via supplemental measures such as private tanks and fire pumps. For larger or more complex structures, required fire flows are calculated using tables derived from Insurance Services Office (ISO) methodologies that account for floor area and construction type, often resulting in higher volumes and longer durations (SFPE, 2024). Compliance is verified through hydrant flow tests and review by the AHJ, which may allow reductions for buildings with approved sprinkler systems, qualifying fire walls, or in rural settings where risks are deemed lower (FPE eXTRA, 2024).

While these guidelines are essential for individual structures, they do not begin to account for the increasing severity and spread of wildfires into urbanized areas. As wildfires encroach on suburban and even dense urban environments, they place exponentially growing demands on fire suppression efforts, often exceeding the capacity envisioned by the original NFPA standards. Ember-driven fires, high winds, and widespread ignition zones require water systems to support extended firefighting operations over vast areas rather than isolated structure protection. Small water systems in particular, may struggle to meet these heightened demands due to inadequate infrastructure, aging pipes, and limited storage capacity, often lacking larger systems' distribution networks, backup sources, and treatment facilities. This gap underscores the need for water utilities to reconsider fire protection strategies, incorporating climate resilience and broader emergency planning into infrastructure and planning decisions.

Fire Preparedness Policy Landscape

Small water systems face heightened wildfire risk due to limited infrastructure, aging assets, and under-resourced operations. These vulnerabilities demand more robust planning and coordination mechanisms to ensure basic system functionality and emergency response capacity during fire events.

California has adopted several baseline fire protection standards, but they have not begun to address small system water needs to suppress wildfires. California Code of Regulations Title 14, Section 1275.02 integrates NFPA 1142 standards, requiring small systems in areas not served by municipal infrastructure to provide onsite water storage or mobile water tenders to meet fire suppression needs (California Code of Regulations, 2023).

Recent policy efforts have further emphasized the need for regional planning and coordination, activities which are not regulatorily required. The Los Angeles County Water Plan (CWP) prioritizes wildfire mitigation for small systems, including watershed sediment control, emergency water supply enhancements, and post-fire water quality management (Los Angeles County Public Works, 2023). Strategy 12 of the CWP further expands this commitment by outlining a coordinated framework to mitigate wildfire impacts on water supply and quality. It calls for the formation of a regional wildfire prevention collective, programmatic permitting tools for fuel reduction, and enhanced hazard mitigation plans targeting agencies within wildland-urban interfaces (Los Angeles County Public Works, 2023). These actions align land, fire, and water managers around shared watershed resilience goals. Under this plan, the Small At-Risk Water Systems Task Force—established to address the needs of vulnerable systems—has highlighted the importance of mutual aid networks like CalWARN. At its January 2025 meeting, the task force identified CalWARN as essential for providing emergency water deliveries and technical support during wildfire events, especially for under-resourced systems (SARWS Task Force, 2025).

In addition to policy mandates, some utilities have taken proactive, voluntary steps to prepare for wildfires. For example, after the 2017 Lilac Fire, Rainbow Municipal Water District (RMWD) developed a wildfire response “action plan” that includes fire flow storage strategies, local weather monitoring, and emergency communications protocols. Although RMWD is not a small system, its experience shows the potential benefits of local wildfire planning, even without regulatory requirements. Their investment, however, was substantial, suggesting that similar efforts may be out of reach for many small systems without financial and technical assistance (Gutierrez & Lagunas, 2021).

Other experts have echoed this concern. Tran (2020) recommends integrating wildfire mitigation plans directly into required ERPs. Pierce et al. (2021) call for a toolkit to support small water systems in planning wildfire events and executing ERPs. The EPA's Wildfire Incident Action Checklist offers one such resource, outlining recommended steps water utilities can take to prepare for, respond to, and recover from wildfires (EPA Office of Water, 2022).As fire risks increase, these cross-agency coordination mechanisms, technical toolkits, and enforceable infrastructure standards may be critical for enabling effective emergency response in small, decentralized systems.

The lack of statewide fire-specific planning requirements, minimal state evaluation of wildfire vulnerabilities in small systems, and the absence of concrete guidance for improving system resilience expose the physical vulnerabilities of small water systems and systemic deficiencies in emergency planning and oversight. While local examples highlight infrastructure fragility, the state has offered a limited assessment of these risks. The State Water Resources Control Board's 2020 Safe Drinking Water Plan may be California's closest to auditing emergency preparedness in small community water systems. Chapter 11 of that plan underscores the destructive impacts of wildfires but does not offer specific recommendations for making small systems more fire-resilient. This absence of statewide fire-specific planning guidance highlights a key oversight gap that leaves many systems functionally unsupported even as wildfire risks escalate.

Current State Oversight & Broader Water Supply Policy Gaps in Wildfire Response

While technical vulnerabilities significantly limit small water systems' ability to withstand wildfire events, regulatory, financial, and oversight deficiencies can compound these risks. This section examines the current state of emergency planning mandates, funding structures, and policy gaps that leave many small systems underprepared for fire-related emergencies.

Wildfires present critical challenges for small water systems, exposing gaps in emergency preparedness and response mechanisms. While multiple state agencies oversee emergency planning—for example, the State Water Resources Control Board (SWRCB) helps safeguard public health and water quality by managing all phases of emergency response, including preparedness, response, recovery, and mitigation for incidents affecting water systems. Similarly, the California Governor's Office of Emergency Services (Cal OES), through its Planning and Preparedness Branch, develops and maintains statewide emergency plans and guidance used by both state and local agencies—a lack of coordinated oversight, support, and regulation, with appropriate funding, still leaves water suppliers, both large and especially small, unprepared for larger-scale fire-related crises.

A significant issue is the lack of funding for fire suppression infrastructure in small systems. Unlike urban water districts, which may be able to levy special fees or even receive general municipal support for distribution system maintenance and supply emergency reserves, small water systems often operate on limited budgets with no dedicated wildfire resilience funding (Wildfire and Water Supply in California, 2021). Without financial resources allocated explicitly to improving infrastructure, these systems remain highly susceptible to fire-related water shortages, compounding the vulnerabilities faced by communities in wildfire-prone areas (California Governor's Office of Emergency Services [Cal OES], 2021). The following section reviews California's emergency planning requirements for small water systems to better understand how these vulnerabilities persist and identifies key regulatory gaps undermining fire resilience.

State Emergency Planning Requirements and Deficiencies

California mandates emergency planning for small water systems, but requirements vary significantly based on system size. Under Health and Safety Code §116460, all community water systems must develop an Emergency Notification Plan (ENP) approved by the SWRCB (Primer of SB 552, 2022). However, ENPs are far less detailed than ERPs. California lacks a centralized system for tracking these documents or monitoring compliance (Department of Water Resources, personal communication, 2025).

The America's Water Infrastructure Act (AWIA) of 2018 requires systems serving more than 3,300 people, not connections, to conduct risk assessments and prepare ERPs that include fire risk mitigation strategies. In Los Angeles County, for example, 118 small water systems each serve fewer than 3,300 connections, a metric that can include multiple households (e.g., apartment buildings or shared service lines) (Pierce et al., 2021). As a result, some of these systems may meet the AWIA population threshold and be subject to its ERP requirements, but others—especially those under the 3,300 population threshold—are excluded from AWIA mandates, despite being located in wildfire-prone regions.

This exclusion contributes to widespread vulnerability. The SWRCB's Division of Drinking Water (2021) has described the uneven application of emergency planning rules as "leading to inequitable progress" toward resilience. Small systems often lack the financial, technical, and staffing capacity of larger utilities, making them less prepared for emergencies. The 2020 State Drinking Water Plan listed 15 emergency preparedness recommendations for small community water systems, including participation in mutual aid organizations and development of ERPs. Many of these were later codified by SB 552. The Water Board also encourages small systems to increase supply reliability through interties, alternative water sources, or consolidation strategies.

Despite these efforts, significant regulatory and capacity gaps remain. California's ERP requirements emphasize notification procedures but lack comprehensive fire response provisions. Title 22 of the California Code of Regulations mandates ERPs for small water systems, requiring public notification protocols, coordination with local agencies, and general mitigation strategies (California Drinking Water Regulations, 2017). However, the regulations do not explicitly require fire preparedness measures or mandate that systems maintain adequate fire flow capacity (California Drinking Water Regulations, 2017). Wildfire preparedness is often absent from existing ERPs, which tend to focus on contamination, seismic events, or power outages. Many small systems also fail to conduct routine fire flow testing and may lack basic fire hydrant infrastructure, leaving them without the data needed to assess or improve fire protection (California State Water Resources Control Board, 2022).

According to the 2022 California State Water Board Drinking Water Needs Assessment, the State Water Board does not have the authority to develop or enforce requirements regarding fire flow (California State Water Resources Control Board, 2022). This responsibility falls to local fire officials, which is why the State Water Board does not have a machine-readable asset inventory, asset condition data, or local fire protection requirements. These resources are necessary to develop cost estimates and assess future fire protection needs (California State Water Resources Control Board, 2022). The State Water Board has said it will further collaborate with the State Fire Marshal regarding these requirements, but it has not provided a specific timeline for doing so.

SB 552 (2021) introduced additional drought and wildfire resilience requirements for small water suppliers and rural communities. It mandates that counties establish contingency plans for groundwater-dependent rural communities and requires small water systems to incorporate fire resilience into their planning (Primer of SB 552, 2022). While key provisions—such as securing a backup water supply by January 1, 2027, and meeting fire flow capacity standards by January 1, 2032—are phased in over time, .

pathways for enforcement remain unclear. Although DWR does not oversee small CWS ENPs or ERPs, it plays a key role under the Sustainable Groundwater Management Act (SGMA), providing technical assistance and administering planning grants. SB 552 also allows counties to incorporate drought resilience planning into existing Groundwater Sustainability Plans.

Progress on local drought planning remains uneven. For instance, LA County, under the guidance of its contractor Stantec, is still in the early stages of drafting its Drought Resilience Plan. The county is assessing how existing plans, including its Hazard Mitigation Plan, Sustainability Plan, and Groundwater Sustainability Plans, might inform the DRP. However, officials intend for the DRP to ultimately stand alone (Stantec, personal communication, March 19, 2025). For more discussion of LA County's DRP progress, see Chapter 3.

Literature Review

Introduction

Small water systems often experience pressure drops when demand spikes during wildfire events. We have seen this globally throughout the U.S. West and other climatically similar areas. These drops can result from insufficient storage capacity, as these systems typically rely on small tanks or groundwater wells with limited refill rates. During fires, power loss and pump failure are common, especially when flames damage power lines and render electric pumps inoperable (Sowby & Porter, 2024). Aging infrastructure or wildfire-related damage, such as pipe ruptures, can cause additional leaks and ruptures that further reduce pressure. Many small systems also face hydraulic limitations, as their networks do not support the sudden high-flow demands of firefighting due to design constraints.

These vulnerabilities have surfaced in several recent wildfire events. The 2020 Almeda Fire in southern Oregon significantly damaged small systems serving the towns of Talent and Phoenix, causing pressure loss and insufficient flow for fire suppression (KTVL, 2021). Water lines melted or burst due to fire exposure, and contamination of drinking water systems followed soon after.

In California's 2018 Camp Fire, which affected the mid-sized Paradise Irrigation District, systemwide depressurization and widespread pipe damage allowed combustion byproducts to infiltrate the water supply (Proctor et al., 2020). The lack of isolation valves and backflow prevention devices exacerbated the spread of contamination, highlighting a vulnerability more common in smaller or aging systems (Proctor et al., 2020).

Although this section focuses on small systems, it is essential to note that even larger systems can be overwhelmed during major wildfire events, particularly in wildland-urban interface areas. During the 2017 Tubbs Fire, Santa Rosa's extensive urban system experienced pressure loss and pipe degradation due to high temperatures, which released hazardous chemicals into the water supply (City of Santa Rosa, 2019).

Similarly, during the 2025 Palisades Fire, a large municipal water system in Los Angeles ultimately "ran dry" despite having three storage tanks filled to capacity in the local area. Firefighting demand exceeded pumping capacity, and water pressure plummeted as demand quadrupled for more than 15 consecutive hours (Quinones, 2025).
While the 2023 Maui fires did not primarily involve a small water system, they offer a cautionary example of how decentralized and infrastructure-limited systems can fail under extreme wildfire conditions. In Lahaina, premise plumbing failures led to uncontrolled leaks, while widespread power outages disabled pumps and prevented water from reaching hydrants (Sowby & Porter, 2024). As a result, firefighters lacked an adequate water supply at critical moments.

Although Maui's system is a combined centralized and decentralized county-run system, many of the failures it experienced, such as system-wide depressurization, lack of backup power, and limited emergency storage, mirror the challenges small systems are especially prone to (Sowby & Porter, 2024). These cases illustrate the cascading effects of infrastructure fragility, limited hydraulic capacity, and emergency coordination breakdowns that overwhelm small systems, which are often least equipped to manage such conditions.. These failures point to physical vulnerabilities and critical gaps in planning and preparedness, which the next section explores more.

Fire Flow Requirements for Small CWS: Regulatory Gaps

Several laws and regulations outline fire flow requirements for small CWS. As previously noted, SB 552 requires systems with fewer than 1,000 connections to meet fire flow requirements by 2032. However, the law does not define those requirements at the state level. A consultant with the Rural Community Assistance Corporation, who provides TMF training for small CWS operators, told our team that those standards are "unclear" and that setting them may fall to local decision-makers such as fire departments and county regulators (Rural Community Assistance Corporation, 2025).

Section 64573 of Title 22 of the California Code of Regulations requires new CWS water mains to have a diameter of at least 4 inches. According to the 2020 Safe Drinking Water Plan, the maximum capacity of such a pipeline at low pressure is approximately 240 gallons per minute, "which still typically does not provide adequate fire flow." The plan also notes that the California Code of Regulations does not require CWS storage capacity to include fire suppression. While CWS are generally designed using AWWA and engineering standards that account for maximum daily demands—including fire suppression flows—and storage capacity is typically sized to include fire flow, this may not hold true for older systems. Given these shortcomings, the plan proposes 1) enacting legislation to address funding gaps in expanding fire flow and 2) establishing minimum statewide fire flow requirements.

State, county, and local codes specify fire flow requirements for certain types of buildings, but we found no specific requirements for different types of water systems.

Regulatory Gaps in More Granular Water-Related Fire Resilience Requirements

Significant regulatory gaps exist in ensuring small water systems are fire-resilient. Fire flow capacity requirements are not required for systems serving fewer than 1,000 connections until 2032 (SB 552, 2022). By contrast, larger systems must comply with NFPA standards for fire flow and system pressurization, primarily addressing structural fire preparedness rather than the broader demands associated with urban wildfire scenarios (California Department of Forestry and Fire Protection [CAL FIRE], 2003). The existing regulatory framework inadequately addresses the extensive water demands required during urban wildfires, which significantly exceed the capacities typically mandated by NFPA for individual structural fires (CAL FIRE, 2003). This discrepancy leaves smaller communities particularly vulnerable to catastrophic fire suppression failures during widespread wildfire events (Wildfire and Water Supply in California, 2021). Beyond infrastructure and fire flow standards, broader gaps in federal and state emergency planning oversight compound the challenges small water systems face.

Methods

Analyzing ERP Shortfalls

To assess how small water systems in high wildfire-risk areas are planning for fire-related emergencies, we conducted a document-based review of Emergency Response Plans (ERPs) from selected systems in Los Angeles County. We examined the presence or absence of fire-specific provisions, including fire flow benchmarks, infrastructure resilience measures, inter-agency coordination protocols, and wildfire-related public communication strategies. The analysis contextualized these findings within current federal and state regulatory frameworks, including SB 552 and Title 22, and evaluated how system size, limited oversight, and lack of centralized ERP access contribute to persistent fire planning deficiencies.

Building an Index to Assess Fire Vulnerability

Given the lack of direct data on water pressure and fire flow, we further developed a Fire Vulnerability Index that combines physical wildfire exposure (e.g., Wildland-Urban Interface extent) with system-level constraints (e.g., financial capacity, service area demographics, isolation, terrain, and size) to systematically assess which small water systems in Los Angeles County are most susceptible to wildfire-related disruption. This is an exploratory effort.

We developed a fire vulnerability index to assess the relative susceptibility of community water systems (CWS) in Los Angeles County to wildfire-related disruption, focusing on identifying systems that may require support, intervention, or regional consolidation. The index integrates six variables: a Terrain Ruggedness Index (TRI) for Los Angeles County, system size, proximity to other systems, financial stability, Disadvantaged Community (DAC) status, and percent Wildland-Urban Interface (WUI). Together, these components reflect both the *physical risk* of wildfire exposure and the *institutional and socioeconomic vulnerability* that affects a system's ability to withstand and recover from fire events. (Reilley et al. 2024, Khatri 2022) Significantly, this project departs from approaches that treat "fire risk" and "vulnerability" as distinct indices (Mahamed et al 2022, Lee et al

2022). Instead, we intentionally combine spatial risk and system vulnerability into a unified measure, drawing on the practical needs of water system planners and consolidation-minded policymakers concerned with where fires are most likely to occur and which systems are least equipped to cope with them. A standalone fire risk index comprising standard fire risk measures such as Fire Hazard Severity Zones (FHSZ), treatable landscape, and WUI could accurately identify geographies at high risk of experiencing fire. However, such an index would overlook the critical role that institutional capacity, financial resilience, and community-level disadvantage play in the actual outcomes of wildfire events.

Rather than weighting fire hazard characteristics equally, we selected the percent WUI of a system's boundary area as the sole spatial exposure metric for inclusion in the composite index. This choice reflects a growing consensus in the wildfire planning literature that the WUI is the most spatially predictive and policy-relevant indicator of wildfire exposure in developed areas. Studies have found that most structures lost to wildfire in California occur within the WUI, where flammable vegetation and human infrastructure directly interface (Radeloff et al., 2018). WUI extent is also used widely in funding allocation and regulatory frameworks, which makes it especially useful for planners seeking to align vulnerability assessments with state and federal resilience initiatives (Syphard et al. 2022). Unlike modeled projections such as Fire Hazard Severity Zones that can underrepresent dynamic fire conditions, and unlike treatable landscape layers, which focus on ecological fuel reduction opportunities, percent WUI captures both exposure and human-structure proximity, making it the most appropriate single indicator of fire risk for this system-level analysis (Haight et al 2004, Johnson & Devulapali 2025).

The remaining five variables reflect internal and contextual vulnerabilities that increase the likelihood of severe wildfire-related disruptions. TRI captures the extent to which steep terrain impedes fire suppression and infrastructure access. System size and financial stability represent core aspects of operational resilience, as smaller and financially weaker systems are less able to invest in fire preparedness or absorb the costs of post-disaster recovery. Proximity to other systems is used to approximate interconnection potential and mutual aid capacity. This measure is critical to a system's support or consolidation ability during regional emergencies. Finally, DAC (as defined by DWR) status is one of the most salient indicators of the socioeconomic profile of communities in regards to water policy. It recognizes that the most disadvantaged communities often experience the slowest recoveries and the most significant barriers to funding and institutional support. These six indicators form a multidimensional vulnerability index grounded in both the spatial realities of wildfire exposure and the institutional constraints of small water systems. The result is a tool designed to measure risk and support CWS where both hazard and capacity limitations intersect most acutely.

Table 1: Fire Vulnerability Index Variables

WUI Score	TRI Score	System Size Score	Financial Score	Distance Score	DAC / SDAC Score
Risk of fire starting and spreading	Risk of fire spreading and vulnerability to fire	Vulnerability to fire	Vulnerability to fire	Vulnerability to fire	Vulnerability to fire

Terrain Ruggedness Index (TRI)

Topography is a foundational determinant of wildfire behavior that influences how fires ignite and spread, how effectively they can be contained, and how easily cities can restore damaged infrastructure. To account for these dynamics, a Terrain Ruggedness Index (TRI) was included in this study's fire vulnerability index to account for these dynamics. Steep and uneven landscapes are associated with accelerated fire spread, more intense burn conditions, and logistical challenges that undermine emergency response and long-term recovery efforts.

Wildfire behavior is strongly influenced by topography, with slope exerting a significant effect on both the rate and direction of fire spread. Using the FIRETEC physics-based simulation model, Rodman et al. (2010) demonstrated that upslope terrain accelerates fire propagation across various fuel types, including grass, chaparral, and ponderosa pine. The study found that fire spread rates consistently increased when fires traveled uphill on a 30° slope, compared to flat terrain, and that this effect varied in intensity depending on fuel structure. The authors attributed this behavior to enhanced buoyancy-driven convection and the alignment of wind flow with flame tilt on slopes, which concentrated heat and intensified the fireline. These processes reduced ignition time and altered fire shape, which led to faster and more intense spread upslope. For community water systems in rugged terrain, such dynamics pose a heightened risk of fire exposure and reduce the operational window for defensive action.

Rugged terrain also impedes fire suppression operations. Fire crews face significantly reduced access in mountainous or irregular landscapes, which can prevent them from reaching the fire line or deploying equipment such as hoses, bulldozers, or aerial retardants with the necessary precision. Inaccessible terrain forces incident commanders to rely on indirect suppression tactics, which are slower and less effective during rapidly developing wildfire events (Scott et al., 2013). The combination of steep slopes and narrow access roads is particularly problematic for water systems in isolated canyons or foothill areas where infrastructure is difficult to reach under normal circumstances, let alone during a fire.

Finally, rugged terrain presents serious barriers to post-fire recovery and infrastructure repair. After a wildfire, steep slopes are especially prone to erosion, landslides, and debris flows, threatening existing infrastructure and newly repaired systems. These secondary hazards can delay restoration and require additional engineering controls such as slope stabilization or sediment retention basins. Transporting materials and equipment to rebuild damaged water mains, pump stations, or treatment facilities is significantly more time-consuming and costly in rugged areas than in flatter terrain, often requiring helicopters or specialized vehicles (USFS, 2020).

This study used a Terrain Ruggedness Index (TRI) to quantify terrain complexity, which measures the mean elevation difference between a central cell and its surrounding neighbors in a digital elevation model (DEM). TRI captures localized terrain variability in a highly relevant way to wildfire vulnerability analysis. Elevation data were sourced from the USGS 10-meter DEM and processed in ArcGIS Pro. TRI was calculated using the "Slope" and "Focal Statistics" tools, and mean TRI values were extracted for each community water system using the "Zonal Statistics as Table" tool. We then normalized these values on a 0–1 scale, with higher scores corresponding to greater ruggedness and thus higher fire vulnerability.

The inclusion of TRI reflects a body of literature linking topographic complexity to fire behavior, suppression difficulty, and post-disaster constraints. Andersen and Sugg (2019) noted that "fire control is least effective in steep terrain, especially where access routes are limited and fuel continuity is high." Incorporating TRI into the fire vulnerability index enables a more accurate and spatially differentiated understanding of which systems face elevated wildfire risk due to the physical geography of their service areas.

Recent fire behavior in Los Angeles County supports using WUI to indicate fire risk. Although many systems touched by fire had a significant percentage of their area covered by fire hazard severity zone and/or treatable landscape, WUI was the most consistent predictor that the January 2025 wildfires would touch a CWS. Every system that saw parts of its service area burn during the January 2025 wildfires overlaps with WUI-designated areas. Systems with a greater percentage of their service area covered by WUI also tended to see more of their service area burn. Las Flores Water Co, Rubio Canyon Land and Water Association District, and Kinneloa Irrigation district–the CWS that were most affected by the January 2025 wildfires based on percent of service area burned–saw 88%, 79%, 73% and 53% of their service areas burn and were 86%, 84%, 96% and 76% covered by WUI, respectively.

F*inancial Stability*

Financial stability is critical to a community water system's (CWS) capacity to prepare for, respond to, and recover from wildfire events. Small and under-resourced systems often lack the fiscal flexibility to implement necessary mitigation measures, maintain infrastructure, or absorb the costs associated with emergency responses and post-fire recovery.

Wildfires can inflict substantial direct and indirect costs on water utilities. Direct costs include damage to infrastructure such as pipelines, treatment facilities, and storage tanks. Indirect costs encompass revenue losses due to service disruptions, increased operational expenses, and potential liabilities. For instance, the financial burden of wildfire-related damages has led to significant economic challenges for utilities, sometimes resulting in increased insurance premiums or difficulties securing coverage. Utilities can also face legal liabilities if inadequate wildfire prevention measures contribute to destructive fires.

Limited access to capital and funding opportunities further exacerbates the financial constraints of small water systems. While programs like the Drinking Water State Revolving Fund (DWSRF) provide financial assistance for infrastructure improvements, the application process can be complex, and smaller systems may lack the administrative capacity to navigate it efficiently. Additionally, allocating funds often prioritizes projects that address immediate health risks, which can sideline proactive wildfire resilience measures.

We selected two indicators to operationalize this dimension of vulnerability: days cash on hand and operating ratio. Days cash on hand reflects how long a system can continue operations without incoming revenue, while the operating ratio measures the relationship between annual revenues and expenses. Utility financial benchmarking commonly uses both indicators, and the SWRCB includes them in its annual financial reporting forms. We obtained the raw data from the California State Water Resources Control Board's publicly available financial datasets for all active community water systems in Los Angeles County.

We normalized each variable to a 0 - 1 scale using min-max normalization. Because lower financial capacity indicates higher vulnerability, normalization was applied so that systems with the lowest reserves or weakest operating ratios received the highest vulnerability scores. We then averaged the two normalized scores to produce a single financial stability score for each system. This score was then joined to the primary CWS shapefile using the system ID field and incorporated into the final fire vulnerability index. We assigned no value to systems with missing financial data, and those systems' fire vulnerability index scores excluded the financial data component to avoid skewing results.

Including this metric ensures that we do not treat fire vulnerability as a purely geographic or physical phenomenon. By acknowledging the institutional and economic precarity many small water systems face, the index more accurately reflects which systems are most at risk of long-term disruption following wildfire events.

System Size

The size of a community water system (CWS), measured by the number of service connections or population served, is a consistent predictor of institutional resilience in the face of natural disasters. Small systems operate with narrower financial margins, fewer technical staff, and limited capacity to upgrade or maintain infrastructure. In wildfire-prone regions such as Los Angeles County, these constraints can translate into reduced ability to implement preemptive fire protection measures, limited emergency response capacity, and slower recovery following fire-related damage.

As discussed in Chapter 1 of this report, existing research has repeatedly emphasized that smaller water systems face disproportionate challenges in delivering reliable and safe water under stress conditions. According to the Public Policy Institute of California (2024), most of the state's at-risk water systems are small, often serve fewer than 3,300 people, and tend to be located in rural or wildland-urban interface areas where wildfire threat is most acute (PPIC, 2020). These systems are less likely to have built-in redundancies such as backup generators, interconnections with neighboring systems, or emergency reserves of water or chemicals. They are also more likely to operate without full-time staff, resulting in longer damage assessment and restoration delays. Research from the U.S. EPA supports these conclusions, noting that small systems are "disproportionately under-resourced" and face persistent barriers to accessing state and federal funding for resilience and recovery projects (EPA, 2024).

In addition to operational and staffing limitations, system size affects wildfire vulnerability through the lens of regulatory compliance. Smaller systems often fall below the thresholds that trigger more rigorous reporting, monitoring, or planning requirements, leaving them under-regulated despite their heightened exposure. This lack of oversight contributes to a cycle of deferred maintenance and underinvestment, which can compound the effects of infrastructure loss during a fire event.

We included system size as a core component of the fire vulnerability index to account for these structural disadvantages. We used two indicators to operationalize system size: the number of service connections and the population served, both sourced from the State Water Resources Control Board's (SWRCB) publicly available water system inventory. While highly correlated, these variables capture slightly different dimensions of system scale. Connections represent infrastructure load, while population reflects potential exposure and service demand during emergencies.

Raw values for both variables were imported into ArcGIS Pro and joined to the CWS boundary shapefile using a unique system identifier. Each variable was normalized separately on a 0 - 1 scale using min-max normalization, with lower connection counts and smaller populations corresponding to higher vulnerability scores. We then averaged the two normalized variables to create a single system-size vulnerability score for each CWS. This score was added as a field to the attribute table of the primary shapefile and incorporated into the final fire vulnerability index.

By integrating system size into the fire vulnerability index, this methodology ensures that the analysis captures not just geographic exposure to fire, but also structural and institutional limitations that affect a system's capacity to withstand and recover from fire-related disruptions.

Proximity to Other Systems

The spatial proximity of a community water system (CWS) to neighboring systems significantly influences its resilience to wildfire-related disruptions. Systems situated closer to others are more likely to have established interties or the potential to develop them and thus can more easily facilitate mutual aid during emergencies. These interties can provide alternative water sources, maintain pressure during firefighting efforts, and expedite recovery after a disaster.

Recent research has highlighted the importance of interties to system resilience. The State Water Resources Control Board (SWRCB) emphasizes that regional collaborations and interties are vital for ensuring water supply reliability during emergencies. Isolated systems, particularly during wildfires, face significant vulnerabilities due to their limited connectivity to other systems. For instance, a study from the Pacific Northwest National Laboratory highlights that emergency interconnections provide utilities with alternative water supply options during natural disasters, thereby maintaining uninterrupted service and mitigating the impact of such events. (Reynolds et al. 2024) Additionally, the U.S. Environmental Protection Agency (EPA) notes that interties are essential components in emergency water supply planning, allowing for resource sharing and increased system redundancy. These kinds of infrastructural relationships are especially important when water systems experience higher-than-usual levels of demand, like during the January 2025 fires. Water systems that serve the Palisades were unable to supply hydrants with water after their tanks ran dry—a problem that could've been avoided if the fire-burdened systems had interties with other less stressed systems. (Hamilton and Zahniser 2025)

Incorporating proximity into the fire vulnerability index recognizes the strategic advantage of spatial closeness to other systems. Proximity is a proxy for potential collaborative opportunities and shared resources, which are crucial during wildfire events.

To operationalize spatial proximity, the analysis calculated the distance between each CWS and its nearest neighbor in ArcGIS Pro using CWS boundary shapefiles for Los

Angeles County from the SWRCB. The “Near” tool calculated the Euclidean distance from the edge of each CWS service area to the edge of the nearest neighboring service area, producing a standardized measure of spatial isolation across the dataset.

Min-max normalization scaled the resulting distance values to a 0–1 range. The method assigned lower vulnerability scores to shorter distances, indicating greater proximity to another system, and higher scores to longer distances reflecting geographic isolation. These normalized values were joined to the attribute table of the CWS shapefile using a unique system identifier and incorporated into the final fire vulnerability index.

This methodology accounts for the role of physical isolation in shaping system-level resilience by including spatial proximity as a component of the fire vulnerability index. Systems that lack nearby partners are less likely to participate in mutual aid, form interties, or receive emergency water deliveries during a wildfire event.

Disadvantaged Community (DAC) Status

Socioeconomic vulnerability is pivotal in determining a community's capacity to prepare for, respond to, and recover from wildfire events. In California, the designation of Disadvantaged Communities (DACs) provides a standardized metric to identify areas that may require additional support due to economic constraints. California Water Code Section 79505.5 defines a DAC as a community with a median household income (MHHI) less than 80% of the statewide median.

The DAC designation provides a practical and policy-relevant framework for assessing socioeconomic vulnerability. DAC status serves as a clear and consistent metric because it ties directly to state-defined income thresholds and relies on quantifiable economic data. Its alignment with California’s funding and regulatory mechanisms also ensures that identified communities are eligible for targeted assistance programs, enhancing its utility for infrastructure planning. Statewide tools such as CalEnviroScreen consistently use DAC classification to integrate socioeconomic and environmental indicators and guide investments in vulnerable communities. As a result, the DAC designation serves as both a technical measure and a policy lever for incorporating equity considerations into environmental and resilience planning.

Incorporating DAC status into the fire vulnerability index acknowledges the compounded risks that economically disadvantaged communities face. These communities often lack the resources for adequate fire prevention measures, infrastructure maintenance, and emergency response, which makes them more susceptible to the adverse effects of wildfires. By identifying and prioritizing DACs, planners and policymakers can allocate resources more equitably and effectively to enhance resilience.

A geospatial overlay analysis using ArcGIS Pro incorporated DAC status using DAC boundary shapefiles obtained from the California Department of Water Resources, which classifies census geographies as DAC or SDAC based on statewide income thresholds. We used the intersect tool to overlay the DAC layer with the community water system (CWS) boundary shapefile to identify systems whose service areas intersect with DAC- or SDAC-designated census tracts.

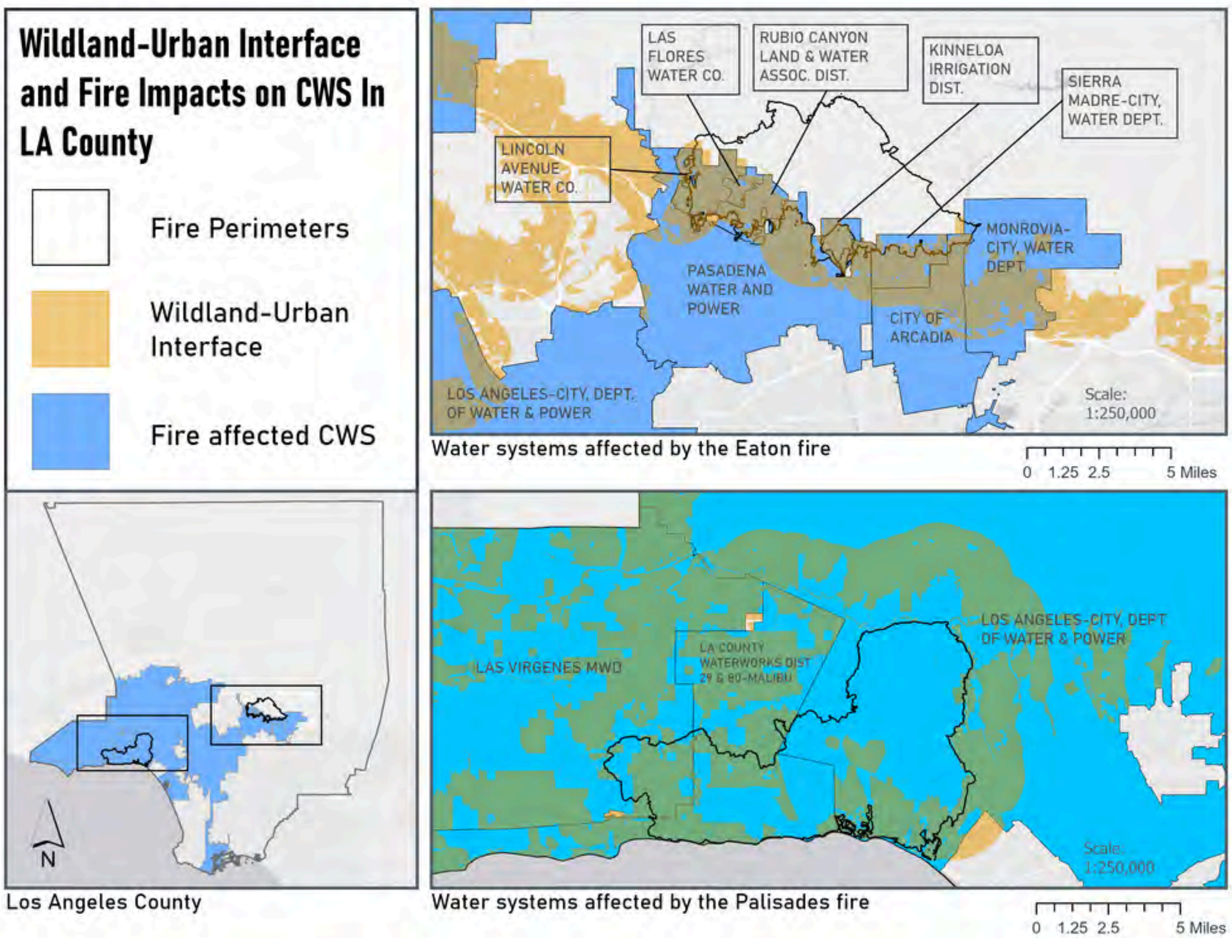
Rather than assign a binary designation, we applied a tiered scoring scheme to capture varying levels of socioeconomic disadvantage. Systems serving SDAC-designated areas were assigned a score of 1.0 to reflect the highest level of socioeconomic vulnerability. Systems serving DAC-designated but not SDAC areas received a score of 0.7, while systems that did not intersect with either category were assigned a score of 0. This categorical scoring was manually joined to the attribute table of the CWS shapefile using a unique system identifier. It was directly incorporated into the fire vulnerability index without further normalization, as the 0 - 1 scale had already been embedded in the scoring logic.

Wildland-Urban Interface (WUI) Exposure

The Wildland-Urban Interface (WUI) attempts to represent the transitional zones where human development meets or intermingles with undeveloped wildland vegetation. These areas are particularly susceptible to wildfires due to the proximity of structures to flammable vegetation and the challenges of firefighting in such environments. The U.S. Fire Administration defines the WUI as "the zone of transition between unoccupied land and human development," highlighting its significance in wildfire risk assessments.

Recent fire behavior in Los Angeles County supports using WUI to indicate fire risk. Although many systems touched by fire had a significant percentage of their area covered by fire hazard severity zone and/or treatable landscape, WUI was the most consistent predictor that the January 2025 wildfires would touch a CWS. Every system that saw parts of its service area burn during the January 2025 wildfires overlaps with WUI designated areas. Systems with a greater percent of their service area covered by WUI also tended to see more of their service area burn. Las Flores Water Co, Rubio Canyon Land and Water Association District, and Kinneloa Irrigation district–the CWS that were most affected by the January 2025 wildfires based on percent of service area burned–saw 88%, 79%, 73% and 53% of their service areas burn and were 86%, 84%, 96% and 76% covered by WUI, respectively.

Figure 1: Wildland-Urban Interface Intersects and Fire Impacts on CWS

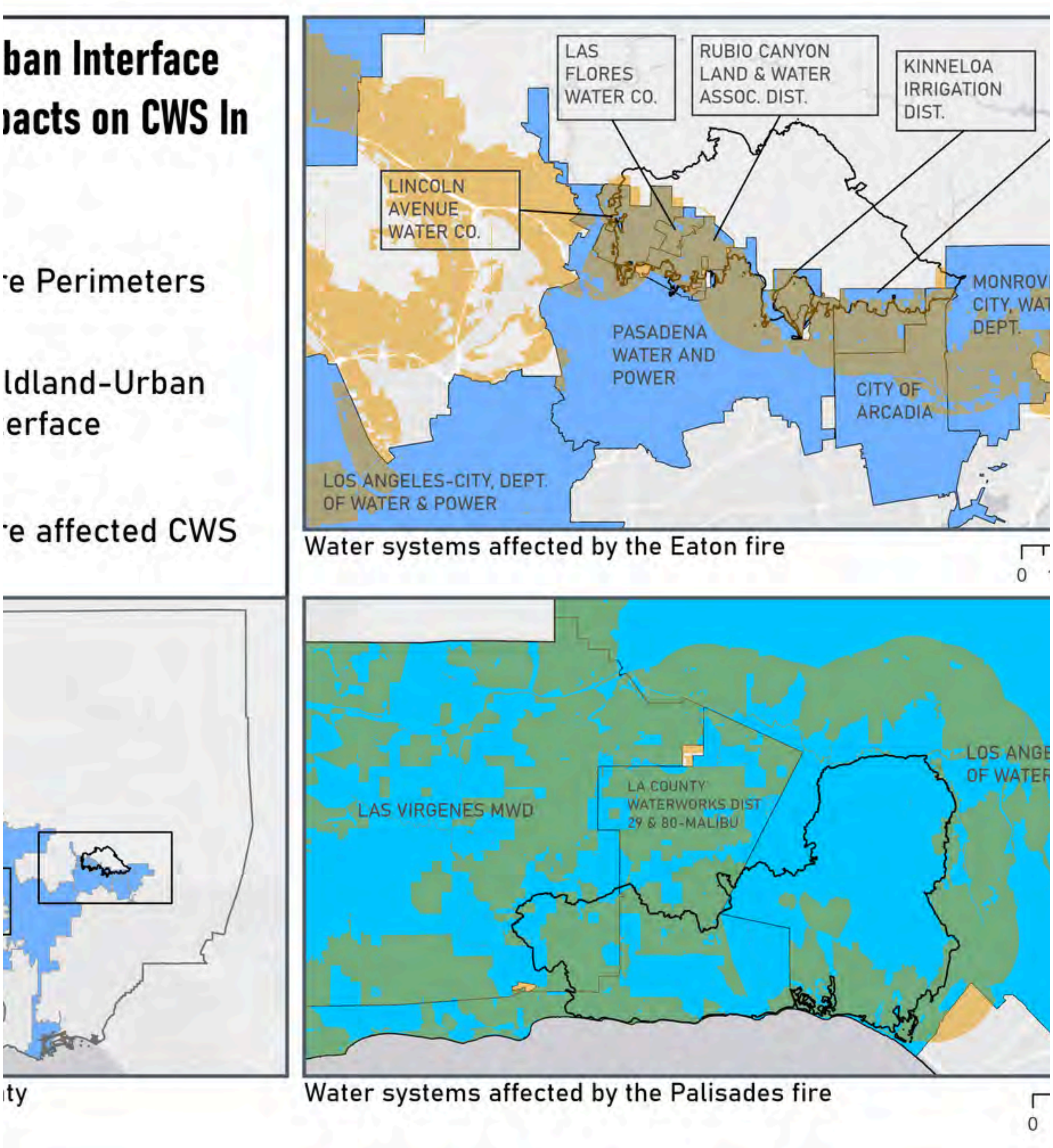


Sources: Wildland Urban Interface (US Forest Service Enterprise GIS), LA County CWS boundaries (LA County DPW GIS Unit), LA County Boundary (LA County Enterprise GIS), January 2025 fire perimeters (Cal Fire Enterprise GIS)

Fire damage to the LADWP service area was especially illustrative of WUI's effectiveness compared to other common fire risk metrics. Fire Hazard Severity Zones prior to January 2025 failed to predict that fire would affect the LADWP service area while Treatable Landscape identified small patches of the service area that were affected. Only WUI indicated strongly that the area served by the LADWP faced elevated fire risk.

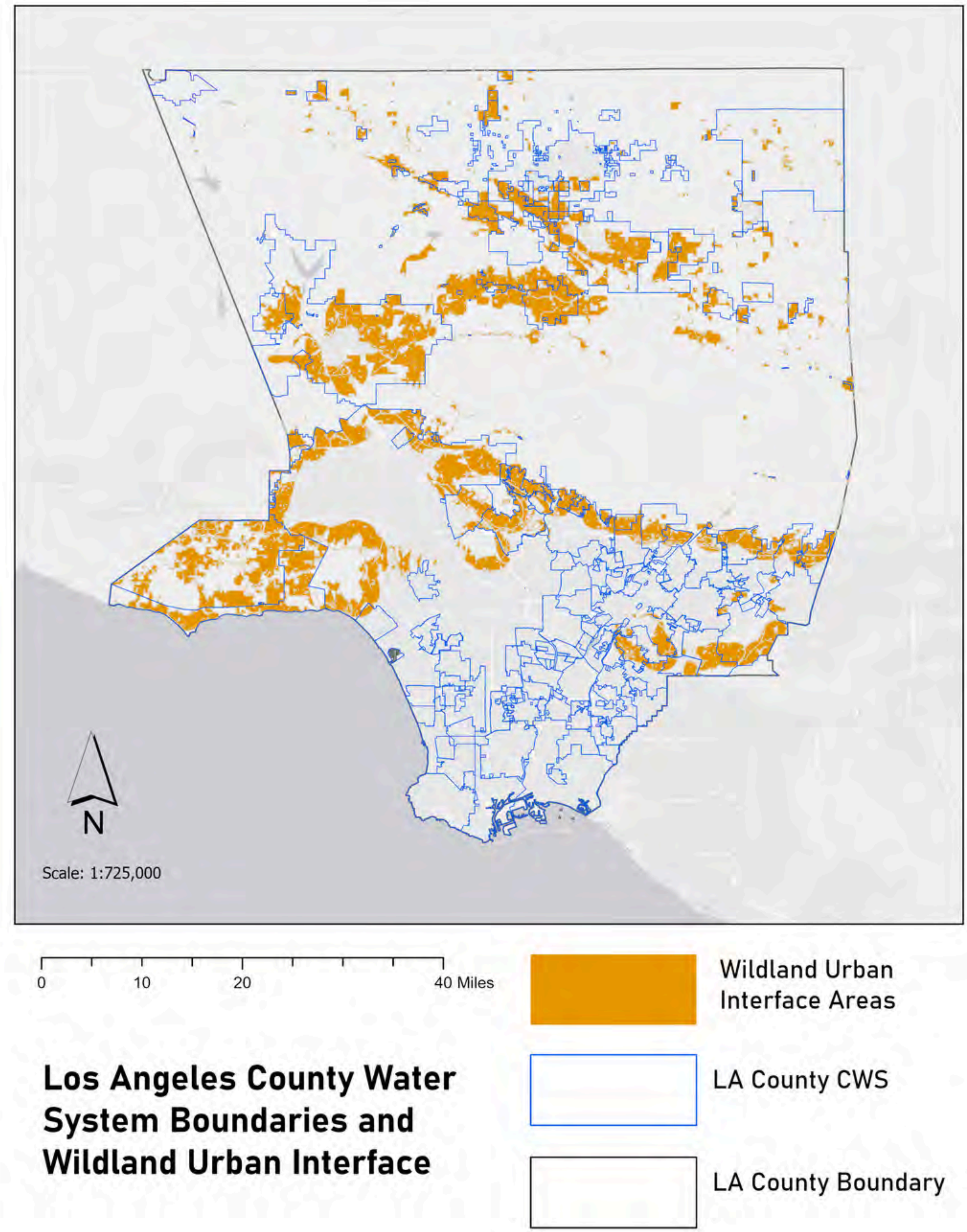
Additionally, no water system with less than 18% of its service area classified as WUI was touched by fire since 2015.

Figure 2: January 2025 Fire Impacts on the LADWP Service Area



Sources: Wildland Urban Interface (US Forest Service Enterprise GIS), Fire Hazard Severity Zones and LA County boundary (LA County Enterprise GIS), CA VTP Treatable Landscapes and January 2025 fire perimeters (Cal Fire Enterprise GIS)

Figure 3: Wildland-Urban Interface and Water Systems in Los Angeles County



Sources: Wildland Urban Interface (US Forest Service Enterprise GIS), LA County CWS boundaries (LA County DPW GIS Unit), LA County Boundary (LA County Enterprise GIS)

Incorporating WUI exposure into the fire vulnerability index acknowledges the heightened risk CWS faces within or adjacent to these zones. Communities in the WUI often experience rapid fire spread, limited evacuation routes, and increased potential for infrastructure damage. Furthermore, expanding urban development into wildland areas has increased the number of WUI regions, exacerbating the challenges associated with wildfire management.

We conducted a geospatial analysis using ArcGIS Pro to assess WUI exposure using WUI shapefiles obtained from the U.S. Forest Service. We overlaid the WUI layer with the CWS boundary shapefile to identify the portion of each water system's service area that overlaps with WUI-designated regions using the "Intersect" tool.

For each CWS, we calculated the percentage of its total area intersecting with the WUI. This value is computed as:

$$\textbf{PercentWUI} = (\text{AreaWUI within CWS} / \text{Total AreaCWS}) \times \textbf{100}$$

Min-max normalization scaled the resulting percentages to a 0–1 range, with higher values indicating greater WUI exposure and thus higher physical fire risk. These normalized scores were joined to the CWS shapefile using a unique system identifier and incorporated into the composite fire vulnerability index.

Final Vulnerability Index Construction

Min-max normalization scaled each of the six selected variables (percent Wildland-Urban Interface (WUI), Terrain Ruggedness Index (TRI), system size, financial stability, proximity to other systems, and Disadvantaged Community (DAC) status) to a 0–1 range. This approach ensured that all variables were standardized and comparable regardless of their original units of measurement. Normalization preserved the original directionality for variables with higher raw values indicating greater vulnerability (e.g., percent WUI, TRI, proximity to other systems, and DAC status). For variables where lower raw values implied greater vulnerability (e.g., system size and financial stability), values were inverted after normalization so that higher scores uniformly signaled greater risk or weaker capacity.

Following normalization, each variable was assigned equal weight in the composite index. This decision reflects the assumption that fire-related vulnerability in community water systems spans multiple dimensions and cannot be meaningfully captured by any single domain. Equal weighting avoids overstating the importance of physical exposure at the expense of institutional capacity or socioeconomic disadvantage, particularly given the evidence that wildfire impacts are shaped as much by preparedness and resilience as by hazard intensity.

The analysis considered alternative weighting strategies but selected equal weighting for its transparency, policy relevance, and suitability for an exploratory index. The calculation derived each system's final vulnerability score as the mean of all six normalized component scores. It was joined to the CWS boundary shapefile in ArcGIS Pro for visualization and spatial analysis.

Final Fire Vulnerability Index

Table 2: Fire Vulnerability Index Construction

Limitations of the Index Approach

While this index offers a robust and policy-relevant framework for assessing wildfire vulnerability across community water systems in Los Angeles County, it's important to acknowledge several limitations. First, the equal weighting of all six variables, while transparent and methodologically simple, assumes that each dimension of vulnerability contributes equally to a system's overall wildfire risk. Certain factors—such as WUI exposure or financial insolvency—may have outsized effects during a fire event, particularly in systems that lack interconnections or operate in steep terrain. A sensitivity analysis or stakeholder-informed weighting scheme could refine these assumptions in future iterations.

Second, selecting percent WUI as the sole fire risk indicator may underrepresent areas with significant fire hazard severity or treatable vegetative fuels but low WUI overlap. Although percent WUI is well-supported in the literature as the most spatially predictive indicator of structural wildfire loss, it may not fully capture emerging fire behavior in areas undergoing rapid land use change or vegetation shifts. Additionally, some water systems serve areas not classified as WUI by the US Forest Service that, for the purpose of assessing wildfire risk, should be classified as WUI. This is due to the fact that some water systems serve more remote areas not considered to be "urban" by the Forest Service, but still include areas where built and natural fuels meet. Regardless, we are confident that recent fire behavior in Southern California shows that WUI is the most broadly spatially predictive indicator of fire risk. Future analyses should seek to refine the fire risk variable in this index.

Additionally, while the index includes DAC status to account for socioeconomic vulnerability, it does not directly incorporate race, linguistic isolation, or public health indicators—factors known to influence post-disaster outcomes but excluded here to align with California's state-defined DAC criteria. Lastly, this index is static, capturing conditions at a single point in time based on available data.

Again, this is an exploratory analysis. Wildfire vulnerability is inherently dynamic, shaped by climate variability, policy shifts, land development, and infrastructure investment. As such, the index should be updated regularly and used as one input, rather than a definitive measure, in planning decisions about resource allocation, consolidation feasibility, and wildfire resilience of water systems.

System Planning & Preparedness

Deficiencies in Emergency Response Planning: What do we Expect?

Emergency Response Plans (ERPs) are documents that outline how a water system will prepare for and respond to emergencies that threaten life, property, or the environment (EPA, 2024). Under federal law, community water systems serving more than 3,300 people are required to develop and maintain ERPs, while California mandates disaster preparedness planning for systems with 10,000 or more service connections. It should not be surprising to see wildfire-related performance issues in small water systems, given the lack of fire-specific provisions in their ERPs, particularly around fire flow capacity and operational resilience. While ERPs typically address contamination response, seismic risks, and power outages, they frequently neglect wildfire-specific water supply strategies. This gap is particularly consequential in high-fire-risk regions, where infrastructure strain (e.g., pump failures, electrical outages) coincides with surging water demand during active wildfires, potentially crippling system functionality. SB 552 attempts to close some of these preparedness gaps by mandating drought resilience planning and backup infrastructure for small systems, but leaves much of the implementation to local agencies and small suppliers, many of whom face significant challenges such as limited technical capacity, constrained funding, and aging infrastructure that can hinder full compliance (DWR, 2025).

While SB 552 outlines drought resiliency measures for small water suppliers, it does not specify statewide fire flow requirements or planning benchmarks based on system size. Accessing and evaluating Emergency Response Plans remains difficult due to the absence of a centralized repository. Neither the state nor a third party maintains current ERPs, limiting transparency even where planning requirements exist. The SWRCB's Division of Drinking Water provided 18 ERPs for systems in LA County, noting that the documents are likely outdated. Obtaining current ERPs for all systems within the subset of interest would require direct outreach to each system.

The ERP for the Antelope Valley District (California Water Service, 2019) illustrates this pattern. Although the document includes detailed procedures for emergency notification and Department Operations Center activation, it does not specify fire flow requirements or establish pressure benchmarks for firefighting purposes. This omission is particularly significant given the district's location in a high-risk wildfire zone, where operational demands on water infrastructure will likely intensify during fire events.

Similarly, the ERP developed by White Fence Farms Mutual Water Company (2023) identifies fire as a potential hazard. Still, it lacks operational strategies for maintaining water pressure, prioritizing supply for firefighting, or coordinating with local fire agencies. Although the plan acknowledges wildfire as a potential cause of low system pressure, stating that operators should "increase production, if possible,"it does not include fire flow benchmarks, identify minimum pressure thresholds for hydrant use, or designate fire suppression priorities during emergencies. Instead, its guidance centers on general contamination precautions, such as increasing disinfectant residuals.

These findings align with prior assessments documenting fire preparedness deficits in small water systems (SB 552, 2022). Under current law, systems serving fewer than 1,000 service connections are not required to meet fire flow standards until 2032, perpetuating regulatory and infrastructural vulnerabilities. For instance, during the 2018 Camp Fire, a rapid loss of water pressure severely hampered firefighting operations, which is an outcome that remains likely in similarly underprepared systems (CAL OES, 2019). Table 3 (p.147) summarizes common ERP deficiencies across systems, illustrating how regulatory gaps manifest in planning documents.

Table 3: Common ERP Deficiencies among Smaller Water Systems

Issue	Description	Required in ERPs	Example
Fire Flow Capacity	Benchmarks for pressure and volume needed to support firefighting during wildfires	Not Required	White Fence Farms ERP (2023): Mentions fire-related pressure loss, advises increasing production if possible, but lacks defined benchmarks or firefighting priorities
Infrastructure Resilience	Use of generators, backup supplies, and fire-resistant infrastructure to maintain service during wildfires	Not Required	Averydale Mutual Water Co. ERP (2010): Mentions backup generator for outages, but not tied to fire resilience
Inter-agency Coordination	Defined roles and mutual aid protocols with local fire agencies	Not Required	Lockheed Martin Aeronautics ERP (2023): Lists fire contacts but lacks coordination procedures
Wildfire-specific Operational Procedures	Fire-specific actions to maintain pressure and prioritize firefighting supplies	Not Required	White Fence Farms ERP (2023): Recognizes wildfire as a hazard but lacks concrete operational strategies
Public Communication for Wildfires	Fire-specific alerts and public messaging during outages, conservation needs, or evacuations	General notification is required, but not wildfire-specific messaging	Green Valley County Water District ERP (2006): Includes contamination notices, but no fire-specific communication measures

Source: Compiled from domestic Emergency Response Plans, including Averydale Mutual Water Company, Green Valley County Water District, White Fence Farms Mutual Water Company, and Lockheed Martin Aeronautics Company.

Compiled from domestic case studies on small water system emergency planning and wildfire-related vulnerabilities.

A close review of ERP systems in high-risk areas shows that, while most meet the formal requirements outlined in Title 22, including maintaining emergency contact directories and outlining general response procedures, many do not robustlyaddress the practical challenges of responding to fire emergencies. This disconnect between regulatory compliance and practical readiness reflects the narrow scope of existing mandates and, more broadly, underlines the limited capacity and preparedness expectations and support we have provided to small systems to engage in comprehensive fire planning.

Infrastructure resilience, a key element of wildfire preparedness, is also insufficiently developed. Although some systems have emergency generators or backup wells, water providers seldom integrate these resources into a comprehensive fire mitigation strategy. For instance, the ERP for Averydale Mutual Water Company mentions an automatic backup generator that activates during power outages. However, the system has not linked this capability to sustained operations during wildfires or other compound hazards. There is no mention of fire-resistant storage tanks, redundant supply lines, or proactive infrastructure protection measures—elements increasingly necessary in high-risk fire zones.

Coordination with local fire response agencies is similarly underdeveloped. While many plans include fire departments in their contact directories, few define mutual aid agreements, operational responsibilities, or communication protocols. Lockheed Martin’s ERP, for example, lists the Los Angeles County Fire Department and other emergency agencies but provides no joint planning procedures or wildfire response coordination mechanisms. This reflects a broader reliance on assumed relationships rather than formalized collaboration frameworks that can be activated during emergencies.

Public communication procedures are another area where wildfire-specific planning is notably absent. Although many ERPs include standard notification protocols for contamination or system failures, few tailor these communications to wildfire events. The Green Valley County Water District ERP includes templates for boil water notices and do-not-drink advisories. Still, these primarily focus on bacteriological or chemical contamination, not scenarios involving firefighting water demands, pressure loss from wildland fire damage, or emergency conservation notices. The absence of real-time alert mechanisms and fire-specific messaging limits the ability of these systems to communicate effectively during fast-moving wildfire events.

These examples illustrate a recurring pattern: while many ERPs satisfy baseline regulatory requirements, they do not reflect the operational demands imposed by wildfire emergencies, particularly the larger and more destructive events of recent years. The absence of fire-flow benchmarks, lack of infrastructure hardening, minimal articulation of inter-agency procedures, and the generic nature of public communications all point to a structural misalignment between policy expectations and practical preparedness. Even where fire risk is acknowledged, ERPs often fall short of translating that risk into system-level mitigation measures or response strategies.

This underscores the broader limitations of the current regulatory framework, which emphasizes notification and continuity planning but leaves critical aspects of wildfire response either optional or undefined. In the meantime, many small systems remain constrained by limited funding and technical capacity. Small water systems and the communities they support remain especially vulnerable during wildfire events without enforceable fire-specific planning standards.

Discussion: Partial Models to Explore and Learn From

Given the multidimensional vulnerabilities identified across LA County's small systems, the following section explores partial models—local, national, and international—that offer practical insights into how water systems might begin to build wildfire resilience more broadly despite their constraints.

Regional Models to Learn From and Adapt

Our research did not identify a complete or comprehensive wildfire preparation model for water systems, let alone small ones. Instead, we explored and examined local, regional, and global water systems strategies to serve as partial models for preparing and combating wildfires (see Table 4 (p.151)).

Table 4: Sample of Wildfire Preparation Approaches by Other Water Systems

Models	Lesson	Description
Los Angeles County	Prepare a Wildfire Resiliency Plan	The plan includes strategies to mitigate, manage, and address wildfire impacts
Wrightwood Community	Plan Defensible Space	Firewalls serve as barriers by protecting water systems infrastructure and redirecting fires around the wall perimeter
Northern California System: East Bay Municipal Utility District	Develop a Multi-layered Approach	Prepare a multi-layer approach by including vegetation management, public safety power shutoff, and coordination with other agencies
Northern California System: Shasta County Water Systems	Apply Lessons Learned	Test equipment by simulating wildfire demands and conditions, identify public notification procedures, and foster relationships with local partners
Oregon	Prepare a Report on Wildfire Impacts	Produce a report on staff lessons learned, practical ERP, current inventory, and conditions of water system infrastructure, and a list of future investments
Australia	Develop Risk Assessments and Plans	Prepare a risk assessment to identify water supply vulnerabilities to bushfires and apply site-specific fire retardants and strategies post-fire
Canada	Develop Risk Assessments and Plans	Prepare an ERP with details on identified vulnerabilities, improvements, essential emergency contacts, mitigation measures, and emergency response
Spain	Invest in Water and Fire Infrastructure & Educational Campaigns	Implement fire resiliency strategies by building hydraulic infrastructure, installing strips of low-flammable vegetation, and educating community members on fire resiliency
Japan	Government Guidance and Innovative Infrastructure & Strategy	Government can promote resilience measures, share resources, and fund reduction and recovery efforts, while private entities could explore innovative strategies like high-pressure sprinklers or "soap-based fire-fighting foam."

Source: Los Angeles County Water Plan, Golden State Water Company's Facebook, East Bay Municipal Utility District, Oregon Health Authority, WWF-Australia, United Nations Office for Disaster Risk Reduction, Government of Canada, Government of Japan, World Bank Group, United Nations Office for Disaster Risk Reduction, Portico, and Climate Adapt

Compiled from international and domestic case studies on wildfire resilience in water systems

Los Angeles County: Prepare a Wildfire Resiliency Plan

The Los Angeles County Water Plan acknowledges the impacts of fire on water infrastructure, supply, and quality. The plan incorporates a Watershed Sediment Management section to serve as a roadmap for improving water resilience by addressing the increasing frequency and intensity of wildfires in the county (Los Angeles County, 2023). One of the plan's targets is to ensure all water management agencies in a WUI administer a wildfire resilience or mitigation plan. The water management agencies would then identify strategies to mitigate wildfire damages, manage wildfire emergencies, and reduce post-wildfire impacts. (Los Angeles County, 2023).

On a local level and outside formal plans, communities can take initiatives to boost fire resilience. Local and regional partners can establish fire-adapted communities by incorporating various components such as community engagement, resident mitigation, safety and evacuation, and regulations, policies, and plans (California Wildfire & Forest Resilience Task Force, 2025). With key components established, communities can employ strategies such as mutual aid, public education campaigns, and neighborhood ambassadors to keep their communities informed, prepared, and ready to take action (California Wildfire & Forest Resilience Task Force, 2025). While these community-based approaches offer valuable localized strategies, further insights can be drawn from other critical infrastructure sectors that have faced similar wildfire risks and developed more mature regulatory frameworks.

Wrightwood Fire: Plan for Defensible Space

In September 2024, the Wrightwood community experienced an intense and ongoing fire known as the Bridge Fire, which resulted in the evacuation of residents and the destruction of houses. The wildfire threatened the community, including essential infrastructure like water systems, prompting the Golden State Water Company (GSWC) to order a "Do Not Drink Water" notice. Before the evacuation order was lifted, GSWC's operators returned to evaluate their water system infrastructure to understand their tank conditions and ensure enough water was available for firefighters. During their inspection, GSWC found minimal damage to their water system due to their fire preparation and infrastructure. GSWC prepared its systems by investing in firewalls to protect its local water supply. When the fire reached the water system, the fire burned toward the wall. However, instead of the fire engulfing the infrastructure, the fire was stopped by the firewalls, resulting in the fire burning around the wall perimeters, maintaining the safety of the water infrastructure. Fortunately, GSWC fire preparation and investments safeguard their water infrastructure, facilitating the restoration of water services and the delivery of safe, reliable drinking water (Golden State Water Company, 2025).

Northern California Systems: Develop a Multi-layered Approach & Apply Lessons Learned

In Northern California, the East Bay Municipal Utility District (EBMUD) serves over 1.4 million water customers and 740,000 wastewater customers in Alameda and Contra Costa counties (EBMUD, 2025). EBMUD enhances public safety by preparing water systems for wildfire risks through a multi-layered approach that includes vegetation management, public safety power shutoff (PSPS), and coordination.

As part of its wildfire preparedness, EBMUD rangers and watershed staff manage year-round vegetation by removing highly flammable vegetation, building fuel breaks, and prescribing controlled burns to reduce and slow the spread of wildfires to protect water quality for all (EDMUD, 2020).

A second tactic is utilizing PSPS. Public safety power shutoff requires the temporary shutoff of power in high-risk fire areas during dangerous weather conditions (Southern California Edison, 2025). EBMUD may initiate PSPS during the hot and dry autumn months to avoid a fire starting (EBMUD, 2020). When EBMUD initiates PSPS, they rely on its backup generators to ensure electricity is available to continue water distribution operations (EBMUD, 2024).

Coordination is another layer to the EBMUD wildfire preparedness approach. The Hills Emergency Forum was established following the 1991 Oakland Hills Fire. As a participant, EBMUD collaborates on mutual aid access among various entities like CalFire, UC Berkeley, counties, and cities. The forum facilitates collaboration with fire agencies and land managers on wildfire mitigation and response (EBMUD, 2025). EBMUD also hosts an annual “Fire Forum” to further coordinate with fire agencies (EBMUD, 2025).

Elsewhere in Northern California, water systems in Shasta County have applied lessons learned from the devastating Carr Fire in 2018. The extreme nature of this fire makes it a relevant example. Some communities lost up to 95 percent of the homes in their water service areas and faced extreme demand due to fire response and high leakage (EPA Office of Water, 2022). Challenges included the destruction of a water system's main office and two pump stations during the fire, along with power outages and undersized generators that disrupted treatment processes and severely hindered customer notification efforts (EPA Office of Water, 2022).

The impacted systems offer the following lessons: "Load test generators under peak demand conditions that mimic what may occur during a wildfire" (EPA Office of Water, 2022). A generator may perform well under normal operating conditions or during a single structure fire response, but may not be adequate for extreme demand conditions. "Identify options for sourcing additional generators if your generators are only designed to operate portions of your infrastructure during an emergency" (EPA Office of Water, 2022). "Identify ways to share public notifications when normal communications have been disrupted" (EPA Office of Water, 2022). "Build a relationship with local response partners, especially heavy water users (i.e., fire)" (EPA Office of Water, 2022). "Work with emergency responders during an emergency (i.e., local Emergency Operations Center)" (EPA Office of Water, 2022).

After the Carr Fire in 2018, impacted water systems took action to recover and mitigate their future fire risk by collaborating, hardening their infrastructure, and adding redundancy. Specifically, "The California Division of Drinking Water established bi-weekly meetings to discuss impacted source water sampling and to identify potential treatment options." "Shasta CSD brought online two new pump stations made from cinder block with metal roofs, making them more fire resistant than the previous wood frame/siding construction." "Shasta CSD and Keswick established an interconnection for redundancy." Redding built a pump station to provide treated groundwater to other systems through interconnections.

Oregon: Prepare Report on Wildfire Impacts

Other states prepare for fire resilience by building on the foundation of the America's Water Infrastructure Act (AWIA) of 2018. For instance, the Oregon Health Authority informs its community water systems, which serve more than 3,000 people, to comply with AWIA by conducting a risk and resilience assessment that informs their developed

ERP (Oregon Health Authority, n.d.). The Public Health Division - Drinking Water Services prepared a technical report with key findings on Oregon wildfire impacts on drinking water systems and water quality. The report shared insights from water systems operations and emergency response staff on the importance of a realistic and affordable ERP, critical water system infrastructure in place, and needed investments in generators for backup power (Oregon Health Authority, 2022).

Australia and Canada: Develop Risk Assessments and Plans

In the last few years, intense wildfires have impacted Australia and Canada. In Australia, the 2019-2020 Australian bushfire season, also known as Black Summer, resulted in catastrophic loss. The bushfires (as wildfires are referred to in Australia) burned up to 19 million hectares, with 12.6 million hectares specifically impacting the forest and bushland (WWF-Australia, n.d.). Unfortunately, the fire resulted in 33 deaths (9 firefighters and 24 community members), 3,000 homes, and 7,000 facilities and "out-buildings" damaged or destroyed (International Federation of Red Cross and Red Crescent Societies [IFRC], 2023). In addition, the bushfires killed or displaced an estimated 3 billion animals (IFRC, 2023). On the other side of the world, the 2023 wildfires in Canada resulted in the death of eight firefighters, up to 15 million hectares burned, and 232,000 Canadians forced to evacuate their homes. Other wildfire impacts include damaged watersheds, animal habitat loss, and destroyed cultural and recreational areas (United Nations Office for Disaster Risk Reduction, 2024).

Australia and Canada's recent wildfire impacts are two distinct international examples of understanding fire resilience in water systems. Australia outlines management actions for preparing before, during, and after a fire. A risk assessment can be conducted to identify water supply vulnerabilities to bushfires. At the same time, local standards can be applied during a bushfire when employing specific fire retardants and various strategies like water quality monitoring post-fire (Smith, 2011).

Canada emphasizes preparing an Emergency Response Plan to identify vulnerabilities, optimize improvements, and take action during an emergency for drinking water systems (Government of Canada, 2024). The ERP should be a proactive document prompting action by including necessary contacts during an emergency, outlining mitigation measures, and emergency response (Government of Canada, 2024). Water systems operators are encouraged to notify the Chief and Council, government agencies, and users depending on the factors related to catastrophes like flooding, earthquakes, and fire. They must inform users of potential water contamination and advise them to boil water for at least two minutes or disinfect it according to directions from local health officials (Government of Canada, 2024).

These two international examples illustrate how different countries approach fire risk to water systems by emphasizing preparedness during and post-fire.

Spain: Invest in Water and Fire Infrastructure & Educational Campaigns

Climate change also poses wildfire threats across Europe, including Greece, Italy, and Spain (Keeley, 2022). In Spain, the municipalities of Riba-roja de Túria and Parterna are situated in urbanized environments surrounded by forests susceptible to wildfires (Climate-ADAPT, 2022). Given their increased vulnerability to wildfires, the municipalities have established fire resiliency strategies to protect key activities in the WUI (Portico, 2023).

The components for deploying its fire resilience strategies include constructing hydraulic infrastructure, implementing green firebreaks, and promoting awareness campaigns and training activities (United Nations Office for Disaster Risk Reduction [UNDRR], 2024). The first strategy is building hydraulic infrastructure to supply recycled water from the wastewater treatment plant to the WUI. Water is distributed through an irrigation and sprinkler tower network to combat wildfires (Keeley, 2022). The second strategy uses green firebreaks, which are low flammable strips of vegetation strategically placed to slow down fires. In addition, they receive water from the hydraulic infrastructure to maintain vegetation moisture (UNDRR, 2023). The final strategy encompasses raising awareness and conducting training activities for school children and residents on fire prevention, climate change impacts, and fire resilience measures for home adoption (UNDRR, 2023).

Japan: Government Guidance and Innovative Infrastructure & Strategy

Japan has the legal and institutional framework for implementing water supply and sanitation services (WSS) to enhance resiliency in natural disasters. The 1961 Disaster Countermeasures Basic Act prompted WSS to strengthen its disaster risk management by planning and implementing risk mitigation and incorporating emergency response procedures based on insights from natural disasters (World Bank Group, 2017). Although droughts, landslides, and earthquakes influence these strategies, some potential transferable lessons could apply. For instance, WSS utilities are encouraged to facilitate a risk assessment and cost-benefit analysis to evaluate and implement cost-effective and technical resilience measures (World Bank Group, 2017). In addition, the Japan Water Works Association and Japan Sewage Works Association established guidelines and a mutual support network in preparation for disaster. There are also subsidies for water supply utilities for risk reduction and disaster recovery from the Ministry of Health, Labor, and Welfare (World Bank Group, 2017).

Japan has some potential strategies for addressing wildfires using innovative water infrastructure. For instance, the Shirakawa Village has a sprinkler system to protect the World Heritage site. Sixty sprinklers are placed around the village to release high-pressure water when heat and smoke activate sensors (Dookeran, 2025). In addition, a Japanese company has been developing a “soap-based fire-fighting foam” that extinguishes fires by using less water (Government of Japan, 2019). The technology offers a potential solution in scenarios where water availability is limited.

Potential Models Outside the Water Sector

Beyond other jurisdictions, water system planners in Los Angeles County may benefit from looking to wildfire and disaster mitigation strategies in different infrastructure sectors such as energy, transportation, and telecommunications. The most intuitive and instructive may be the energy sector, which, in California, appears to be the most heavily regulated regarding disaster preparedness. Under SB 901 (2018) and AB 1054 (2020), electrical utilities regulated by the California Public Utilities Commission must prepare Wildfire Mitigation Plans (WMPs) to manage the risk of wildfire posed by their equipment (AB 1054- CHAPTERED, 2019; SB 901- CHAPTERED, 2018). The plan must include “an overview of...programs, systems, and protocols to support residential and non-residential customers in wildfire emergencies.” Southern California Edison’s 2023-25 WMP lists several customer protections to implement during emergencies, including billing adjustments and extended payment plans for fire-affected customers, suspension of disconnections for non-payment, and deposit waivers for small businesses that need to reestablish their connections (Southern California Edison Company, 2024).

Municipal utilities, such as the Los Angeles Department of Water and Power (LADWP), must also prepare WMPs if they locate their electrical lines in areas at risk of wildfire. LADWP's plan covers fire prevention and response, but dedicates significantly more space to the former. For example, preventative strategies include specific design standards, vegetation management, regular inspection and maintenance, and protocols that specify permitted activities under normal versus red flag conditions. The fire recovery portion of the plan, on the other hand, lists high-level steps to take after a disaster. They include maintaining core services, preparing for state and federal public assistance, and streamlining rebuilding (Los Angeles Department of Water and Power, 2024).

The transportation sector may also offer lessons. Some California jurisdictions specifically plan for emergency preparedness in their transportation infrastructure. Following the 2017 Thomas Fire, Ventura County and Santa Barbara County partnered to develop a Transportation Emergency Preparedness Plan (Ventura County Transportation Commission, n.d.; Ventura County Transportation Commission & Santa Barbara County Association of Governments, 2020). Sonoma County's 2021 Comprehensive Transportation Plan notes roadway improvements in the City of Santa Rosa that, taking lessons from 2017's devastating Tubbs Fire, would enhance evacuation routes in the WUI (Sonoma County Transportation Authority, 2021).

Other tools may also enhance CWS's wildfire preparedness. Microgrids can keep electricity costs low after wildfires (Perera et al., 2023) and may also be less at risk of damage from wildfires than utility infrastructure (Moreno et al., 2022). We also recommend examining opportunities to update the California Building Code and Fire Code with specific provisions for water system preparedness. The codes do not mention CWS (California Fire Code, 2022; California Building Code, 2022). Building on these cross-sectoral strategies and tools, we now turn to concrete steps that small water systems can reasonably take to strengthen wildfire resilience.

Looking Ahead

What Can Small Systems Reasonably Do Next to Enhance Wildfire Resilience?

Assessing Fire Flow & Pressurization

While hydrant flow testing is the standard method for evaluating fire flow and pressurization—measuring actual gallons per minute under conditions that approximate those encountered during unconfined wildfires—it is rarely performed in small systems due to cost, limited hydrant infrastructure, and technical constraints (NFPA, 2024). Reviewing distribution system maps, pipe sizes, and storage capacities can help estimate a system's fire flow potential, though such data is frequently incomplete or unavailable (University of Tennessee, n.d.).

Although ERPs submitted to the SWRCB can offer insight into how systems plan for fire flow capacity and wildfire preparedness, these documents are not centrally maintained or consistently up to date. While not responsible for ERP content, the DWR supports broader resilience planning through drought and groundwater initiatives. Reviewing available ERPs helps illuminate operational limitations and highlights key deficiencies in fire-specific planning. Other potential sources of information, such as local water district reports, county emergency plans, or fire department records, may contain relevant hydrant testing data or anecdotal evidence of past fire suppression challenges. However, access to such data is highly variable.

Given these data limitations, alternative approaches must often be used to estimate fire flow capacity. These include applying pipe diameter and pressure equations to calculate theoretical maximum flow (NFPA, 2022), referencing American Water Works Association (AWWA) fire demand guidelines, and consulting National Fire Protection Association standards. Interviewing residents and local firefighters can help document previous water pressure failures during wildfire events. GIS mapping can also overlay system infrastructure with fire hazard zones to identify vulnerable areas. Hydraulic modeling software offers another proactive approach by simulating pressure drops under emergency demand conditions.

Improving System Resilience

Small water systems face significant challenges in wildfire preparedness, but can take several key steps to enhance resilience, at least on the margins. Improving fire flow capacity is essential, as many small systems lack the infrastructure to provide the sustained water pressure needed for firefighting (UCLA Newsroom, 2025). Upgrading pumps, increasing pipe diameters, and ensuring access to supplemental water sources can improve emergency response (U.S. Fire Administration [USFA], 2008).

Backup water storage is critical to fire protection systems, ensuring an adequate water supply during emergencies. According to the National Fire Protection Association (NFPA), acceptable water sources for fire pumps include reliable waterworks, water storage tanks, and natural sources like rivers, ponds, and lakes (NFPA, 2021). Implementing dedicated emergency water reserves, such as elevated storage tanks or cisterns, is essential for maintaining water availability when power outages or infrastructure damage disrupt normal distribution (NFPA, 2021). Strategically locating these reserves in vulnerable areas enhances their effectiveness, providing a reliable water supply for firefighting efforts and bolstering community resilience.

Engaging in mutual aid agreements, such as CalWARN (California Water/Wastewater Agency Response Network), which is part of the larger WARN (Water/Wastewater Agency Response Network, system, a nationwide mutual aid framework that allows water utilities to assist each other across state lines if needed, allows small water systems to coordinate with neighboring utilities and access shared resources, including personnel, equipment, and emergency water supplies during crises (U.S. Environmental Protection Agency [EPA], 2020). These agreements provide critical assistance during power outages, wildfires, and other emergencies, ensuring that systems without sufficient emergency reserves can still provide water to their communities.

CalWARN, in particular, facilitates rapid mobilization by maintaining an extensive network of utilities across California, offering emergency pumps, generators, and water tankers to affected systems (California Water/Wastewater Agency Response Network [CalWARN], n.d.). Participation in mutual aid networks also streamlines regulatory compliance by helping small systems meet emergency response requirements outlined by state agencies (EPA, 2020). Additionally, these agreements reduce financial burdens by allowing small utilities to access shared infrastructure rather than investing in expensive emergency equipment individually. By leveraging regional partnerships, small and large systems can strengthen their resilience, ensuring continued water service and improved disaster response capabilities. This mutual aid model proved critical during the Eaton Fire in Los Angeles County, where Pasadena Water and Power (PWP) activated emergency protocols and coordinated with regional agencies to sustain service despite damage to critical infrastructure. Crews worked around the clock to assess facilities, and a temporary “do not drink” order was issued while water quality and system integrity were confirmed (AWWA, 2025).

Another strategy to improve resilience is developing interties with neighboring water systems, which allows small utilities to connect to regional networks or larger providers. These interconnections increase redundancy and ensure alternative water sources are available in the event of infrastructure failure or contamination (CalWARN, n.d.). Through these collaborative efforts, small water systems can better prepare for and respond to emergencies.

Public-private partnerships strengthen emergency response capabilities by pooling resources from government agencies, private businesses, and nonprofit organizations. Initiatives like the California Community Foundation’s (CCF) Wildfire Recovery Fund demonstrate how such collaborations can effectively support wildfire resilience and disaster recovery (California Community Foundation, n.d.). By leveraging funding from corporations, philanthropies, and local governments, these partnerships may also help small communities rebuild infrastructure, improve emergency preparedness, and provide aid to vulnerable populations (California Community Foundation, n.d.).In the water sector, partnerships with private water providers, local businesses, and nonprofits can secure investments for system upgrades, workforce training, and enhanced emergency preparedness efforts (Congressional Budget Office, 2022).

Finally, system consolidation can also be an effective long-term strategy. Many small water systems struggle with aging infrastructure, limited technical expertise, and financial constraints that make it difficult to recover from wildfire damage (Dobbin et al., 2022). Consolidating smaller systems into larger regional networks can provide economies of scale, improve water quality management, and enhance overall resilience against wildfire-related disruptions (Dobbin et al., 2022). By implementing these strategies, small water systems can better prepare for wildfire emergencies, ensuring reliable water access for residents and firefighting efforts. Achieving these outcomes, however, depends on local actions, robust regulatory frameworks, and sustained investment, which are essential for supporting small systems in implementing fire resilience strategies.

State Regulatory Action, Legislative Support, and Funding Pathways for Small Water System Improvements

Enhancing resilience in small water systems against wildfire impacts requires carefully weighing the possibility and potential value of legislative action and regulatory solutions, while providing accessible and effective funding pathways for any enhanced resilience (Pierce et al., 2021). Regulatory compliance forms the foundation for sustainable resilience, ensuring water systems are adequately prepared for fire emergencies.

However, resilience mandates alone are insufficient without matched implementation support. Existing programs are fragmented, with varying eligibility criteria, application timelines, and administrative burdens that disproportionately disadvantage small systems with limited staff capacity. A more centralized and coordinated support structure—such as a statewide wildfire resilience technical assistance hub—would better align local needs with available funding and policy resources.

Recognizing that compliance with regulatory requirements necessitates substantial financial investment, several federal and state funding pathways have been established. FEMA administers the Hazard Mitigation Grant Program (HMGP) and the Building Resilient Infrastructure and Communities (BRIC) program at the federal level, funding pre- and post-disaster mitigation projects. These initiatives support slope stabilization, pipeline undergrounding, debris mitigation basins, fire-resistant tank constructions, and emergency monitoring systems beneficial to small water systems (FEMA, 2024). Similarly, the EPA offers complementary support through its Drinking Water System Resilience Program, targeting underserved communities for resilience planning and infrastructure upgrades to mitigate wildfire risks (EPA, 2024). In typical federal circumstances, USDA Rural Development also provides crucial grants and low-interest loans explicitly tailored to rural infrastructure improvements, including fire-resistant upgrades (USDA, 2024).

Yet, while comprehensive in theory, these funding programs often rely on competitive grant models or local match requirements that many small systems cannot meet. Streamlining application processes, reducing cost-share expectations for disadvantaged communities, and pre-allocating funds to high-risk regions could significantly improve access and impact.

At the state level, the Safe Drinking Water State Revolving Fund (SDWSRF) explicitly provides low-interest loans and grants for enhancing fire-resistant infrastructure, including water storage tanks, pipeline reinforcements, and backup power systems (California Department of Water Resources, 2024). California's Small Community Drought Relief Program also funds emergency and temporary infrastructure solutions, which are critical for addressing immediate water supply challenges during drought or wildfire events. Cost-sharing models offered through the Clean Water State Revolving Fund (CWSRF) are particularly beneficial, providing flexible loan terms and loan forgiveness opportunities to economically disadvantaged communities. For example, the Orange County Water District's Groundwater Replenishment System (GWRS) demonstrates how blending CWSRF loans with federal and state grants can fund large-scale infrastructure projects (EPA, 2024). But ultimately, only a small fraction of these programs are directed to firefighting resilience projects, and no mechanism exists to prioritize water systems in wildfire-prone areas. California should consider dedicating a resilience carve-out within SDWSRF and CWSRF allocations to explicitly fund wildfire preparedness projects in at-risk regions.

Effective interagency coordination is clearly crucial to maximize the utility of these regulatory and funding resources. The Interagency Drought & Water Shortage Task Force is key in identifying high-risk communities, coordinating strategic resource allocation, and recommending prioritized funding distributions directly to the State Water Board. Similarly, Local Emergency Planning Committees, as recommended by AWIA, encourage proactive planning and close coordination between community water systems, local fire departments, and emergency responders. This collaborative approach ensures that resources are effectively allocated, enhancing preparedness, minimizing response times, and improving overall resilience to wildfires and other emergencies (AWIA, 2018). However, these coordinating bodies currently lack enforceable authority and consistent statewide engagement. Without mandates or incentives for local participation, interagency coordination remains uneven. A statutory requirement for water system participation in Local Emergency Planning Committees and annual joint wildfire preparedness drills could standardize and operationalize this collaborative intent.

In terms of more specific forms of wildfire requirements and support for small water systems, California's SB 552 provides a critical start in this work in the form of a legislative framework mandating fire resilience measures, including adequate fire flow capacity, emergency water storage, and backup water sources by January 1, 2027 (California State Water Resources Control Board, 2022). Complementing SB 552, the California Fire Code (Title 24, Part 9) further specifies detailed requirements, including minimum fire flow rates, hydrant placement, spacing standards (e.g., hydrants placed within 600 feet of residential dwellings and 400 feet of commercial buildings), and defensible space regulations like vegetation clearance of at least 30 feet, extendable to 100 feet in higher-risk areas to ensure robust wildfire response capabilities (California Fire Code, Sections 301, 304, 507.5, 2022). These regulations and NFPA fire flow standards, such as required minimum flow rates of 500 GPM for residential dwellings and 1,000 GPM for commercial buildings, ensure robust fire preparedness (NFPA, 2024). Yet implementation remains uneven due to a lack of funding, technical capacity, and enforcement oversight. State regulators should conduct annual fire flow compliance audits and offer phased compliance timelines paired with targeted grants to ensure that the most vulnerable systems can realistically meet these mandates.

California Drinking Water Regulations (Title 22, CCR) further protect public water systems through mandated emergency water supply plans, backflow prevention, public notification systems for contamination events, and comprehensive post-fire water quality monitoring and treatment procedures (California Drinking Water Regulations, 2024). These regulations align closely with the California Safe Drinking Water Act, ensuring comprehensive wildfire risk mitigation through enforceable water quality standards and operational requirements (California Drinking Water Regulations, 2024). Still, regulatory alignment does not guarantee field-level integration. Many systems lack the resources to meet post-fire monitoring standards, particularly in remote or low-capacity districts. Integrating post-fire water testing costs into emergency funding programs and deploying mobile testing teams could close this critical implementation gap.

Several pieces of legislation have been introduced in California since the 2025 Los Angeles fires. For instance, recent proposed legislation by Assemblymember Steve Bennett goes above existing frameworks by mandating water districts in high-risk fire zones regularly top off water storage tanks, install reliable backup power systems for pumps, and harden critical facilities against wildfire damage (California State Assembly Democratic Caucus, 2025). This law addresses vulnerabilities observed during past wildfires, where multiple hydrants losing pressure or running dry severely hindered fire suppression efforts. In theory, mandatory post-event reporting by fire departments on water system performance also fosters accountability and continuous system resilience improvements.

However, the passage of this law in its early form may be untenable to comply with, enforce and may lead to major legal and financial liabilities for systems, especially small ones. Thus as with any legislative approach, this bill needs to be refined to the current operating reality of systems and funded accordingly.

Wildfire Vulnerability Index Findings

This analysis evaluated the wildfire vulnerability of all community water systems in Los Angeles County using a composite index that integrates physical exposure, financial capacity, system scale, spatial isolation, and socioeconomic vulnerability and is distinct from other measures discussed in this report. This novel measure was born out of the need to understand the fire hazard posed to community water systems in Los Angeles County, which was illustrated by the January 2025 fires. The index reveals substantial variation across systems and highlights distinct structural patterns that drive wildfire risk across the region (see section 2A of the appendix for full fire vulnerability index ranking).

At the top of the vulnerability index are 25 small CWS with a common profile: extremely limited scale, low financial capacity, high exposure to wildfire-prone landscapes, and weak regional integration. These systems almost universally serve very small populations, with population and service connection scores close to 1.0, and are almost exclusively classified as disadvantaged or severely disadvantaged communities. These scores reflect maximum vulnerability resulting from the minimal operational scale. Financial instability is a major compounding factor for high-scoring CWS. Many top-ranked systems exhibit poor or marginal operating ratios and low days-cash-on-hand scores, indicating limited capacity to withstand wildfire events and recover afterward. Several systems—such as Landale Mutual, Wilsona Gardens, and Rivers End Trailer Park —illustrate the convergence of financial precarity and physical exposure.

Wildland-Urban Interface (WUI) exposure is another consistent characteristic. 11 of the 25 highest-scoring systems serve WUI-classified areas, placing them in fire-prone zones where natural vegetation and development meet. Los Angeles Residential Community Foundation, which is covered almost entirely by WUI but also scored highly on system size and financials, exemplifies this aspect of vulnerability and was included in our consolidation analysis (see Chapter 3).

Spatial isolation was a less consistent predictor of high overall vulnerability. While 14 of the 25 most vulnerable CWS had elevated distance scores contributing to their fire vulnerability index, the remaining eight systems were adjacent to or surrounded by other CWS. Many high-scoring systems remain far from potential receiving systems, limiting their ability to establish regional interties or emergency water-sharing agreements—factors that restrict opportunities for mutual aid and long-term consolidation. Mettler Valley Mutual, located in the isolated northwest corner of Los Angeles County, exemplifies this dimension of vulnerability. The system holds a high WUI score of 0.94, a

DAC designation, elevated financial and system size scores, and appears in the consolidation potential analysis. Lancaster Park Mobile Home Park and Sleepy Valley Water Company also scored highly on the distance variable and are featured in the analysis (see Chapter 3).

Many of these same systems are located in Disadvantaged or Severely Disadvantaged Communities (DAC/SDAC). The intersection of fire exposure, structural weakness, and socioeconomic vulnerability signals an urgent equity issue: the most at-risk systems often serve the communities with the fewest resources. Of the top 25 highest-scoring systems, 22 serve DACs or SDACs. The three CWS that did not carry a DAC or SDAC classification did not report data for this variable.

In contrast, larger municipal and investor-owned utilities, which rank lowest on the vulnerability index, benefit from economies of scale, financial stability, and denser system networks. These systems tend to be located in more accessible and more heavily populated areas, have greater proximity to neighboring systems, and serve more affluent or better-resourced populations.

From this data, three broad categories of systems emerge:

1. Isolated Mutuals and Trailer Park Systems: These systems dominate the top 25 and reflect the highest levels of vulnerability across every dimension. They are often located outside of major population centers, have minimal governance infrastructure and are especially prone to fire-related disruption due to a convergence of vulnerability factors.
2. Small Rural Public Systems: These systems show a mix of vulnerabilities. They are moderately to highly vulnerable in terms of size, distance, and service area terrain but are sometimes more financially stable or slightly better connected.
3. Urban Utilities and Major Providers: These systems consistently score lowest on the index, reflecting their superior financial, infrastructural, and geographic positioning.

The top 25 systems encapsulate the most acute forms of vulnerability observed across Los Angeles County. They are disproportionately small, financially fragile, socially disadvantaged, and geographically isolated, and their convergence of risk factors is far more pronounced than in the county's broader water system landscape. Most systems countywide fall near the middle of the index, but the distribution skews heavily at the top, where the highest-scoring systems cluster across multiple dimensions of vulnerability. This pattern underscores that fire vulnerability is not the product of a single condition, but rather the intersection of scale, exposure, financial health, and community context, with the most at-risk systems displaying compounding weaknesses across nearly every metric captured in this analysis. Many aspects of vulnerability included in the fire vulnerability index intersect with those of vulnerability included in the drought risk index in Chapter 3. Five of the ten systems listed as “critical risk” in the drought index are also among the 25 most fire vulnerable systems. Each of these systems–The Village Mobile Home Park, Mitchells Avenue E Mobile Home Park, Mettler Valley Mutual, Western Skies Mobile Home Park and the Los Angeles Residential Community Foundation–are profiled as the Case Studies at the end of this report.

Conclusion

This chapter assesses the wildfire vulnerability and preparedness of small community water systems in Los Angeles County, focusing on how physical exposure, institutional capacity, and socioeconomic disadvantage intersect to shape risk. Through developing and applying a composite Fire Vulnerability Index, we identified which systems are most susceptible to wildfire-related disruption due to intersecting deficiencies in physical infrastructure, emergency planning, and institutional capacity. California's escalating wildfire crisis has exposed a critical vulnerability in the state's infrastructure: the inability of small community water systems to meet the demands of wildfire preparedness, suppression, and recovery. These systems, which often serve rural areas, mobile home parks, and historically underserved communities, face a convergence of risks that dramatically increase their likelihood of failure during fire events. Through developing and applying a composite Fire Vulnerability Index, we identified intersecting deficiencies in physical infrastructure, emergency planning, and institutional capacity that leave many of these systems exposed to fire-related (and other disaster-related) disruption.

The systems ranked highest on the vulnerability index tend to be small, isolated, financially precarious and serve socially and economically vulnerable populations. These systems operate with limited technical and financial resources and often lack proximity to neighboring systems that could offer emergency interconnections or mutual aid. The analysis revealed that many of the most vulnerable systems are also situated in disadvantaged or severely disadvantaged communities. This intersection of systemic underinvestment and wildfire exposure presents a significant equity challenge.

The pervasive absence of fire-specific provisions in ERPs is equally concerning if we are serious about supporting small systems to take on wildfires, in full or in part. Even in systems located in high-risk fire zones, ERPs often meet only the bare minimum state regulatory requirements and focus on contamination and earthquake response while omitting fire flow benchmarks, operational strategies to sustain pressure during fires, or coordination protocols with local fire agencies. This failure to translate known risks into actionable plans reflects broader regulatory gaps and a lack of state-level enforcement mechanisms. Senate Bill 552 (2021) marks an important step towards addressing these deficiencies by requiring fire flow compliance and emergency supply planning. However, the staggered timelines and ambiguous enforcement structure mean many systems will remain unprepared for years. More broadly, these challenges underscore the urgent need for a coherent preparedness framework that integrates wildfire resilience into emergency planning and water infrastructure design. Without enforceable policies that link funding, technical assistance, and clear performance benchmarks to preparedness expectations, small systems will continue to face structural disadvantages that leave them vulnerable to the accelerating pace and intensity of wildfires.

While local efforts and best practices such as mutual aid agreements, backup storage expansion, and interties offer promising paths forward, they are also challenging to implement without state technical assistance and financial support. Models from Northern California (such as EBMUD's wildfire mitigation strategies), Oregon (via AWIA-aligned ERPs), and international case studies (including Japan's automated sprinkler infrastructure and Spain's recycled water deployment) illustrate that some degree of effective resilience planning is possible. However, replicating these models in small, decentralized, and often volunteer-run systems requires targeted investment, regional coordination, and a rethinking of how emergency planning standards are developed and enforced.

Los Angeles County is responsible for addressing urgent infrastructure needs through funding, technical assistance, and regulatory reform while also building a long-term planning framework that integrates fire resilience into every facet of water system management. This includes establishing minimum fire flow and backup supply requirements for all systems, mandating fire-specific ERP components, expanding CalWARN participation, and incentivizing consolidation or interconnection in regions with clustered vulnerabilities. Without these measures, the state risks perpetuating a status quo in which the communities least equipped to recover from wildfire will most likely continue to face its impacts.

This analysis offers a novel and policy-relevant framework for evaluating wildfire vulnerability in small community water systems, but it has several limitations. The Fire Vulnerability Index assigns equal weight to all variables, which may obscure the outsized impact of specific factors like WUI exposure or financial insolvency. Future research should explore weighted or stakeholder-informed versions of the index. Additionally, using WUI as the sole fire risk indicator may under represent vulnerability in areas with high vegetative fuel loads but low WUI classification. The index also excludes other key dimensions such as racial and linguistic isolation or public health burdens, which may influence recovery outcomes but fall outside California's DAC definition. Finally, the index is static and based on currently available data. As wildfire risk evolves with climate, land use, and investment, future work should develop dynamic or regularly updated tools and explore how this index and our broader review can support targeted funding, ERP reform, resilience, and regional consolidation strategies.

Many of the systems most vulnerable to wildfire also face serious threats from water shortages and long-term drought. These overlapping challenges further strain their already limited infrastructure and institutional capacity. When systems lack emergency planning, interties, and adequate supply during fire events, they reveal a broader fragility that leaves them unprepared for prolonged dry periods. To build comprehensive resilience strategies, planners and policymakers must recognize how these risks intersect. Chapter 3 analyzes how drought and water shortage risks deepen existing vulnerabilities and identifies small systems that may benefit from consolidation or regional support to ensure reliable service under worsening climate conditions.

Recommendations

Here we list several policy recommendations based on our research and findings.

1. **Establish statewide minimum fire flow requirements for all community water systems.** California currently defers fire flow standards to local jurisdictions which leaves significant gaps for small systems. A uniform baseline that accounts for system size and fire risk would provide clarity and ensure minimum fire fighting capacity county-wide.

2. **Encourage routine fire flow testing and infrastructure audits for small water systems in the WUI.** While larger utilities often conduct regular hydrant flow tests, many small systems lack the resources or protocols to do so. Establishing a requirement for periodic fire flow testing (potentially tied to eligibility for state technical or financial assistance) could help identify critical system deficiencies before emergencies occur and improve overall preparedness.

3. **Make wildfire planning capacity more clearly eligible for SRF and Proposition funds, and develop new funding pots for this purpose.** State infrastructure funds can overlook operational resilience. Enabling and in some cases requiring funding applicants to demonstrate fire planning (mutual aid agreements, for example) would embed expectations and feasibility for resilience into state funding mechanisms.

4. **Create a dedicated wildfire technical assistance fund for small systems.** Even modest investments in infrastructure (eg., hydrants, backup generators, interties) can meaningfully improve outcomes during wildfires. A dedicated technical assistance fund would help small systems overcome financial barriers to enhance urban fire and wildfire resiliency.

5. **Mandate and fund the ability of small CWS in high-WUI areas to maintain backup pressurization measures.** Fires can disrupt electric pumps and leave systems unable to maintain flow. Systems in high-WUI areas should be required to maintain gravity-fed tanks or backup pressurization measures, sized to meet an ideal minimum period of uninterrupted service. High-WUI can be defined as above 18% of service area coverage; no systems with less than 18% WUI coverage have experienced fire in their service area since 2015.

6. **Develop and disseminate wildfire response toolkits tailored to small CWS.** Existing resources like the EPA's wildfire checklist are underused. A Southern California-specific toolkit developed with input from small and/or rural operators should be distributed with training (through organizations like the Rural Community Assistance Corporation).

7. **Require that any new small CWS demonstrate fire resilience in permitting processes.** State and county permitting authorities should condition approval of new systems in high fire risk areas on operators being able to demonstrate fire flow, backup power and coordination standards.

8. **The Fire Vulnerability Index in this report should be refined and updated.** The fire vulnerability index contained in this report is a novel, experimental measure and should be treated as such. Although we believe its findings to be a useful indication of CWS fire vulnerability, its accuracy and usefulness could be improved upon with better data and a more customized approach to the fire risk variable. More detailed spatial data on built and natural fuels in LA County–possibly using LIDAR or image analysis in a GIS–would lend greater accuracy to the fire risk variable. Additionally, any future analyses should use the most recent available data as the financial, demographic and geographic profiles of CWS will change over time.

9. **Centralize and standardize Emergency Response Plans (ERPs) with fire-specific requirements.** Require all small CWS to submit ERPs to a centralized state database with standardized wildfire-specific components. ERPs must include:

a. Defined fire flow benchmarks and minimum operational pressure thresholds.
b. Interagency coordination protocols with local fire and emergency management authorities.
c. Clear emergency water prioritization strategies during fire events.

10. **Tie CalWARN participation and mutual aid preparedness to funding eligibility.** Require that all small CWS seeking wildfire-related state or federal funds must:

a. Be active participants in CalWARN or equivalent mutual aid networks.
b. Have formal mutual aid and emergency coordination agreements in place.
c. Conduct at least one annual joint wildfire readiness exercise with partner agencies.

11. **Establish a statewide wildfire water infrastructure audit program.** Create a mandatory wildfire infrastructure audit program for small community water systems in high-risk zones. The audit would:

a. Evaluate system vulnerability based on factors such as hydrant spacing, pipe diameter, storage capacity, elevation challenges, and power backup reliability.
b. Identify gaps in physical and operational readiness for wildfire response.
c. Be conducted every five years by certified third-party assessors or regional technical assistance providers.
d. Be used to develop prioritized improvement plans tied to funding eligibility and compliance timelines.

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Chapter 3

Assessing Small Water Systems Affected by Drought & Water Shortage Risk and the Cost of Potential Solutions

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Background on State Requirements for Small System Drought Preparedness

Introduction

Drought is a slow-onset natural hazard during which prolonged periods of below-average precipitation diminish water availability across ecological, agricultural, and urban systems. Unlike other natural disasters such as floods or wildfires, the onset and end of a drought are difficult to pinpoint, and its impacts often unfold silently but severely. More than a simple lack of rainfall, drought is a multi-dimensional phenomenon that includes not only meteorological deficits but also cascading effects on soil moisture, surface and groundwater levels, and human systems. In California, where variable hydrology and periodic dry spells define the climate, drought can significantly disrupt water supply, food production, energy generation, and local economies (California DWR, 2025; NOAA & NIDIS, n.d.).

Droughts are commonly organized into four categories: meteorological, agricultural, hydrological, and socioeconomic (Mishra & Singh, 2010). California defines drought broadly as when water demand exceeds supply due to climatic conditions and water system constraints. The state assesses drought severity through a combination of hydrologic indicators, such as reservoir levels and snowpack, and socio-economic impacts (California DWR, 2025).

Drought can be especially devastating for small community water systems (CWS)—those serving fewer than 3,000 service connections. These systems often lack the technical, managerial, and financial (TMF) capacity to adapt to prolonged water shortages. As a result, even moderate dry periods can lead to severe service disruptions, reliance on emergency water supplies, or system failures (Hanak et al., 2015; Klasic et al., 2022).

This chapter assesses drought risk and consolidation feasibility for LA County's small CWS. After providing background about California's Senate Bill 552, which established drought-preparedness requirements for small CWS, the chapter presents a water shortage risk assessment, producing a list of systems that appear especially at risk of running out of water. It then analyzes the physical costs of consolidating these CWS with receiving systems that are more drought-resilient, and considers policy interventions beyond consolidation. Combined with the CWS that scored the highest in Chapter 2's wildfire vulnerability index, the top systems at risk of water shortage form the basis of this report's final section, which presents case studies focused on options for policy intervention.

Senate Bill 552 (2021)

California lawmakers drafted Senate Bill 552 (2021) to recognize the extreme and inequitable vulnerabilities that small water suppliers and rural communities face during drought. Regulations pre-dating SB-552 did little to protect these systems against potential water shortages, and during drought events, they suffered.

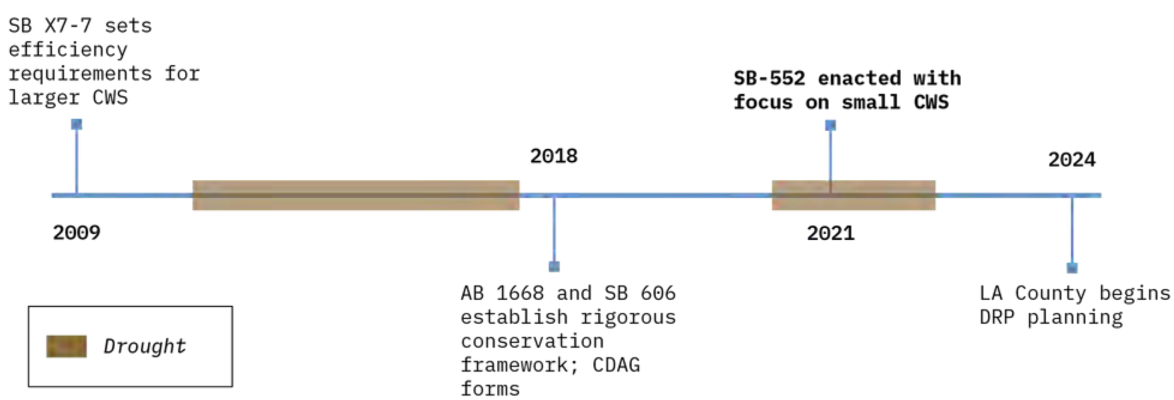
A key example was the historically severe 2012-2016 drought, which disproportionately affected small CWS due to inadequate supply, limited organizational capacity, and overreliance on groundwater (Griffin & Anchukaitis, 2014; Lund et al., 2018). During this drought, some small systems depended on emergency measures such as bottled water distribution and trucking supplies (Hanak et al., 2015). In East Porterville in Tulare County, approximately 1,000 households had reported dry wells by April 2015 (Glenza, 2015). Some small CWS struggled to balance conservation with the need for increased revenue to fund system upgrades (Klasic et al., 2022).

Media accounts of the drought highlighted financial and infrastructural weaknesses (Lurie, 2015) and geographic and economic inequities. "You should not be penalized and live in conditions with unaffordable and toxic water because you're rural," one advocate told a journalist (Lohan, 2017). Small CWS managers were overworked and struggled to retain staff and maintain TMF capacity (Glenza, 2015). Small systems that had deliberately built TMF capacity before the drought were more resilient, but these were the exception (Klasic et al., 2022).

Larger systems fared better during these dry years, partly because they were required to and were thus better prepared. California CWS serving 3,000 connections or more must comply with regulations that ensure drought preparedness. For years, these systems have published Water Shortage Contingency Plans (WSCPs) as part of their Urban Water Management Plans (California DWR, 2025b). They must also comply with the Water Conservation Act of 2009, or SB X7-7, which establishes efficiency requirements for CWS serving more than 3,000 end users (California DWR, n.d.). In 2018, lawmakers established an even more rigorous conservation framework requiring large systems to implement efficiency measures such as appliance upgrades, water reuse, and conservation mandates (Friedman, 2018; Hertzberg, 2018).

Before SB-552, small water systems—those serving fewer than 3,000 connections—lacked similar mandates or guidelines. In response to this disparity, in 2018, the Department of Water Resources (DWR) formed the County Drought Advisory Group (CDAG) to develop drought planning recommendations for three categories of water systems not covered by existing regulations: small CWS, state smalls, and domestic wells. Over several years, the CDAG worked with state agencies and external stakeholders to determine the needs and vulnerabilities of these smaller systems (County Drought Advisory Group, 2018). The resulting report formed the basis of SB-552 (Department of Water Resources, personal communication, March 14, 2025), which Governor Gavin Newsom signed into law on September 23, 2021 (Hertzberg et al., 2021).

Figure 1: Legislative and Hydrological Context for SB-552



Source: California DWR, 2025; California DWR, n.d.; Friedman, 2018; Hertzberg, 2018; Hertzberg et al., 2021.

In the midst of major droughts in the 2010s and 2020s, California enacted laws aimed at improving urban water conservation. SB-552, passed in 2021, established drought-preparedness requirements for small CWS.

SB-552 Requirements: The Basics

SB-552 divides responsibilities among the state, counties, and small CWS (California DWR & SWRCB, 2022). In terms of planning, counties are responsible for the smallest systems: state smalls, domestic wells, and, to a lesser extent, CWS with fewer than 1,000 connections. They must prepare a Drought Resilience Plan (DRP) and establish a standing drought task force to advance drought and water shortage preparedness (California DWR, 2025a). The county can prepare the DRP as a standalone document or incorporate it into existing plans, such as a local hazard mitigation plan, emergency operation plan, climate action plan, or general plan (California DWR, 2023). While the task force is explicitly required to plan for state smalls and domestic wells, many counties, including Los Angeles, meet the requirement with a task force that addresses a broader set of at-risk systems (Department of Water Resources, personal communication, March 14, 2025).

Under SB-552, small CWS responsibilities differ based on system size. While CWS with greater than 1,000 connections must draft an abridged Water Shortage Contingency Plan (WSCP), those with fewer need only incorporate drought planning elements into their emergency notification plan (ENP) or emergency response plan (ERP) (Hertzberg et al., 2021). Small CWS are only required to have ENPs, which are much less detailed than ERPs. In theory, an ENP's drought planning elements should resemble those that appear in a WSCP, but as discussed in Chapter 2, many small systems' ERPs or ENPs lack that kind of detail. As discussed in Chapter 2, California has no system for tracking these documents or meeting this requirement, limiting the effectiveness of either ENPs or ERPs in drought planning and response (Department of Water Resources, personal communication, March 14, 2025).

Table 1 (p.185) compares requirements for small CWS with fewer than 1,000 connections and those with more than 1,000 connections.

Table 1: Drought Planning Requirements for Small CWS under SB-552

Requirement Deadline	**>1,000** connections	**<1,000** connections
Annual Water Supply and Demand Reporting through eAR No mandated deadline	Required	Required
Abridged Water Shortage Contingency Plan (WSCP) July 1, 2023	Required	Not required
Drought Planning Elements for Emergency Notification Plan (ENP) or Emergency Response Plan (ERP) No mandated deadline	Not required	Required
Well Monitoring January 1, 2023	Required	Required
CalWARN Membership January 1, 2023	Required	Required
Backup Power and Water Supply January 1, 2024 (power) & January 1, 2027 (water)	Required	Required
Water Metering and Leakage Monitoring January 1, 2032	Required	Required
Meet Fire Flow Requirements January 1, 2032	Required	Required

Source: Hertzberg et al., 2021.

Under SB-552, every small CWS must follow most of the same requirements. A key exception is the Abridged WSCP, which only CWS with more than 1,000 connections must adopt.

LA County's Progress on State Requirements

As outlined above, small CWS and counties share responsibilities under SB-552. This section reviews the progress made by Los Angeles County and its small CWS in fulfilling those obligations and examines the challenges small systems may face as compliance deadlines approach.

Progress: Small CWS Responsibilities

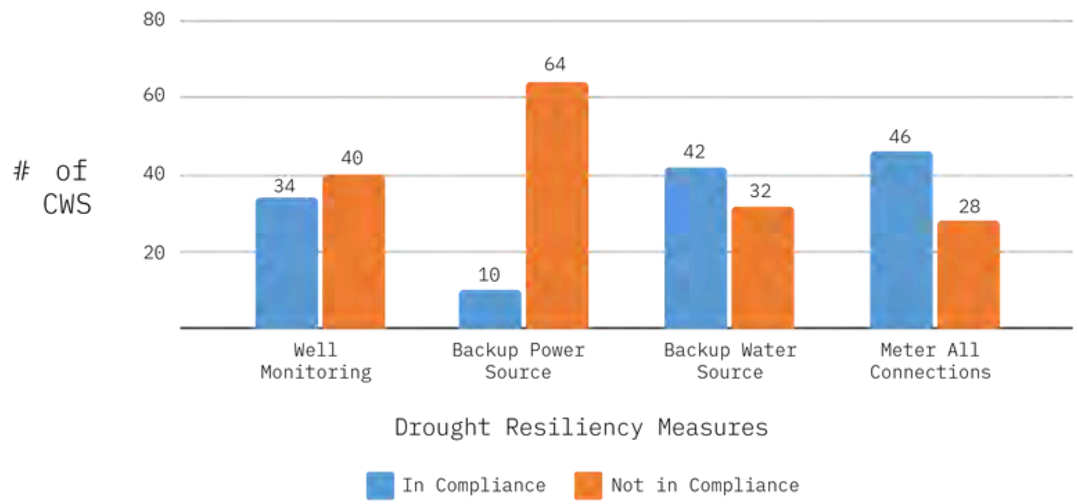
Small CWS in LA County have made moderate progress in meeting their SB-552 responsibilities. However, the data we relied on to make that judgment are incomplete and unavailable for recent years.

In 2022, the SWRCB administered a Drought Cost Assessment to estimate the cost of small CWS fulfilling SB-552's drought resiliency measures (SWRCB, 2022). The assessment records the progress made by small CWS towards four drought resiliency measures: well monitoring, backup power, backup water, and metering for all service connections. In LA County, available data covers only 74 CWS with fewer than 1,000 connections.

Of those 74 systems, 54% lack the equipment to regularly monitor well production or capacity (required by 2023), while 86% do not have a backup power supply (required by 2024). Forty-three percent of these systems do not have a backup water supply in the form of a new well or intertie (required by 2027), and 38% do not monitor water usage for all their service connections (required by 2032) (SWRCB, 2022). A consultant with the Rural Community Assistance Corporation who works with CWS across the state told us that even a sounder for well monitoring, which retails around $1,000, "can be a squeeze" for small systems, and that non-portable backup generators are prohibitively expensive. Regarding SB-552 compliance in general, "anything that costs either staffing hours or money" is a burden (Rural Community Assistance Corporation, personal communication, March 13, 2025).

Figure 2 (p.187) illustrates these 74 systems' compliance with the four measures from the cost assessment.

Figure 2: SB-552 Compliance Progress Among Small CWS in LA County (2022)



Source: SWRCB 2022 Drinking Water Needs Assessment Drought Infrastructure Cost Assessment

Figure 2 shows progress in fulfilling four requirements under SB-552 for 74 small CWS in LA County with <1,000 connections as of 2022. SWRCB excluded fire protection requirements from its analysis because of "the lack of available machine-readable asset inventory and local fire protection requirements."

Progress: LA County Responsibilities

The County's primary responsibilities under SB-552 are 1) establishing and running a drought task force and 2) drafting a DRP. The County and its contractors are in the early stages of what they expect to be a 15-month process that started in late 2024 (Stantec, personal communication, March 19, 2025).

Led by DPW, the County established several task forces under the County Water Plan in April 2024, including the Small, At-Risk Water System Task Force (Los Angeles County Department of Public Works, 2024a). This task force held its kickoff meeting in September 2024 with participants from water systems, government agencies, community organizations, and academics. The task force includes an SB-552 working group, whose responsibilities include developing the County's DRP (Los Angeles County Department of Public Works, 2024b).

Although DPW is the lead agency in DRP development, the County has contracted the consulting company Stantec to prepare a plan (Los Angeles County Department of Public Works, 2024a). Stantec will incorporate a risk assessment and short-term and long-term response and mitigation strategies to address the potential impacts of drought and water shortages for state smalls and domestic wells in the DRP (Los Angeles County Department of Public Works, 2025). Other counties that have hired consultants to lead the technical development of their DRP include Mendocino County, which hired EKI Environment and Water, Inc. The County released a draft DRP in March 2025 (EKI Environment & Water, 2025) and is now accepting public comment (County of Mendocino, 2025).

LA County's DRP must include details about consolidation for state smalls and domestic wells and provisions related to emergency drinking water solutions. It must also outline implementation steps and explain how local, state, and federal sources can fund implementation (California DWR, 2023). Stantec relies on DWR's Water Shortage Vulnerability Tool to assess risk. The team is also drawing on existing regional plans—such as the County's 2024 Climate Action Plan and the 2020 All-Hazards Mitigation Plan—to inform potential vulnerabilities and solutions for the smallest of the County's water systems (Stantec, personal communication, March 19, 2025).

Based on our conversation with Stantec engineers, Table 2 (p.188) lists the County's SB 552 responsibilities and progress.

Table 2: LA County Progress in Meeting its SB-552 Responsibilities

Task	Status
Establish a standing county drought and water shortage task force, or an alternative process for small water systems and domestic wells by January 1, 2022	Completed*
Assess potential drought and water shortage risk for the systems in the plan	In progress
Provide emergency and interim drinking water solutions in the County Drought and Water Shortage Risk Mitigation Plan	In progress
Consider consolidations for existing water systems and domestic wells in the plan	In progress
Consider domestic well drinking water mitigation programs in the plan	In progress
Consider a step analysis to implement the plan	In progress
Consider analyzing local, state, and federal funding sources available to implement the plan	In progress

**with the Water Plan Small, At-Risk Water Systems Task Force*

Source: Interview with Stantec consultants.

The County is in the early stages of meeting its SB 552 requirements. It has contracted with the consulting firm Stantec to draft its DRP, which will be aimed at mitigating drought risk for state smalls and domestic wells.

Learning from Small CWS Drought Planning in Neighboring States

California is not alone in requiring small CWS to improve drought preparedness. This section gives an overview of drought planning in other states in the western and southwestern U.S., which face similar water shortage challenges as Southern California.

Some state requirements are, in certain respects, stricter than California's. For example, Arizona requires all CWS, regardless of size, to include drought-planning elements in their “system water plan,” which goes beyond SB 552’s minimum requirement that the smallest systems include drought-planning elements in ENPs. In other states, drought planning for the smallest CWS is recommended, but not required. In Utah and Nevada, CWS with fewer than 500 connections are excluded from some drought-planning and conservation requirements, which implies less oversight for systems that are potentially most at risk of water shortage.

Arizona

In 2005, the Arizona Drought Preparedness Plan established drought planning requirements for CWS. All CWS in Arizona must update and submit their “system water plan” every five years to the Arizona Department of Water Resources (ADWR). The system plan includes sections on water supply, drought preparedness, and conservation (Arizona Department of Water Resources, n.d.).[1]

All CWS must submit the system water plan and its three components regardless of system size. State guidance considers the water supply component a “good foundation” for the drought preparedness component, as it requires a detailed inventory of water supply and infrastructure, and regular data reporting. As for the drought component, the guidance is explicit: “The Drought Preparedness Plan is not an emergency response plan, although emergency response should be one component of the plan. The purpose of the Drought Preparedness Plan is to prevent a drought/water shortage emergency.” The only difference between large and small systems is reporting cycles and due dates, with small systems due the year after large systems (Arizona Department of Water Resources, 2021).

Utah

Utah’s Division of Water Resources prepares the Drought Response Plan as a framework for state actors to coordinate and address drought emergencies (Utah Division of Water

1 The water supply section details service area, transmission facilities, and monthly system production data (ADWR, 2021). The drought preparedness section outlines drought and emergency response strategies, including how to educate the public about drought stages (ADWR, 2021). Although this section incorporates an emergency response plan, its purpose is to prevent drought and water shortage emergencies (ADWR, 2021). The conservation section outlines how to increase efficiency, reduce water waste, and raise community awareness of water conservation (ADWR, 2021).

Resources, 2022). It also encourages jurisdictions to develop locally specific drought mitigation plans (Utah Division of Water Resources, 2021).

In Utah, the Water Conservation Act mandates that each public water system with more than 500 connections submit an updated conservation plan every five years. The plan must include information on water conservation goals and implementation, water rate structure, and details on water loss. Systems that fail to submit a plan every five years will be classified as non-compliant and ineligible to receive state funding. Systems with fewer than 500 connections are not required to submit a plan (Utah Division of Natural Resources, 2025).

Nevada

In 1991, Nevada established laws for municipal, industrial, and domestic water suppliers to adopt conservation plans to support local drought planning (Nevada Department of Conservation and Natural Resources, 2015). The Nevada Revised Statutes (NRS) 540.121 through 540.151 specify content requirements of plans, processes, and schedules for public water systems (Nevada Division of Water Resources, 2024).

NRS § 540.141(2)(a) requires any system with 500 or more connections to incorporate a drought contingency plan into its water conservation plan to ensure a reliable supply during extended dry periods. NRS § 540.145 calls for calculating water loss based on the system size. Systems with fewer than 15 service connections are exempt from conservation requirements (Nevada Division of Water Resources, 2024).

New Mexico

New Mexico's 2001 water conservation guide includes water conservation and drought contingency planning that all CWS can implement, but advises tailoring selected elements to the local community. CWS are encouraged to prepare in advance by developing an Emergency Action Plan for Drought Management, including supply constraints, criteria for triggering a drought response, and forming a drought task force (New Mexico Office of the State Engineer, 2001).

In 2023, the state legislature passed the Water Security Planning Act, given a projected water shortage, newly available funding opportunities, and the urgent needs of rural CWS (New Mexico Office of the State Engineer, 2023).

Oregon

The Oregon Health Authority requires CWS to serve 3,300 people or fewer to develop an ERP system for system employees to consult during emergencies. As is true for all states, for CWS serving more than 3,300 people, the ERP must align with the America's Water Infrastructure Act (AWIA), which requires a risk and resilience assessment (Oregon Health Authority, n.d.).

The Oregon Health Authority also provides EPA resources that water systems can reference when preparing for and responding to drought. The Oregon Department of Emergency Management developed the Local Water Supply Emergency Planning Guidance to inform local agencies on drought and water considerations (Oregon Health Authority, n.d.), such as identifying vulnerable systems, reviewing existing drought contingency plans, and reducing demand (Oregon Department of Emergency Management, 2023).

Colorado

Colorado has developed various resources for drought contingency planning. The 2018 Colorado Drought Mitigation Response Plan includes directions for monitoring drought, evaluating impacts, and addressing and mitigating such conditions (Colorado Water Conservation Board, 2018). In 2020, the Colorado Water Conservation Board developed its Drought Management Planning: A Guide for Water Providers and tailored it to meet the needs of local water providers and planners (Wood Environment & Infrastructure Solutions, Inc. & INTERA, 2020).

The guide recommends conducting a drought vulnerability assessment, drought monitoring, and selecting appropriate drought mitigation and response strategies. It also proposes a framework for administering the plan and includes a detailed template and worksheet that CWS can use to develop their plans (Wood Environment & Infrastructure Solutions, Inc. & INTERA, 2020).

Establishing a Threshold of Concern for At-Risk Systems

Background & Literature Review

To assist the County in its County Water plan-mandated and SB-552 adjacent requirements for small CWS, our team at UCLA conducted a threshold of concern analysis for all small systems in LA County. We aimed to identify small CWS at risk of water shortage and assess their physical consolidation potential.

Our threshold of concern analysis for small CWS in LA County identifies water systems that are especially vulnerable to drought or water shortage. This status might make them suitable candidates for consolidation by larger nearby systems. Developing the analysis involved several steps. First, we selected indicators – variables that might contribute to a system's risk of running out of water. Second, we assigned weights to those indicators. Third, we developed a scoring system whose range included our threshold of concern. Beyond that threshold, a system would become a potential candidate for consolidation.

There is a fairly robust literature that uses, assesses, and develops drought indices for evaluating water shortage risk in various parts of the world. However, it is not often specific to small regulated systems, which is our focus in this report. These indices were helpful as a guide in our selection of indicator categories, offering two main takeaways:

1. Physical availability metrics alone (e.g., per capita supply, climatic variability) often fail to capture water risk's social, economic, and spatial dimensions (Sullivan, 2002; Ohisson, 2000).
2. Common drought indicators comprise several main categories: natural system assessment, planning and allocation, and operational management (Wenxin et al., 2022). Pedro-Monzonís et al. found an overall absence of unified frameworks to select appropriate indicators across diverse hydrological, socio-economic, and policy contexts (2015).

While broadly instructive, these indices lack the specific approaches we need in the LA County context, whose combination of arid and semi-arid climates, variety of land uses and population densities, variable topography, and focus on small CWS calls for a tailored risk assessment approach. Frameworks for assessing water system performance more generally often take a global or national perspective, emphasizing either developing nations in particular (Haider et al., 2013) or regions like the Middle East and North Africa, South Asia, and Africa in general (Hussain et al., 2022). Few existing indicator frameworks address small systems, whose capacity to measure indicators may be limited (Haider et al., 2013). Performance frameworks from the American Water Works Association (Miner, 2008), Australia's National Water Commission (NWC, 2012), and other national and international entities address drought only indirectly, listing indicators having to do with water availability, service interruptions, and infrastructure constraints (Haider et al., 2013).

This peer-reviewed literature supports the suitability of some of the broad indicator categories we used in our analysis, such as those dealing with overall water supply and operational issues, such as service interruptions. It also points to the need for more context-specific analyses, such as the one we put forth below.

The primary source we drew from for our threshold of concern analysis closely addresses our specific context: DWR's 2024 *Drought and Water Shortage Vulnerability Assessment Update*, which assesses vulnerability for small systems and rural communities in California. DWR defines vulnerability as "the combination of environmental, sociological, and structural factors that make it more or less likely for people, organizations, or other assets (i.e., water systems) to be harmed when they are exposed to a hazard" (Ekstrom et al., 2025). In the first iteration of this assessment, DWR developed its indicators based on many in-person meetings and online technical sessions with the diverse stakeholders involved in the 2018 CDAG, and updated its scoring and metrics based on conversations with groundwater engineers, geologists, county planners, climate scientists, and other water experts.

The 2024 update builds on prior assessments mandated by Assembly Bill 1668 (2018) and Senate Bill 552 (2021), which required the state to evaluate vulnerabilities in small water suppliers and rural communities. The report incorporates the latest data sources, spatial analysis techniques, and climate projections to assess physical, environmental, and organizational factors contributing to water shortages.

Our methodology also aligns with state policies, including the SGMA and the SAFER program for safe drinking water. In addition to the DWR technical report, the analysis uses the State Water Resources Control Board forecasting model as a second key source. Furthermore, the team met with three external experts, two from the DWR and one from the State Water Resources Control Board, and presented and received feedback from the LA County Small, At-Risk Water Systems Task Force. The UCLA resilience assessment aims to identify small water systems at the highest risk of running out of water supply and subsequently considers their potential for consolidation, among other solutions.

Methodology

This study first considers the threshold of concern risk assessment when categorizing risk indicators into three components: climate change impacts, environmental and groundwater conditions, and water system infrastructure. Key indicators included projected temperature increases, wildfire risks, groundwater depletion trends, infrastructure resilience analysis examining interties, water source availability, and service disruption records. After extensive conversations with experts, we refined our approach to focus on resilience as a key organizing principle, particularly in small water system consolidation.

The risk indicators follow a structure that addresses the specific needs of small water systems pursuing consolidation under the new resilience-focused framework. These include groundwater decline, source capacity, and supplier size—factors that may determine a system's need to integrate into regional infrastructure. Small systems seeking consolidation prioritize reliability, interconnection potential, and redundancy, particularly in the face of climate-driven supply disruptions. While previous assessments considered broader systemic risks, this refined approach focuses on actionable consolidation pathways, where small systems can effectively improve their resilience through strategic partnerships and infrastructure investments by concentrating on key physical, environmental, and infrastructure risks.

The updated assessment synthesizes multiple dimensions of water system risk, aiming to help state and local agencies and small water systems plan for future water shortages and direct resources where they are needed most. The results are presented to support technical assistance and funding decisions for small water systems at the highest risk.

Risk Indicators and Composite Score

The resilience-based framework treats all risk indicators as interconnected factors contributing to a system's ability to sustain operations under stress. Each indicator is weighted differently to create a composite resilience score, reflecting its relative impact on system performance. Each weight reflects insights gained through a substantial technical literature review, expert feedback, and conversations aimed at building a threshold for small water system consolidation. Rather than categorizing risks separately, this approach evaluates all contributing factors within a single scoring structure.

Based on a review of the literature and expert input, groundwater decline and intertie presence are the highest, at 20%, due to their outsized role in system reliability and supply continuity. Emergency intertie capacity follows at 15% as a measure of backup support. Supplier size, source capacity, and drought impact are each weighted at 10% to reflect core system characteristics and external stressors. Bottled water reliance, distribution outages, and surrounding land use are each weighted at 5% to account for additional system strain. This scoring framework identifies system vulnerabilities and guides consolidation and infrastructure action decisions.

Table 3: Risk Indicators and Composite Score Weighting

Indicator	Data Source	What it Measures	Weight
Groundwater Decline	DWR 2024	Groundwater level decline (ft). (2003-2024)	20%
Interties	SAFER Risk Assessment	Presence of interties.	20%
Emergency Interties	SDWIS 2024	Presence of emergency interties	15%
Supplier Size	SWRCB SABL_Plus	Inverted count of service connections as a proxy for the size of the staff managing the water system	10%
Source Capacity Violations	SAFER Risk Assessment, 2024	Presence of a source capacity violation	10%
Shortage: Drought Impacted Experienced	SWRCB Division of Drinking Water	Estimation of what water systems were impacted by the 2021/2022 drought	10%
Distribution Outages	eAR Reporting Year 2023	A count of distribution impacts related to water outages	5%
Shortage: Bottled/Hauled Water	SAFER Risk Assessment, 2024	Water systems with a record of receiving bottled and/or hauled water to augment the water supply	5%
Surrounding Land Use	DWR (2024b), DWR Land Use 2022	% of land use dedicated to agriculture	5%

Source: Data sources used in this analysis were pulled from the Department of Water Resources' 2024 Vulnerability Assessment.

Each indicator is rescaled to a 0–100 scale to enable consistent comparison across variables with differing units and data formats. Certain indicators, such as the rate of groundwater decline, are continuous and reflect a gradient of severity. Others are binary in nature, indicating whether a specific risk condition is present or absent. For example, a system without an intertie receives the maximum risk score for that indicator, while a system with an established interconnection receives a score of zero. This study uses a binary scoring method to clearly identify critical vulnerabilities and appropriately weight them within the overall risk assessment.

This study sums the weighted scores to produce a single composite score between 0 and 100. Scores above 50 point to critical vulnerabilities requiring near-term intervention. This study categorizes systems scoring between 40 and 50 as high risk and recommends prioritizing them for monitoring and support. Scores between 30 and 40 are considered moderate risk, and anything below 30 is considered low risk. It should be noted that our analysis also identified 17 systems with insufficient data – they were excluded from the analysis but merit further consideration.

$$\text{Composite Score} = \sum (\text{Rescaled Value x Weight})$$

Table 4: Threshold of Concern

Composite Score Range	Risk Level
>=50	Critical Risk
40-49	High Risk
30-39	Moderate Risk
<30	Low Risk

Source: UCLA Threshold of Concern Analysis

The thresholds are grounded in both the shape of the data and the real-world implications of each indicator. We didn't use strict percentiles—like quartiles or tertiles—because risk isn't evenly distributed. Instead, we looked for natural gaps or inflection points in the composite scores where risk profiles meaningfully change. For example, systems scoring 50 and above typically had multiple compounding stressors—like no interties, groundwater decline, and supplier size issues—which signal immediate operational vulnerability.

The thresholds also reflect the weightings assigned to each indicator. So a system scoring 50 is hitting a combination of high-impact risk factors. That's why we treat scores 50+ as Critical, not just the top 25%. Our study grounded the breakpoints in both the statistical distribution of the scores and the actual severity of system conditions. This approach lets us prioritize the systems that are not just numerically high, but operationally at risk. We conducted several sensitivity analyses to confirm the findings are sound.

Threshold Findings

Critical Risk Systems

Using this approach, we find that 10 small water systems in Los Angeles County are classified as Critical Risk, each with a composite score of 50 or higher. These systems show multiple, overlapping structural and environmental vulnerabilities that compromise their ability to maintain safe and reliable water service. A key driver of elevated risk across these systems is the complete absence of interties—both standard and emergency. All 10 systems received a maximum risk score (100) for both intertie and emergency intertie indicators. The composite score is expected to change for Alpine Springs Mobile Home Park as it is currently undergoing a master meter consolidation with Palmdale Water Company (Resolution no.20-19, Palmdale Water District).

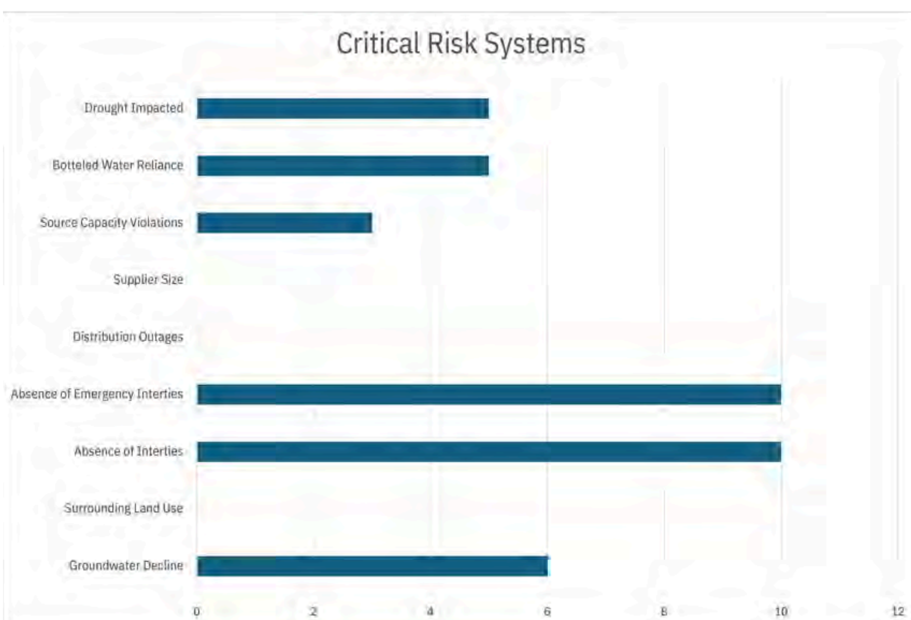
Groundwater decline represents another common vulnerability. Six out of the 10 systems received groundwater risk scores, indicating significant reductions in groundwater levels that jeopardize long-term supply sustainability. Systems such as The Village Mobile, Lancaster Park, El Rancho Mobile, Mitchell’s Avenue, Del Rio Mutual, and Hemlock Mutual are all experiencing the effects of declining groundwater conditions.

Table 5: Top Ten Systems Scored as Critical

Water System Name	Composite Score
The Village Mobile Home Park	65
Los Angeles Residential Community Foundation	60
Alpine Springs Mobile Home Park	60
Lancaster Park Mobile Home Park	55
Sleepy Valley Water Company	55
El Rancho Mobile Home Park	50
Mitchell's Avenue E Mobile Home Park	50
Del Rio Mutual	50
Hemlock Mutual Water Company	50
Mettler Valley Mutual	50

Source: UCLA Threshold of Concern Analysis

Figure 4: Critical Risk Systems



Source: UCLA Threshold of Concern Analysis

High Risk Systems

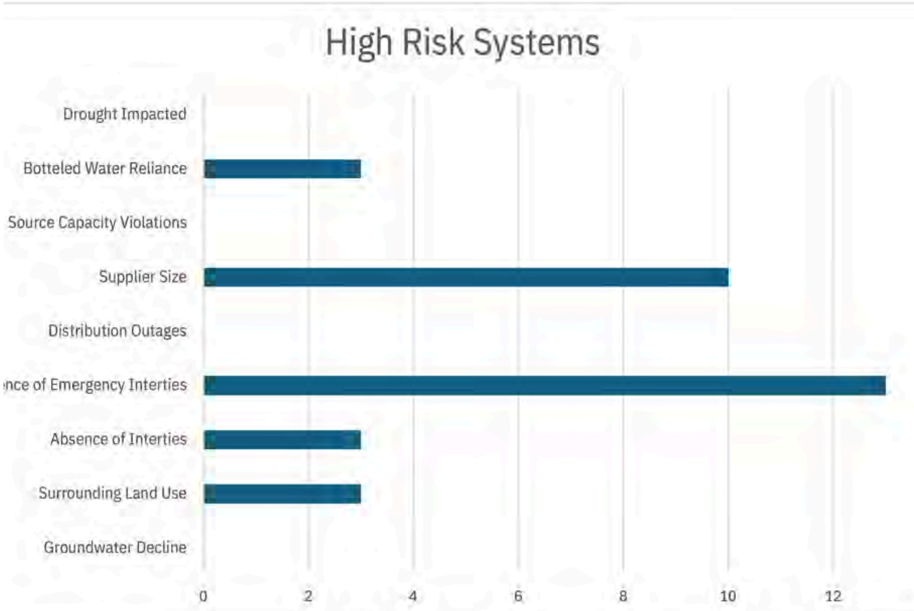
Thirteen small water systems in Los Angeles County are classified as High Risk, with composite scores between 40 and 45.05. These systems display a range of structural vulnerabilities that compromise their long-term sustainability and reliability, despite not meeting the threshold for Critical Risk. A shared and significant concern across all 13 systems is the complete lack of interties. Every system receives a maximum risk score (100) for the standard and emergency intertie indicators. This confirms that these systems are fully isolated and unable to rely on alternative supply sources during outages or emergencies.

While distribution outages or capacity violations do not mark these systems, deeper vulnerabilities persist. Ten of the 13 systems scored 100 for supplier size, confirming they likely lack the authorized source capacity to meet current demand or comply with regulatory limits. Three systems—Winterhaven Mobile Estates, North Trails Mutual Water Company, and Paradise Ranch MHP—scored the maximum for bottled water reliance.

Groundwater Data Gaps: Six systems report a score of zero for groundwater decline, suggesting insufficient data rather than stable conditions. Given that groundwater trends are a key stress indicator in small water systems, these missing data points may obscure additional risk factors.

All systems scored zero for source capacity violations and drought-impacted shortage.

Figure 5: Higher Risk Systems



Source: UCLA Threshold of Concern Analysis

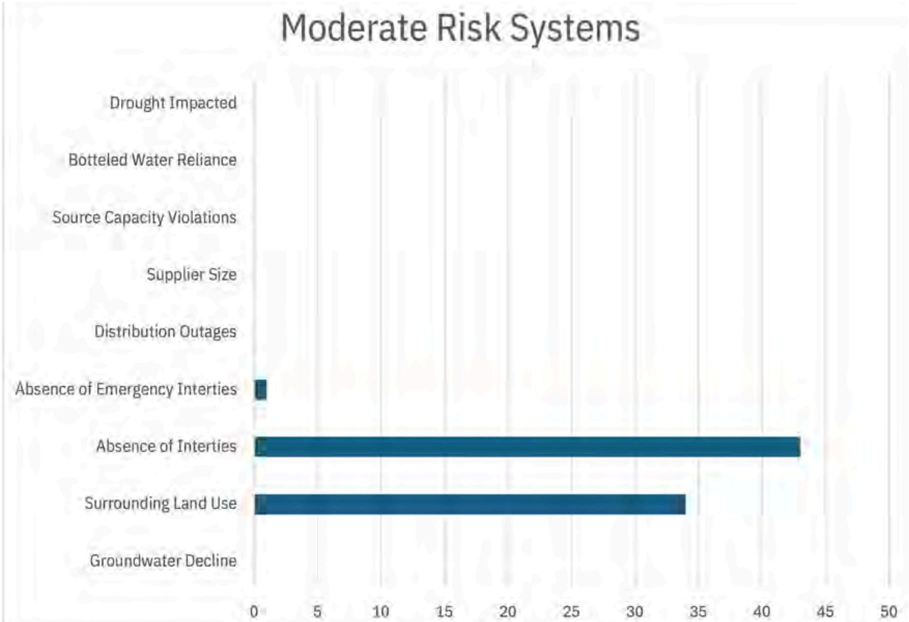
Moderate Risk Systems

A total of 43 small water systems in Los Angeles County are classified as Moderate Risk, each earning a composite score between 30.0 and 35.05. While not in immediate crisis, these systems operate under structural and operational conditions that merit close monitoring and preemptive support. The most consistent vulnerability among these systems is the complete absence of emergency interties—all 43 scored a maximum risk value of 100 for this indicator. Similarly, almost all systems lack standard interties, with 35 of the 43 scoring 100 in this category.

All moderate systems show no violations for source capacity, supplier size, bottled water reliance, and drought impact shortage. Only one system shows distribution outages, and it is ranked at the highest score within this category. Several systems—including La Habra Heights County Water District, Eastside Union School District, and Little Rock View Mutual Water Company—are flagged for groundwater decline, each receiving a risk score of 75 in this indicator. These scores indicate a meaningful trend of aquifer depletion and long-term water supply stress.

Nine systems scored the highest on groundwater decline, and four scored the highest for surrounding land use.

Figure 6: Moderate Risk Systems



Source: UCLA Threshold of Concern Analysis

Low Risk Systems

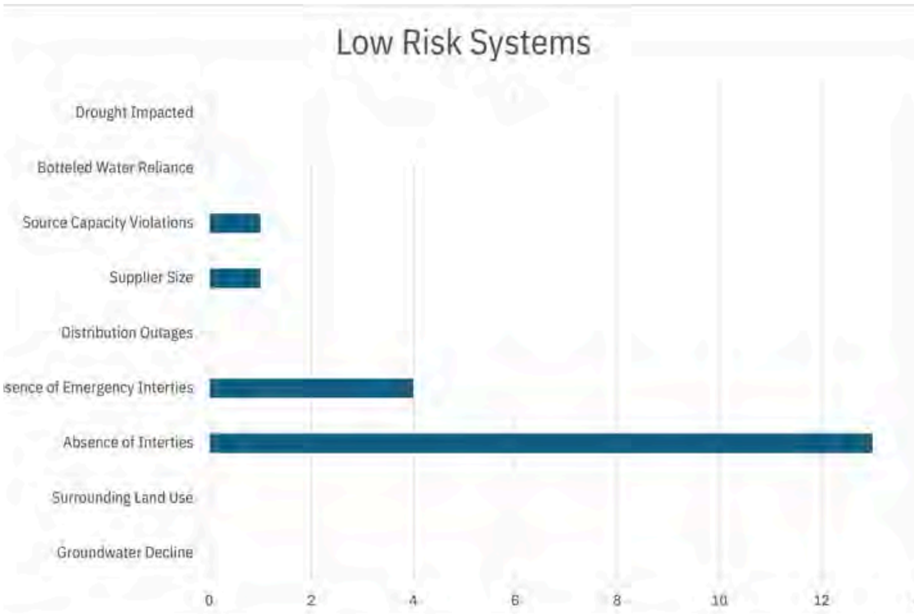
Twenty-nine small water systems in Los Angeles County are currently classified as Low Risk, each with a composite score between 0 and 20. According to the indicators assessed, these systems display limited structural or environmental vulnerabilities and maintain relatively stable operational conditions in general.

A defining characteristic of this group is that the majority have some degree of intertie or emergency intertie infrastructure, with 13 of the 29 systems scoring 100 for emergency interties, indicating strong redundancy. An additional two systems had interties but received lower scores due to limited capacity or documentation. This analysis finds that many of these systems are at least partially integrated into regional water supply networks, which provide redundancy during times of crisis.

Groundwater decline is limited to a few systems—only seven systems recorded a risk score of 75, while three more had scores of 0, indicating either a stable groundwater condition or incomplete data.

One system—Cal-Am Water Company, East Pasadena—was flagged for source capacity violations, receiving the maximum score for that indicator. Despite its overall low composite score, this suggests a significant operational constraint related to meeting authorized water production limits. Four systems scored 100 for distribution outages. Supplier size appears less concerning in this tier, with the majority scoring zero for supplier size, except for one.

Figure 7: Low Risk Systems



Source: UCLA Threshold of Concern Analysis

Potential Consolidations and Alternatives Analysis for Top Drought and Fire Risk Systems: Distance and Cost Analysis

Consolidation Potential

In Chapter 2, this report identified the community water systems (CWS) most at risk of wildfire-related disruption by developing and applying a composite Fire Vulnerability Index. Earlier in Chapter 3, this report identified critical risk systems in a separate water shortage risk assessment. Together, the findings from these two risk assessments informed the creation of a list of the top ten CWS with fire and drought vulnerabilities, referred to in this section as "systems of concern." This list of 10 systems consists of the top 10 at most critical risk of water shortage, with the exception that the system tied for second in highest drought risk, Alpine Springs Mobile Home Park, is already undergoing consolidation. Therefore, the 10 systems of concern include the nine top-scorers from the drought risk assessment, along with Western Skies Mobile Home Park, which is at moderate risk for water shortage but importantly ranks among the top 5 systems at highest fire risk in Los Angeles County. Five of the 10 systems of concern appear on both the top 10 critical drought risk list and the top 25 list of systems for fire vulnerability.

This section of the report assesses the physical and cost feasibility of physical consolidation scenarios for each of the 10 systems of concern and also provides options for alternative solutions. The methodology employed, however, can reasonably be applied to all high drought and fire risk systems in the County and potentially elsewhere.

As discussed in Chapter 1 of this report, physical consolidation is only one of several solutions available to small CWS facing vulnerability to drought and fire. SB 552 requires that counties develop a Drought and Water Shortage Risk Mitigation Plan, and these plans must consider consolidations for existing water systems and domestic wells

(Primer of SB 552, 2022), highlighting the effectiveness of consolidation as a tool for climate resilience, where applicable.

It is necessary to assess the physical distance and potential costs of consolidation and other available solutions to suggest paths forward for identified systems of concern. UCLA's feasibility analysis largely draws from the State Water Resource Control Board (SWRCB)'s Cost Assessment and accompanying documentation for viability thresholds and cost estimates related to consolidation and alternative solutions for at-risk water systems. The Cost Assessment is part of the agency's annual Drinking Water Needs Assessment to improve California's Human Right to Water outcomes. It is a "model comprised of decision criteria, cost assumptions, and calculation methodologies used to estimate a statewide cost for implementing long-term and interim solutions for Failing public water systems, At-Risk public water systems, high-risk state small water systems, and domestic wells" (State Water Resources Control Board, 2024a, p. 112).

UCLA's feasibility analysis relies on many of SWRCB's figures and assumptions because SWRCB and consultant research, extensive stakeholder engagement, and public feedback has informed them over the course of half a decade, including "consultations with water systems, vendors, manufacturers, service providers, and consultants" (State Water Resources Control Board, 2024b, p. 38). According to SWRCB, "every effort was made" to make cost assumptions tailored to California (State Water Resources Control Board, 2024b, p. 38). The model has been updated since the initial 2021 Needs Assessment, as recently as June 2024, to reflect increasing prices and improve other considerations as time passes. There are also no reasonable, robust alternatives publicly available to derive such cost estimates. That being said, as the Board makes clear, its cost estimation in the SAFER program is a high-level tool not meant to determine cost feasibility for a specific site (State Water Resources Control Board, 2024c, p. 5), or to replace the need for preliminary engineering or rate determination studies. The same assumptions, limitations, and caveats apply to our work.

While the exact inputs of a consolidation feasibility assessment may vary from study to study, a standard process always considers the distance between systems and some menu of cost estimates. Physical proximity and potential consolidation costs heavily influence consolidation feasibility and decisions about whether to pursue or rule out physical consolidation of water systems. Since distance largely drives cost, a shorter distance between systems is much more feasible than a greater distance, with distances beyond certain thresholds deemed infeasible if not impossible. In an analysis of consolidations in California between 2015 and 2021, Dobbin et al. found that the mean distance between physically consolidated and receiving water systems was 1.061 miles (2023). The median distance was 0.174 miles (Dobbin et al., 2023). This important distinction demonstrates how outliers can skew the mean of physical consolidation distances, when in reality, most physical consolidations take place with distances far below the average of about one mile. In fact, only nine out of the 119 studied consolidations were greater than three miles (Dobbin et al., 2023). Managerial consolidations spanned slightly larger distances: the mean distance between systems was 3.248 miles, and the median was 0.751 miles (Dobbin et al., 2023). Similarly, research performed by researchers at the UCLA Luskin Center for Innovation used 1, 3, and 5-mile buffers around water systems of concern, with systems with no sufficient systems within 5 miles classified as "spatially isolated" and thus not recommended for consolidation (Pierce & Gmoser-Daskalakis, 2020). Corona Environmental Consulting's 2019 "Cost Analysis of California Drinking Water System Mergers" paper used a 3-mile pipeline length as the upper limit of project feasibility (Henrie & Seidel, 2019).

Furthermore, SWRCB discusses additional long-term modeled solutions in a supplemental cost estimate methodology alongside its most recent Drinking Water Needs Assessment (State Water Resources Control Board, 2024d). While mostly focused on responding to water quality concerns, SWRCB's Additional Long-Term Modeled Solutions Cost Estimate Methodology discusses technical assistance, administrator assistance, providing a new well, long-term bottled water, and Other Essential Infrastructure (OEI) upgrades as alternatives to consolidation worth modeling (State Water Resources Control Board, 2024d). The Department of Water Resources (DWR) and SWRCB websites highlight water conservation as a priority, leading to this analysis's grappling with the possibilities of water reuse and conservation as creative in-situ solutions. While more of a compliance strategy than a full-on solution, SWRCB models costs of OEI upgrades that are required by SB 552, including metering all un-metered service connections, backup power, and adding or upgrading a sounder device to measure static well levels (State Water Resources Control Board, 2024d). SB 552 also requires small water systems to construct a backup source if they rely on a single source (State Water Resources Control Board, 2024d), which is why this analysis also explores costs for constructing a public well.

Spatial Proximity Assessment

Physical consolidation is the physical integration of two or more water systems into one unified system via new infrastructure. Joining two water systems can occur through the construction of an intertie or the construction of new main and distribution lines in the case of consolidating private domestic wells with another system (Dobbin et al., 2022).

Importantly, SWRCB's Cost Assessment Methodology Supplemental Appendix differentiates between "intersect" and "route" situations: intersect refers to a situation "where the Joining system, state small water system, or domestic well physically lies within the service area boundary of a potential Receiving system" (State Water Resources Control Board, 2024c, p. 21). Route is a situation "where the Joining system is physically located within a maximum distance from the service area boundary of a potential Receiving system along a street" (State Water Resources Control Board, 2024c, p. 21).

Figure 8: Possible Modeled Physical Consolidation Types Per SWRCB

Source: Cost Assessment Methodology Supplemental Appendix p. 22

The research team used Network Analyst in ArcGIS Pro to identify the roadway distance from the boundary of a potential receiving system to the boundary of the potential joining system of concern. This was deemed the most appropriate method for assessing potential new pipeline routes between CWS in Los Angeles County, based on guidance from the Los Angeles County Waterworks District's engineers. This approach differs from the methodology employed in SWRCB's Cost Assessment, which uses the roadway distance from the boundary of a potential receiving system to the centroid of the potential joining system of concern. The approach used here better reflects real-world infrastructure planning, where water system interties are typically made at the system boundary rather than centroids, which may lie in inaccessible or irrelevant locations.

By calculating the shortest distance between system edges, the analysis captures the minimum feasible length of a newly constructed pipeline to enable consolidation. This method aligns with engineering practice, where system boundaries define the physical limit of infrastructure and allow for a more realistic evaluation of cost, feasibility, and permitting needs when planning regional water system consolidation. Although this report uses a slightly different method to produce the figure for linear feet needed to calculate pipeline construction, the way this report uses cost per linear foot matches SWRCB's Cost Assessment methodology.

As described in the Physical Consolidation Cost Estimate Methodology Supplemental Appendix, "The maximum viable modeled distance for public water systems is 3 miles from the boundary of a potential Receiving system to the centroid of the potential Joining system. For potential Joining state small water systems and domestic wells, the maximum viability distance is 0.38 miles from the possible receiving community water system's boundary" (State Water Resources Control Board, 2024b, p. 13). It is important to understand that these maximums are determined by bounds of cost feasibility; they are not pure physical or engineering limits. Domestic wells supply water to an individual household or up to four individual connections, and state small water systems, often referred to as state smalls, supply water to at least five and fewer than 15 connections or 25 people (Strategy for State Small Water Systems, Domestic Wells and Other Self-Supplied Communities, 2024). Their extremely small scale of water provision warrants a smaller acceptable distance of consolidation, since the cost per connection is ultimately higher. The scope of this report does not include the consolidation of domestic wells.

The 10 systems of concern analyzed for feasibility in this section service between 21 to 208 connections, and therefore, the 3-mile threshold as determined by SWRCB is defined as the limit. However, it should be stressed that systems under 0.38 miles apart or those fully contained within the boundaries of a potential receiving system, here being called an "intersect," are even stronger candidates for consolidation from a cost perspective.

In Chapter 1, this report identified 15 well-performing CWS in Los Angeles County that are large enough to act as a receiving system. For each system of concern, the closest large, well-performing system from this list of 15 CWS was selected as the "potential receiving system" for modeling a hypothetical consolidation. Los Angeles CWWD 40 Reg 4 & 34 Lancaster, Santa Clarita Valley Water Agency, and San Gabriel Valley Water Co. - El Monte appear as potential receiving systems. For eight of the 10 systems of concern,

there were no other CWS available within 3 miles to model besides the listed "potential receiving system." For Hemlock Mutual Water Company and Del Rio Mutual Water Company, there were additional CWS within 3 miles, but these CWS did not make sense to model as they are much farther than the chosen "potential receiving system," and their route would run through the boundaries of the large system anyway.
Calculating roadway distance between systems using the Network Analyst tool in ArcGIS Pro demonstrates proximity feasibility and provides an estimate for pipeline distance, which influences the project's projected capital costs.

Distances produced by the Near tool and the Network Analyst tool provide a range for potential pipeline length. The distances used to calculate the consolidation costs are based on the Network Analyst approach, in order to keep consistency with SWRCB's methodology.

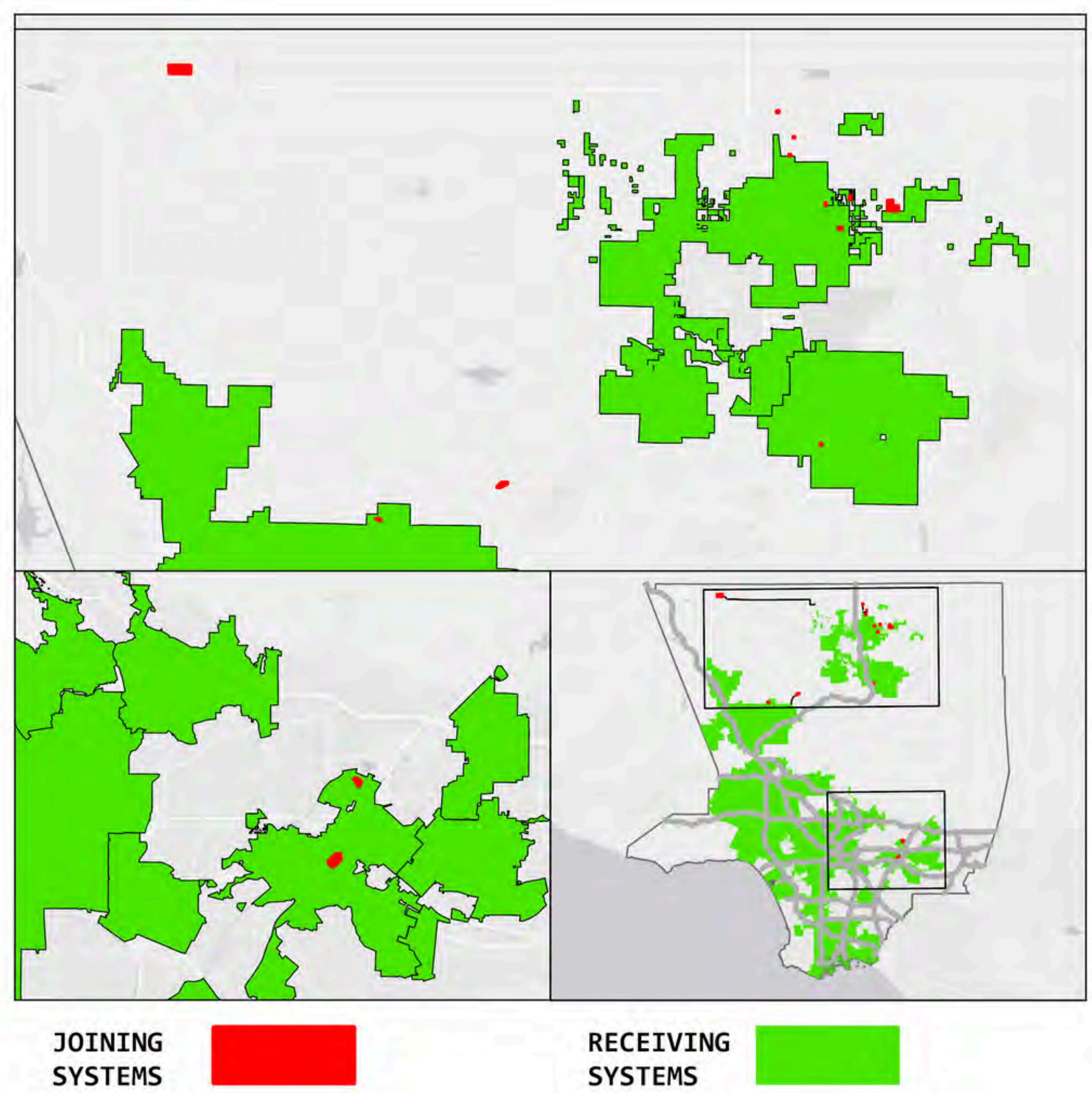
Table 6: Recently, Consolidated Systems in Los Angeles County

Potential Joining System	Potential Receiving System	Straight line distance between systems (Near tool)	Road Distance between Systems (Network Analyst)
The Village Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34 Lancaster	0 miles	Directly across the street
Lancaster Park Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34 Lancaster	0.8 miles	1.3 miles
Los Angeles Residential Community Foundation	Santa Clarita Valley Water Agency	0 miles	Within the boundaries of the receiving system (intersect)
Western Skies Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	0 miles	Directly across the street
El Rancho Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	0 miles	Within the boundaries of the receiving system (intersect)
Mitchell's Avenue E Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	1.23 miles	1.25 miles
Del Rio Mutual Water Company	San Gabriel Valley Water Co. - El Monte	0 miles	Within the boundaries of the receiving system (intersect)
Hemlock Mutual Water Company	San Gabriel Valley Water Co. - El Monte	0 miles	Within the boundaries of the receiving system (intersect)
Sleepy Valley Water Company	Santa Clarita Valley Water Agency	2.36 miles	3.23 miles
Mettler Valley Mutual Water Company	Santa Clarita Valley Water Agency	14.6 miles	25 miles

Source: UCLA Cost Assessment Spreadsheet

Note: Road distance was used in the UCLA Cost Assessment, as it more accurately reflects pipeline routes than straight-line distance. This report follows SWRCB guidance for intersecting systems: "For Joining systems whose location or service area boundary intersect with a Receiving water system's service area boundary, a 1,000-foot distance is assumed for public water systems and state small water systems" (State Water Resources Control Board, 2024b, p. 41). A 1,000-foot buffer was also applied to systems directly across the street from receiving systems—such as The Village Mobile Home Park and Western Skies Mobile Home Park—to address GIS boundary limitations.

Figure 9: Potential Joining and Receiving Water Systems in Los Angeles County



Potential receiving systems cover large swaths of Los Angeles County and overlap with several systems of concern. The majority of systems of concern reside in the Antelope Valley (upper half of Figure 9). However, several systems of concern are geographically isolated and demonstrate CWS fragmentation in this region.

High-Level Cost Evaluation of Physical Consolidation

The 10 systems of concern then underwent an evaluation considering the estimated costs of physical consolidation alongside the potential and cost considerations of alternative solutions that alleviate drought and water shortage risks.

To assess the cost feasibility of physical consolidation, a modified version of SWRCB's Equation 1 in its Physical Consolidation Cost Estimate Methodology Supplemental Appendix to the Drinking Water Needs Assessment (State Water Resources Control Board, 2024b, p. 40) was recreated and used. This appendix presents dollar amounts, percentages, and rationale for each input.

Table 7: SWRCB Cost Assessment vs. UCLA Cost Assessment

Cost Inputs Included in SWRCB Cost Assessment for Consolidation Capital Cost	**Cost Inputs in the UCLA Model for Consolidation Capital Cost**
Regionally Adjusted Pipeline Cost	Regionally Adjusted Pipeline Cost
Regionally Adjusted Service Line Cost	Regionally Adjusted Service Line Cost
Connection Fees	*Connection Fees*
Administration Costs	Administration Costs
CEQA Cost	CEQA Cost
Contingency	Contingency
Planning and construction	Planning and construction
Engineering Services	Engineering Services
Inflation	Inflation
	Elevation Multiplier
	Fault Crossing

Sources: SWRCB Cost Assessment and Santa Cruz County Small Water Systems Connection Feasibility Analysis

Note: Connection fees were revised to $6,816 to reflect Los Angeles County-specific estimates. Elevation multiplier and fault crossing inputs were added based on other cost estimation examples.

A comparison of SWRCB Cost Assessment for Consolidation Capital Cost and this report's version, which differ only in updated connection fees and the addition of an elevation multiplier and fault crossing component.

As with SWRCB's Cost Assessments, our cost evaluation model is a high-level estimate and not to be used in lieu of an in-depth site-specific project estimate. Still, we aim to build upon SWRCB's estimates by applying several additional considerations derived from other local consolidation feasibility studies. In particular, we include an elevation multiplier and fault crossing factor, which do not appear in SWRCB's Cost Assessment. Still, Santa Cruz County's assessment incorporates them in some form, and other counties might also include them.

The analysis used in this report also refines the SWRCB's cost estimate of connection fees ($3,411 to $4,762) to a more recent number derived from data that reflects Los Angeles County-specific systems: $6,816. This change is important because connection fees vary widely across the state and play a large role in determining overall cost.

Table 8: Recently, Consolidated Systems in Los Angeles County

Cost Component	Cost Estimate	Source
Pipeline Cost	$220 per linear foot (determined by Network Analyst)	From SWRCB 2024 Cost Assessment
Connection Fees	$6,816 (to be multiplied by the count of joining system's service connections)	Averaged from reported connection fee data in the Electronic Annual Report (eAR) Section 8 Reporting Year 2023
Service Line Cost ($/project)	$6,200 per service connection	From SWRCB Cost Assessment
Administrative Cost	15% of the total construction cost	From SWRCB Cost Assessment
CEQA Cost	$25,000 intersect to intersect; $100,000 for route consolidation	From SWRCB Cost Assessment
Contingency	20% total capital cost	From SWRCB Cost Assessment
Planning and construction costs	10% total cost	From SWRCB Cost Assessment
Engineering Services	15% total cost	From SWRCB Cost Assessment
Inflation	3.1% total cost	From SWRCB Cost Assessment
Regional Multiplier	32%	From SWRCB Cost Assessment
Elevation Multiplier	1.05 if the elevation difference between the system and source exceeds 50 feet	From Santa Cruz County Small Water Systems Connection Feasibility Analysis
Fault Crossing	$100,000	From Santa Cruz County Small Water Systems Connection Feasibility Analysis

Source: UCLA Cost Assessment Spreadsheet

Note: The cost components listed in Table 8 form the basis of the Physical Consolidation Cost Estimates in this report.

Cost Components Added Beyond SWRCB 2024 Cost Assessment

Connection Fees

Electronic Annual Report (eAR) data from the SWRCB website informed a recalculation of the relevant connection fee cost estimate. The Section 8 - Customer Charges, Income, and Affordability file has several questions about connection fees. First, we filtered the Section 8 file to display only responses from community water systems in Los Angeles County. Then, we extracted the answers to two questions, starting with "A2.1. What is the average charge for a brand-new connection?" and "A2.4 What is the average charge* for a brand-new Multi-Family connection (based on the most common meter size)?" The next step was averaging every reported response from Los Angeles County community water systems (when provided) for these two questions for an average of $6,816. It is important to note that the responses offered a large range. Many systems reported $0, while many exceeded $10,000. The first quartile of this data was $0, and the third quartile was $8,125. The maximum in this filtered dataset was Palmdale Water District, with a reported $364,000 as the average charge for a brand-new multi-family connection. Palmdale Water District also reported $18,650 as the average charge for a brand-new connection. While this report's cost evaluation aims to add more precision, this finding demonstrates the limitation of a high-level cost estimate and the variability in costs depending on the specific project. The self-reported nature of this data also limits the analysis. However, this report argues a cost estimate of $6,816 reflects current and local conditions more accurately than the lower figure provided by SWRCB.

Elevation Multiplier

Slope and elevation differences can bring pressure-related and terrain-specific costs. Other feasibility analyses have employed sophisticated methods to consider slope and pressure-related challenges. Santa Cruz County's cost methodology includes the following: "A 0.05% increase in cost relative to the base cost is added for each unit of pipeline length if it exceeds 50 feet" (Santa Cruz County Small Water Systems Connection Feasibility Analysis, 2025). To gauge terrain as a potential challenge without data on source elevation, this analysis evaluated elevation differences between each system of concern and its potential receiving system. This report found that for the 10 modeled consolidation routes (the path from potential joining system to receiving system), none of them had elevation changes above 50 feet. Due to the minimal elevation changes between systems in this analysis, the Elevation Multiplier did not apply to these 10 consolidation scenarios.

Fault Crossing

The UCLA Cost Assessment adds $100,000 if a proposed physical consolidation crosses a fault to accommodate hazard planning. The team initially decided to include fault crossing because it appears in the Santa Cruz County Small Water Systems Connection Feasibility Analysis (2025) and other consultant estimates, and due to an awareness that planning for earthquake risk is a common consideration in Los Angeles County. In “The Resilience Value of Recycled Water for Los Angeles,” Chow et al. consider “the risk of seismic rupture due to shifting faults” a “major threat” to California’s aqueducts and cite past catastrophic earthquakes as setting the stage for the earthquake risk becoming enshrined in California’s hazard planning (2024). The UCLA Cost Assessment included this factor to include as many relevant potential costs as possible and aim toward a conservative cost projection.

The 10 identified systems of concern appear not to directly cross a fault, so this additional cost was not applied. However, three of the systems—Los Angeles Community Foundation, Mettler Valley Mutual Water Company, and Sleepy Valley Water Company—are all extremely close to a fault line and should, therefore, be further evaluated for potential fault crossings.

Figure 10: Fault Proximity for Selected Water Systems

Source: California Geological Survey, Fault Activity Map of California (2024).

Note: Red dots mark the addresses of Los Angeles Community Foundation (left), Mettler Valley Mutual Water Company (middle), and Sleepy Valley Water Company (right). Black lines and purple-highlighted lines represent nearby fault lines.

Cost Thresholds for Physical Consolidation

SWRCB developed the following funding viability thresholds for its Cost Assessment Model based on the Safe Drinking Water State Revolving Fund Intended Use Plan. This assessment uses these thresholds to determine whether the estimated capital costs of physically consolidating systems of concern are financially feasible. However, a more expensive consolidation project may still be preferable to other alternatives.

SWRCB specifies that “The Division of Financial Assistance does not currently employ funding viability thresholds for consolidation projects for state small water systems and domestic wells. Funding decisions are made on a case-by-case basis” (State Water Resources Control Board, 2024b, p. 16). Therefore, we reiterate that decision-makers must carefully evaluate each physical consolidation project for small systems on a case-by-case basis before considering advancing it. This report’s final section presents case studies to address further considerations for consolidation feasibility.

There are many more considerations to address before advancing a physical consolidation. For one, this cost feasibility analysis is not all-encompassing and likely leaves out certain costs. While this report models cost per connections in Table 10, the modeled cost per connection is likely lower than what a receiving system such as Los Angeles County Waterworks District 40 would actually face.

Notably, this report does not address operations and maintenance. This report also does not explore the impact that physical consolidation would have on a receiving agency. For example, more research is needed to understand how groundwater rights would be conveyed or mitigation for water supply impacts if a system has no transferable right. Decision-makers must also evaluate any challenges that could arise from the potential introduction of water quality issues from stagnant water or water age, longer emergency response times, or difficulty aligning system operational standards such as remote monitoring, billing, etc.

Table 9: Funding Viability Thresholds for Modeled Consolidation Projects

	Funding Viability Criteria
Public Water System > 75 service connections	Estimated Capital Cost per Connection < $96,000
Public Water System < 75 service connections	Estimated Total Capital Cost < $7.2 million

Source: Physical Consolidation Cost Estimate Methodology Supplemental Appendix p. 16

Physical Consolidation Capital Cost Evaluation Results: Systems of Concern

The research team used Excel to calculate the components of the UCLA Cost Assessment for each consolidation scenario.

Table 10: Summary of Consolidation Capital Cost Estimates

Joining System	Receiving System	Joining System No. of Service Connections	Physical Consolidation Cost Estimate	Physical Consolidation Cost Estimate Per Connection	Meets Cost Viability Threshold (Total)	Meets Cost Viability Threshold (Per Connection)
The Village Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34 Lancaster	34	$1,459,819	$42,936	Yes	Yes
Lancaster Park Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34 Lancaster	21	$4,059,105	$193,291	Yes	No
Los Angeles Residential Community Foundation	Santa Clarita Valley Water Agency	22	$1,060,347	$48,198	Yes	Yes
Western Skies Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	61	$2,108,712	$34,569	Yes	Yes
El Rancho Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	76	$2,358,134	$31,028	Yes	Yes
Mitchell's Avenue E Mobile Home Park	Los Angeles CWWD 40 Reg 4 & 34	24	$3,991,113	$166,296	Yes	No
Del Rio Mutual Water Company	Los Angeles CWWD 40 Reg 4 & 34	133	$3,728,019	$28,030	Yes	Yes
Hemlock Mutual Water Company	San Gabriel Valley Water Co. - El Monte	208	$5,530,499	$26,589	Yes	Yes
Sleepy Valley Water Company	Santa Clarita Valley Water Agency	58	$9,972,076	$171,932	No	No
Mettler Valley Mutual Water Company	Santa Clarita Valley Water Agency	98	$68,854,335	$702,595	No	No

Source: UCLA Cost Assessment Spreadsheet

Only two of the 10 systems of concern are not viable under the threshold relevant to their system size. These systems are Sleepy Valley Water Company and Mettler Valley Mutual, whose consolidation costs exceed total and per connection thresholds. Sleepy Valley Water Company and Mettler Valley Mutual have road distances of more than three miles from their potential receiving systems.

Six out of 10 systems of concern meet both cost viability thresholds (estimated capital cost per connection is less than $96,000, and estimated total capital cost is less than $7.2 million). These favorable systems are The Village Mobile Home Park, Los Angeles Residential Community Foundation, Western Skies Mobile Home Park, El Rancho Mobile Home Park, Del Rio Mutual Water Company, and Hemlock Mutual Water Company. Each of these six systems' estimated capital costs total less than $50,000 per connection. Lancaster Park Mobile Home Park and Mitchell's Avenue E Mobile Home Park are feasible as they meet their relevant cost threshold (estimated total capital cost is less than $7.2 million), but have high capital costs per connection.

Predictably, systems of concern that did not meet the physical proximity feasibility thresholds were also found to be infeasible against the chosen cost viability thresholds. Sleepy Valley Water Company and Mettler Valley Mutual Water Company, still very much at risk from drought and fire, will need significant support due to their isolated status and identified vulnerabilities. These systems and those seeking to support them must explore alternative and creative solutions to enhance preparedness and reduce vulnerability.

Alternatives to Physical Consolidation

Physical consolidation is not feasible for every at-risk system, nor is it always the preferred outcome. Therefore, this report provides alternative solutions with cost considerations. Possible alternatives for obtaining new water include drilling a new well, participating in water recycling projects, managerial consolidation, and other water system partnerships. Water conservation strategies may be supplemental for drought resilience by reducing demand.

Other Essential Infrastructure (OEI) Upgrades

Many failing and at-risk public water systems have aging infrastructure that requires upgrades or replacement. Other Essential Infrastructure (OEI) upgrades may offer a viable solution for systems vulnerable to drought and fire, depending on the specific improvements needed and their associated costs. In some cases, these upgrades alone may be sufficient to ensure compliance with drinking water standards, maintain an adequate water supply, and support the long-term sustainability of the system. This section estimates OEI needs to better understand infrastructure upgrade costs as an alternative to system consolidation, or as a cost consideration for the receiving system.

Given that OEI focuses on addressing drought resiliency infrastructure requirements in accordance with SB 552, other essential infrastructure cost calculations are included in this report for the identified systems of concern. However, based on the 2024 Drinking Needs Assessment Methodology, water systems do not need to calculate the OEI elements if they join a consolidation plan. The receiving water system is rather obligated to subsume the OEI costs and needs (State Water Resources Control Board, 2024d, p. 14). Additionally, SWRCB's OEI analysis excludes high-risk state small water systems and wells due to insufficient information to support the assessment (State Water Resources Control Board, 2024d).

The OEI costs were calculated for the 10 systems of concern. Costs are roughly calculated for meters, backup power, sounders, and additional storage for each system, as seen in Table 6, pulled from SWRCB's Additional Long-Term Modeled Solutions Cost Estimate Methodology.

Table 11: Other Essential Infrastructure (OEI) Components

Components	Systems Included
Service Connection Meters	Failing and at-risk systems without 100% metered service connections
Back-Up Power	Failing and at-risk systems that do not currently have back-up power for their sources
Sounder to Measure Static Well Levels	Failing and at-risk systems that do not currently have access to a device that will allow them to measure their well's groundwater level
Additional Storage	Failing and at-risk systems that need additional storage
SCADA & Electrical Upgrades	Incorporated into cost estimates for storage tanks

Source: Physical Consolidation Cost Estimate Methodology Supplemental Appendix p. 16

Meter Cost Assumptions

In accordance with SB 552, small CWS are also required to place meters at each of their connections to monitor water usage, identify leaks, and help customers reduce demand during droughts or when needed.

Using the 2024 State Water Board OEI cost analysis, each meter's cost formula is:

Total Cost Estimate ($) = **$29,000** (equipment & software) + **$1,200** (per new meter at each service connection) + **8%** Total Cost Engineering +**10%** Total Cost Contingency + **$4,000** Environmental & Permitting + **3.1%** Total Cost Inflation + Regional Multiplier (**+32%** for Los Angeles County)

The cost per meter uses component cost estimates for 1" drive-by meters, enabling readers to take automated readings (State Water Resources Control Board, 2024d).

In Table 12 (p.X), systems with unmetered connections have costs ranging from approximately $59,000 to $290,000, depending on the number of unmetered connections each system has. Hemlock Mutual Water Company and Sleepy Valley Water Company, along with the potential receiving systems, have ensured each of their connections is metered and in compliance as of 2025. Del Rio Mutual Water Company has the highest estimated costs for meter installation on this critical list, given that it has 133 connections to the meter.

Table 12: Estimated 2024 Meter Installation Cost for Unmetered CWS Connections

Joining System	Total Service Connections	Connection Type	Meter Type	Unmetered Service Connections	Final Cost Including Adjustments
The Village Mobile Home Park	34	RS	UM	34	$110,864
Lancaster Park Mobile Home Park	21	RS	UM	21	$86,980
Los Angeles Residential Community Foundation	22	RS	UM	22	$88,817
Western Skies Mobile Home Park	61	RS	UM	61	$160,468
El Rancho Mobile Home Park	76	RS	UM	76	$188,026
Mitchell's Avenue E Mobile Home Park	24	RS	UM	24	$92,492
Del Rio Mutual Water Company	133	RS, IN, CM	UM	133	$292,747
Hemlock Mutual Water Company	208	RS, CM	ME	0	$0
Sleepy Valley Water Company	58	RS	ME	0	$0
Mettler Valley Mutual Water Company	98	RS	MU	8	$63,097
Receiving System	**Total Service Connections**	**Connection Type**	**Meter Type**	**Unmetered Service Connections**	**Final Cost Including Adjustments**
Los Angeles CWWD 40 Reg 4 & 34 Lancaster	52,476	CM, IN, RS	ME	0	$0
San Gabriel Valley Water Co.-El Monte	46,608	CM, IN, RS	ME	0	$0
Santa Clarita Valley Water Agency	32,473	CM, IN, RS	ME	0	$0

Reference: UCLA Cost Assessment Spreadsheet. Connection types are Residential (RS), Industrial (IN), and Commercial (CM). Meter types are Unmetered (UM) and Metered (ME). Final cost, including adjustments, is the sum of the total hard costs with cost adjustment factors (Engineering, Contingency, Environmental & Permitting, Inflation, and Regional multiplier).

Backup Power

Each system is required to have enough electrical supply in case of a power failure to supply the maximum daily demand. According to SB 552, water systems must “no later than January 1, 2024…ensure continuous operations during power failures, provide adequate backup electrical supply” and by “January 1, 2027, have at least one backup source of water supply, or a water system intertie, that meets current water quality requirements and is sufficient to meet average daily demand” (*California SB552, 2021-2022*, n.d.).

Using the 2024 State Water Board OEI cost analysis, each backup electrical supply cost formula is:

Backup Electrical Supply Total Cost Estimate = **$30,134** per generator + (**$341 * Maximum Daily Demand (MDD)**) + **32%** Regional Multiplier + **5%** Total Cost Permitting + **3.1%** Total Cost Inflation + **5%** Total Cost Electrical + **25%** Total Cost Contingency

The base cost for a generator is $30k, and the $341* Maximum Daily Demand (MDD) is used to size the generator capacity.

The cost model assumes that the backup generators are in a single location; otherwise, additional costs are added to the model to reflect multiple locations. The location information is not available online to make this assessment.

Each CWS’s eAR responses to a non-mandatory question in Section 16 A about source auxiliary power supply enabled us to identify which systems indicated having a backup generator supply. Responses varied, from blanks (unknown) to yes and no (*Electronic Annual Report (eAR) | California State Water Resources Control Board*, n.d.). Given that it is self-reported, it may still be unclear if the amount of electric backup supply meets the system's power needs.

Given that the estimated MDD, maximum daily demand, is not available online for these water systems, a few assumptions were made to generate an approximation of MDD. Therefore, the final costs, including adjustments, are a rough estimate of the costs needed to update the systems.

MDD (gallons per day) = Population Water System Serves × Residential GPCD (gallons per capita per day) × Peak Demand Factor

MDD is in gallons per day. The State Water Resources Control Board reports that Los Angeles County's Average daily residential use for 2024 is 73 GPCD, and 71 GCPD for 2025 (California Urban Water Production, n.d.). The ranges can vary widely based on area, region, and reporting. For example, the Metropolitan Water District of Southern California reported SoCal as using 114 gallons per capita per day in 2023, decreasing from 209 GPCD since 1990 (MWD | Southern Californians' per Person Water Use Drops to Lowest in 35 Years, n.d.). Keeping consistent with the State Water Board's methodology, 73 GPCD will be used as an estimate in the formula (CWB Long Term Solutions Cost Methods 2020, n.d.).

Peak demand factor is reported to be 1.5-2.5, depending on the geographical location of the system. Given that the State Waterboard used 2.25 as their peaking factor in calculations, this number will be used in the formula below to calculate MDD. Older California Public Utilities Commission documentation states, "A rule of thumb in general use states that the maximum demand for domestic service is two to three times the average daily demand in gallons per minute" (SP U-22 - Determination of Water Supply Requirements, n.d.).

The formula is as follows:

MDD (GPD) = (Population Water System Serves × **73** GPCD × **2.25** Peak Demand Factor)

(State Water Resources Control Board, 2024d)

Table 13: Estimated 2024 Backup Power Installation Cost per CWS

Joining System	Population	Connection Type	Do they have backup electricity?	Estimated MDD	Total Equipment Cost	Final Cost Including Adjustments (+70.1% total costs)
The Village Mobile Home Park	71	RS	no	11,661.75	$4,006,791	$6,815,551
Lancaster Park Mobile Home Park	60	RS	in progress	9,855.00	$3,390,689	$5,767,562
Los Angeles Residential Community Foundation	184	RS	yes	30,222.00	$10,335,836	$17,581,257
Western Skies Mobile Home Park	198	RS	unknown	32,521.50	$11,119,966	$18,915,061
El Rancho Mobile Home Park	215	RS	no	35,313.75	$12,072,123	$20,534,681
Mitchell's Avenue E Mobile Home Park	24	RS	unknown	3,942.00	$1,374,356	$2,337,780
Del Rio Mutual Water Company	700	RS, IN, CM	no	114,975.00	$39,236,609	$66,741,472
Hemlock Mutual Water Company	686	RS, CM	yes	112,675.50	$38,452,480	$65,407,668
Sleepy Valley Water Company	162	RS	yes	26,608.50	$9,103,633	$15,485,279
Mettler Valley Mutual Water Company	160	RS	in progress	26,280.00	$8,991,614	$15,294,735
Receiving System	**Population**	**Connection Type**	**Do they have backup electricity?**	**Estimated MDD**	**Total Equipment Cost**	**Final Cost Including Adjustments (+70.1% total costs)**
Los Angeles CWWD 40 Reg 4 & 34 Lancaster	204673	CM, IN, RS	info not in eAR	33,617,540.25	$11,463,611,359	$19,499,602,922
San Gabriel Valley Water Co.- El Monte	246000	CM, IN, RS	info not in eAR	40,405,500.00	$13,778,305,634	$23,436,897,883
Santa Clarita Valley Water Agency	108813	CM, IN, RS	info not in eAR	17,872,535.25	$6,094,564,654	$10,366,854,477

Reference: UCLA Cost Assessment Spreadsheet. Connection types are Residential (RS), Industrial (IN), and Commercial (CM). Final cost including adjustments is the sum of the total hard costs with cost adjustment factors (totaling 70.1%: Inflation, Regional Multiplier, Permitting, Electrical and Contingency).

In Table 13, these smaller water systems have significant costs to update their infrastructure and provide a backup electrical supply in case of a power outage. Specifically, The Village Mobile Home Park (~$6.8 million), El Rancho Mobile Home Park (~$20.5 million), and Del Rio Mutual Water Company ($66.7 million) would need to set up these backup systems and infrastructure. Western Skies Mobile Home Park and Mitchell's Avenue E Mobile Home Park may also need a backup supply, but further investigation is required to understand if that has been put into place or is in progress. For comparison purposes, we included the numbers for the receiving and small water systems that indicated that they already had a power supply set up.

The $341 in cost x MDD drives these numbers significantly up in our calculations. Given that these numbers are quite high, we assumed this information might be speculative but still useful since it follows SWRCB’s methodology precisely. For more accurate MDD calculations, it is recommended that you get the data directly from the CWS point of contact.

Sounders

Sounders are devices that measure static well levels on a regular basis to help diagnose well production or capacity issues before problems arise (State Water Resources Control Board, 2024d). There are a few types of sounders that require adjustments to the wellhead, but due to the lack of site-specific details, SWRCB recommends using a sounder device that utilizes sound waves (i.e., no need for wellhead adjustments) for the cost model. According to the State Waterboards, these devices generally have a one-time fee of $1,853 (State Water Resources Control Board, 2024d).

Survey responses to the optional question in Section 530 of the eAR, which asks about monitoring water levels in wells, were collected for each water system. Survey responses indicating “No” or “Unknown” were assumed to be out of compliance with regard to sounders and therefore, included in this cost estimate (Electronic Annual Report (eAR) | California State Water Resources Control Board, n.d.). Additionally, SDWIS data on the number of active wells in each water system helped determine the number of sounders needed (Public Drinking Water Watch, n.d.). Below is the equation needed to calculate the estimated costs for sounders (State Water Resources Control Board, 2024d).

Sounder Device Total Cost Estimate ($) = **$1,853** (per active well) + **32%** Regional Multiplier + **3.1%** Total Cost Inflation

Table 14: Estimated 2024 Metering Cost for Unmetered CWS

System of Concern	Sounder Installed?	Active wells without sounders	Final Cost Including Adjustments
The Village Mobile Home Park	Unknown	1	$2,503
Lancaster Park Mobile Home Park	No	1	$2,503
Los Angeles Residential Community Foundation	No	0	$0
Western Skies Mobile Home Park	Unknown	1	$2,503
El Rancho Mobile Home Park	No	1	$2,503
Mitchell's Avenue E Mobile Home Park	Unknown	1	$2,503
Del Rio Mutual Water Company	Yes	0	$0
Hemlock Mutual Water Company	Yes	0	$0
Sleepy Valley Water Company	Yes	0	$0
Mettler Valley Mutual Water Company	No	2	$5,007

Reference: UCLA Cost Assessment Spreadsheet. Number of active wells without sounders indicates the number of sounder devices needed. Final cost including adjustments is the sum of the total hard costs with cost adjustment factors (Inflation and Regional multiplier).

The Village Mobile Home Park, Lancaster Park Mobile Home Park, Los Angeles Residential Community Foundation, El Rancho Mobile Home Park, and Mitchell's Avenue E Mobile Home Park all have one active well needing a sounder, costing ~$2503 to bring the system into compliance. Mettler Valley Mutual Water Company has two active wells and therefore costs $5,007 to install the sounders. Given that the survey responses were optional, a detailed follow-up with the system is recommended, especially to determine if the “unknowns” do or do not have sounders installed.

Additional Storage Costs

Water systems need enough storage to meet the Maximum Daily Demand (MDD) and fire flow requirements. The State Water Board cost model includes a cost analysis for a new storage tank; however, the public information available does not include enough details to make an appropriate estimate on storage tank costs. Table 15, directly from the Additional Long-Term Modeled Solutions Cost Estimate Methodology, describes the equations and costs associated with additional storage. For this analysis, the data for the storage tank and booster pump costs is not available.

Table 15: Additional Storage Cost Assumptions from SWRCB

Cost Element	Cost Estimate
Components	
Storage Tank	$70,000-$19 M
SCADA	$73,403
Booster Pump	$38,000-$8.7 M
CEQA	$85,000
Cost Adjustments	
Urban Regional Multiplier	32%
Inflation	3.10%
Contingency	15%

Source: Page 19, Table 11 from SWRCB's Additional Long-Term Modeled Solutions Cost Estimate Methodology

However, we can still calculate the minimum costs should a water system need more storage. The range is $546,393 if the storage tank costs $70k and the booster pump is $38k. On the high end, the storage costs reach $57,137,585. Given that these water systems are small, the lowest cost estimate for extra storage ($546,393) is included in the final calculation, in the section called OEI Costs + Additional Storage Minimum.

Summary

OEI costs are necessary to maintain system compliance with SB 552 to ensure drought and fire resilience. The total estimated OEI costs in Table 16 (p.X) are likely underestimating the total costs needed to update the system, given the earlier assumptions regarding each system's MDD, the number of backup generators needed, and the lack of information around additional storage. If any of these water systems consider consolidation a potential solution, then the receiving system would subsume OEI costs.

Hemlock Mutual Water Company and Sleepy Valley Water Company have updated their systems recently. Given that they are meeting SB 552 regulations on most of these measures, they are likely to have sufficient storage systems in place. These OEI costs are significant for Mitchell's Avenue E Mobile Home Park, The Village Mobile Home Park, Western Skies Mobile Home Park, El Rancho Mobile Home Park, and Del Rio Mutual Water Company, ranging from ~2.4 million to ~$67.5 million in costs to update their systems.

It is important to consider these costs when evaluating the water system's financial viability in the coming years and determining whether outside funding sources could support these solutions. Furthermore, it is recommended to work directly with the water systems to identify a more accurate cost estimation for backup electrical supply (aside from the SWRCB's methods).

Hemlock Mutual Water Company and Sleepy Valley Water Company have already addressed most OEI costs—aside from potentially unknown storage tank needs—yet still rank as critical risks for drought and fire. Physical consolidation, improved access to emergency water supplies, or new wells may be necessary to ensure long-term resilience. For Mettler Valley Mutual Water Company and Sleepy Valley Water Company, the cost of physical consolidation is not financially feasible and far exceeds the estimated OEI costs, making further investment in OEI upgrades a more realistic option. A case study examining the specific challenges faced by these systems could help identify viable paths forward.

Table 16: Summary of Estimated OEI Costs

System of Concern	Meter Cost	Backup Electrical Supply	Sounders	Total Estimated OEI Costs	Total OEI Costs + Additional Storage Minimum
Hemlock Mutual Water Company	$0	$0	$0	$0	$546,393
Sleepy Valley Water Company	$0	$0	$0	$0	$546,393
Mettler Valley Mutual Water Company	$63,097	$0	$5,007	$68,103	$614,496
Los Angeles Residential Community Foundation	$88,817	$0	$0	$88,817	$635,210
Lancaster Park Mobile Home Park	$86,980	$0	$2,503	$89,484	$635,877
Mitchell's Avenue E Mobile Home Park	$92,492	$2,337,780	$2,503	$2,432,775	$2,979,168
The Village Mobile Home Park	$110,864	$6,815,551	$2,503	$6,928,918	$7,475,311
Western Skies Mobile Home Park	$160,468	$18,915,061	$2,503	$19,078,033	$19,624,426
El Rancho Mobile Home Park	$188,026	$20,534,681	$2,503	$20,725,210	$21,271,603
Del Rio Mutual Water Company	$292,747	$66,741,472	$0	$67,034,219	$67,580,612

Reference: UCLA Cost Assessment Spreadsheet. Summary of estimated OEI infrastructure costs by required component. Upgrades are necessary for SB 552 compliance. Backup power and storage costs may vary significantly based on each system's MDD and chosen equipment.

Table 17: Summary of Estimated OEI Costs Compared to Consolidation Costs

System of Concern	OEI Costs (Meters & Sounders)	OEI Costs +Backup Electrical	Total OEI Costs + Additional Storage Minimum	Physical Consolidation Cost Estimate
Hemlock Mutual Water Company	$0	$0	$546,393	$5,530,499
Sleepy Valley Water Company	$0	$0	$546,393	$9,972,076
Mettler Valley Mutual Water Company	$68,103	$68,103	$614,496	$68,854,335
Los Angeles Residential Community Foundation	$88,817	$88,817	$635,210	$1,060,347
Lancaster Park Mobile Home Park	$89,484	$89,484	$635,877	$4,059,105
Mitchell's Avenue E Mobile Home Park	$94,995	$2,432,775	$2,979,168	$3,991,113
The Village Mobile Home Park	$113,367	$6,928,918	$7,475,311	$1,459,819
Western Skies Mobile Home Park	$162,972	$19,078,033	$19,624,426	$2,108,712
El Rancho Mobile Home Park	$190,530	$20,725,210	$21,271,603	$2,358,134
Del Rio Mutual Water Company	$292,747	$67,034,219	$67,580,612	$3,728,019

Reference: UCLA Cost Assessment Spreadsheet.

Notably, backup electrical supply needs have driven OEI costs up significantly. For example, The Village Mobile Home Park, Western Skies Mobile Home Park, and El Rancho Mobile Home Park have OEI costs exceeding $6.9 million, $19 million, and $20.7 million, respectively, representing more than 80% of the total cost when including additional storage. In contrast, their physical consolidation cost estimates are much lower: $1.5 million, $2.1 million, and $2.4 million. Del Rio Mutual Water Company stands out with the highest OEI cost at over $67 million, more than 18 times its estimated consolidation cost. These figures highlight the wide variability in infrastructure needs and potential investment paths across systems. It also highlights potential issues with the State Water Board's methodology concerning backup electrical supply, which is the primary driver of high OEI costs.

Alternative Solutions to Physical Consolidation

Alternative Solution: Water Conservation Promotion

According to the research team's conversation with a CWS operator at Los Angeles County Waterworks District in Palmdale and other statistics on seasonal water use in Los Angeles County, water demand can double from wintertime usage to summertime usage in the Antelope Valley due to domestic irrigation (Pierce & Gmoser-Daskalakis, 2020). As water supply becomes more uncertain in areas affected by drought due to environmental and political forces, water conservation measures to reduce demand are one, at least partial, solution to addressing water shortage.

Technical assistance programs such as Department of Water Resources (DWR)'s Water Conservation Assistance Program offer a promising direction of working with small water systems to increase access to direct install services including customer metering, indoor water efficient fixtures, leak detection services, flow meters and groundwater level monitors for drinking water production wells, and special studies, including rate studies (Water Use Efficiency, 2025). According to DWR's Small Water Supplier Conservation Program Dashboard, the program has already served 10 households at Sleepy Valley Water Company through the installation of new toilets, showerheads, aerators, a well monitoring unit, household leak repairs, one training session, and one leak detection study (California Department of Water Resources, n.d.). The program has served 98 households at Mettler Valley Mutual by installing toilets, showerheads, meters, a well monitoring unit, one supplier leak repair, one training session, and one rate study (California Department of Water Resources, n.d.). Such support is essential given the CWS's limited options due to their spatial isolation. So far, DWR has spent $6,976,910 to assist 32 small water suppliers in California, estimating an annual water savings of 44,420,300 gallons. Nine of those small water suppliers have been from Los Angeles County, comprising 379 households served and 14,595,100 estimated gallons saved in Los Angeles County. DWR notes that many small water suppliers do not have enough staff to run conservation programs or the capacity to apply for state grants and other assistance to develop and implement a conservation program internally, demonstrating the need for this type of program (California Department of Water Resources, n.d.).

As noted earlier, SB522 requires small CWS to implement well monitoring, water metering for each connection, and leakage monitoring by 2032. Additional support for programs that build capacity toward conservation would encourage reduced water demand, therefore lessening drought impacts. Jurisdictions may need to step in to explore further water curtailment, training and education toward conservation, and incentives. Such measures will not change a system's access to water supply nor solve fire-risk-related challenges, but conservation promotion is a relatively straightforward strategy to promote while CWS pursues larger-scale solutions.

Alternative Solution: New Public Supply Well

Drilling a new well may be a potential option for small CWS at risk of drought and water shortage because it provides an opportunity for an additional water supply. Of course, in many cases with shortage risk this is not an option exactly because the larger aquifer where a new well might be drilled is running low or dry.

Table 18: Summary of New Public Supply Well (1,000 ft) Cost Assumptions

Cost Element	Cost Estimate	Source
Components		
Well Drilling	$900,000	From SWRCB Cost Assessment
SCADA	$73,403	From SWRCB Cost Assessment
Well Pump and Motor	$226,500	From SWRCB Cost Assessment
Well Development Cost	$36,000	From SWRCB Cost Assessment
Initial Water Quality Sampling	$3,030	From SWRCB Cost Assessment
Well Permitting	$3,209	From SWRCB Cost Assessment
Cost Adjustments		
Regional Multiplier	32%	From SWRCB Cost Assessment
Inflation	3.10%	From SWRCB Cost Assessment
Contingency	15%	From SWRCB Cost Assessment
Planning & Construction	10%	From SWRCB Cost Assessment
Engineering Services	15%	From SWRCB Cost Assessment
Overhead	10%	From SWRCB Cost Assessment
Upgraded Electrical per Site	20%	From SWRCB Cost Assessment

Source: pages 22-23 of SWRCB's Additional Long-Term Modeled Solutions Cost Estimate Methodology

Note: Well permitting data is based on 2021 County Permitting Data, found on pages 25–27 of the Additional Long-Term Modeled Solutions Cost Estimate Methodology from the State Water Resources Control Board (SWRCB).

Using SWRCB's equation for a new public supply well, the research team modeled that drilling a new 1,000 foot well in Los Angeles County costs $2,547,633. This figure is higher than private industry and private use estimated but consistent with SWRCB's findings that quotes staff sought for wells of different sizes and depths ranged from

$309,82059 to $3,000,000 (State Water Resources Control Board, 2024d) once all regulatory and sustainable groundwater management considerations are taken into account. Depending on the system of concern, the drilling of a single new well may or may not be less expensive than the estimated capital cost of a physical consolidation. Small CWS is unlikely to have the funds to drill a new well without financial assistance.

Alternative Solution: Obtaining New Water via Recycling

Wastewater recycling for water supply systems is a creative solution, especially important in areas impacted by drought and uncertain access to new water supply. Large water recycling projects often cost hundreds of millions of dollars. For example, estimates place the total capital costs for the City of Ventura's VenturaWaterPure Program at $259 million (FAQs, n.d.), and Stantec estimates for Palmdale Water District (PWD)'s Pure Water Antelope Valley Program (Pure Water AV) could total around $196.5 million in construction costs (Stantec, 2024). The high price tag puts this alternative solution out of reach for small water systems with limited financial capacity.

Several large water recycling projects are increasing drought resilience in the Antelope Valley. Antelope Valley-East Kern Water Agency (AVEK), a wholesale, supplemental water provider located in Palmdale, California, operates the High Desert Water Bank, the Westside Water Bank, and the Eastside Water Bank; AVEK also shares responsibility for the Upper Amargosa Creek Recharge project, a joint effort between the City of Palmdale, AVEK, PWD and Los Angeles County Waterworks District 40 (Water Banking, 2025). PWD is constructing its Pure Water AV project. This indirect potable reuse project will purify tertiary-treated wastewater to produce safe and clean water for the local groundwater aquifer (Stantec, 2024). This project will create additional local water supplies and decrease dependency on imported water, among other benefits (Home - Pure Water Antelope Valley, 2024). Pure Water AV's Demonstration Facility broke ground in 2024, and PWD expects the facility to be operational in 2030 (Home - Pure Water Antelope Valley, 2024).

The team initiated outreach to PWD management, asking if they have any plans to integrate any smaller water systems in the Antelope Valley as part of Pure Water AV or have discussed the possibility of doing so. We learned that Pure Water AV planning discussions have not included small CWS in the area, and no agencies are working with PWD on the project at this time.

According to our exchange with management, Pure Water AV's intent is to increase water supply reliability for existing customers and provide new water supply for future customers. The name 'AV' is to make any expansion working with other water agencies easier by not restricting it to Palmdale. PWD is understandably focused on securing a sustainable water supply for its paying customers, and the project does not plan to expand PWD's water distribution system.

The team attempted to connect with AVEK management several times to explore the same question: whether AVEK plans to or is interested in integrating any smaller water systems in the Antelope Valley to benefit from its water banking projects. We also asked what considerations or barriers may affect their decision. We did not receive a response. Without further information, larger systems or coalitions sharing recycled water with smaller systems seem unlikely. This report strongly suggests that parties in charge of large water recycling projects consider the possibility of integrating small CWS in these projects, seeing as they are one of the only substantial new supplies of water becoming available. SWRCB should begin considering possible incentives for recycled water sharing in light of the dire water supply needs of isolated CWS.

Alternative Solution: Managerial Consolidation

Existing research often offers managerial consolidation as a potential solution for CWS experiencing water quality challenges due to contamination and TMF concerns (Dobbin et al., 2022). Ideally, the struggling system and the system with more TMF capacity are near each other, although they can be farther in distance than what is feasible for physical consolidation. At the same time, managerial consolidation is not a direct solution for drought and fire risk and it is often a loosely-used term that can mean many things between achieving economies of scale to the bringing to bear of more advanced technical skills in system operation. It is important to note that TMF issues are not the primary factors driving the drought and fire risk defined by the analyses performed earlier in this report. However, systems of concern may wish to explore managerial consolidation or more formal partnerships (beyond mutual aid) to free up capacity for new planning challenges, such as planning for fire prevention.

Managerial consolidation, or at least some form of technical assistance, may be an option worth exploring for Sleepy Valley Water Company and possibly Mettler Valley Mutual Water Company. Both are too far from the Santa Clarita Valley Water Agency for physical consolidation but are within reasonable driving distance (approximately 3.23 miles and 25 miles, respectively) for another party to help manage.

It is important to note that managerial consolidation, even when voluntary, can be a complex endeavor. Necessary steps, such as performing rate studies and reconciling rates impacted by Proposition 218, can add costs and time to a consolidation process.

Alternative Solution: Other Types of Water System Partnerships

A variety of partnership types are a potential solution for critical risk water systems, to help increase capacity in case of emergency. Water systems can collaborate through local resource sharing, which encompasses informal and formal agreements to enhance efficiency, reduce costs, and improve service delivery (*Drinking Water Partnerships and Consolidation | California State Water Resources Control Board*, 2024). These partnerships are particularly beneficial for small or rural systems lacking access to specialized personnel or equipment. The establishment of formal partnerships is possible through legal contracts that do not impact systems' legal structures and governance. They can take the form of shared services, joint uses of infrastructure, or formations of legal entities such as a Joint Powers Authority (JPA). Informal partnerships are more flexible arrangements that do not require legal contracts, such as coordinated purchasing agreements, mutual aid agreements, and a genal sharing of knowledge (*Drinking Water Partnerships and Consolidation | California State Water Resources Control Board*, 2024). Partnerships are a potential pathway to securing some of the same benefits that consolidation provides. As a result, experts strongly recommend considering either informal or formal partnerships as a solution when consolidation is not possible for geographical or political reasons (Dobbin et al., 2022).

Partnerships to facilitate local and regional resource sharing should include establishing additional or enhanced interties. In UCLA’s Threshold of Concern Analysis conducted earlier in this chapter, interties played a key role in determining whether a system is at risk during drought conditions or emergencies. In Chapter 2, this report explained that the development of interties can more easily facilitate mutual aid during emergencies and increase system redundancy by providing alternative water sources during a crisis, maintaining pressure during firefighting efforts, and expediting recovery after a disaster.

In UCLA's Threshold of Concern Analysis, the research team weighted interties at 20% and emergency interties at 15%. This report found that among the top 10 systems of concern, none have emergency interties. Water systems falling within high or critical risk categories of the analysis should explore informal or formal partnership costs to address capacity shortages during emergencies.

Conclusion

In this chapter, we analyzed drought and water shortage risk for small CWS with 15-999 service connections, consulting with experts from Los Angeles County, SWRCB, and DWR to assemble and properly weight a list of drought risk indicators. Our analysis was motivated by SB 552, which lawmakers enacted in 2021 in recognition of the unique vulnerabilities that small CWS face during drought. SB 552 requires each county to assess drought and water shortage risk for state smalls and domestic wells, and, based on that analysis, consider consolidation for those systems. Under the leadership of the consulting firm Stantec, that effort for LA County's state smalls and domestic wells is underway. With its focus on small CWS, our analysis complements the County's in-progress efforts. By the time Stantec's work is done, the County should have a list of not only state smalls and domestic wells, but also small CWS to consider for consolidation.

Our work in this chapter included 1) a water shortage risk assessment and 2) a consolidation feasibility assessment, which we review.

Summary of findings

The water shortage risk assessment relied on the DWR Water Shortage Vulnerability Assessment Update for 2024. DWR's assessment included datasets from DWR, the 2024 SAFER Assessment, and information from SWRCB's Safe Drinking Water Information System. The risk assessment offers a data-driven method for assessing the resilience of small CWS in LA County. The framework produces a composite resilience score that reflects structural capacity and environmental stressors by weighting nine distinct indicators—including groundwater decline, intertie presence, system size, and previous exposure to drought impacts. This scoring methodology enables a comparative understanding of system vulnerability and is a foundation for targeted investment, regulatory oversight, and potential system consolidation.

This resilience-based composite framework reveals a landscape in which many small water systems operate with limited redundancy and varying degrees of vulnerability, supporting a tiered approach to intervention. We identified four distinct risk tiers

cross the county's small water systems: Critical, High, Moderate, and Low.
Critical Risk systems (n = 10) scored above 50, indicating severe and overlapping vulnerabilities. The absence of interties and emergency interties was universal in this group, compounding risks associated with groundwater decline and distribution outages. These systems should be considered top priorities for technical assistance, capital investment, and potential regional consolidation.

High Risk systems (n = 13) scored between 40 and 50. While not at the crisis threshold, these systems are marked by gaps in intertie infrastructure and small supplier size. Three systems exhibit bottled water dependence; over half have incomplete groundwater data, masking potential long-term risks. These systems require close monitoring and may benefit from infrastructure support to reduce isolation and increase operational capacity.

Moderate Risk systems (n = 43) exhibit a more diffuse vulnerability pattern. The most common issue is a lack of emergency interties, which are not present in any systems in this tier. Intertie absence is also widespread. While most show no signs of capacity violations or service outages, emerging trends—such as aquifer stress and land use encroachment—are beginning to surface. Preventive planning and data quality improvements are recommended for this group.

Low-Risk systems (n = 29) maintain relatively stable operational profiles, with composite scores below 30. Although several lack interties and some report groundwater decline or outage history, these conditions are either isolated or offset by other strengths such as sufficient supplier size and absence of regulatory violations. Still, some systems show early warning indicators—including bottled water reliance and source capacity violations—that warrant continued observation.

The physical proximity and cost analysis section of this chapter used geospatial data in ArcGIS Pro and a refined host of costs, drawing from the SWRCB Drinking Water Needs Assessment's Cost Assessment and accompanying appendices, to determine which systems of at risk for drought or fire lend themselves toward physical consolidation or alternative solutions. We refer to these CWS, which fall into the Critical Risk category, as systems of concern.

Numerous small CWS in LA County may be good candidates for physical consolidation. Eight out of ten systems of concern are feasible for physical consolidation with a receiving system: Lancaster Park Mobile Home Park, Los Angeles Residential Community Foundation, Western Skies, Mobile Home Park, El Rancho Mobile Home Park, Mitchell's Avenue E Mobile Home Park, Del Rio Mutual Water Company, and Hemlock Mutual Water

Company. These CWS are within 3 miles of a receiving system identified as capable of consolidating. They are also within SWRCB-defined thresholds of financial viability.

The two remaining systems of concern, Sleepy Valley Water Company and Mettler Valley Mutual, are spatially isolated from any potential receiving systems and therefore are not feasible candidates for physical consolidation using this report's methodology. These two systems should explore drought and fire resiliency through alternative solutions, such as managerial consolidation or conservation measures. Notably, no systems of concern in this study have an emergency intertie. While starting a large-scale water reuse project is prohibitively expensive for these systems, recycling projects by other water agencies in the Antelope Valley could lead to new opportunities for collaboration with smaller systems. However, political will for such an idea is not yet apparent.

Recommendations

Here we list several policy recommendations based on our research and findings.

1. **Invest in drought and fire preparedness for small CWS.** Significant investment is needed from the state and federal government to help prepare CWS for drought and fire events. At a minimum, small CWS of concern must receive assistance with emergency intertie construction and water metering installation.

2. **Include small CWS in county-level drought planning.** LA County's SB 552-required drought planning task force includes all struggling small CWS in its planning, not just state smalls and domestic wells. Depending on the number of small CWS in their jurisdiction, other counties should do the same, recognizing that state smalls/domestic wells and small CWS face similar drought and shortage risks.

3. **Recommend that counties assess drought risk and consolidation potential for small CWS.** SB 552 and associated regulations should urge counties to assess 1) drought and water shortage risk and 2) consolidation potential for state smalls/domestic wells and small CWS, as we have done here. The teams conducting these assessments should collaborate to the greatest extent possible to share lessons and methods.

4. **Establish a targeted auditing and compliance review process to identify small water systems with persistent data gaps in indicators such as groundwater decline and intertie infrastructure.** SWRCB should flag systems that consistently fail to self-report for technical assistance or regulatory follow-up to prevent data omissions from masking vulnerabilities that delay interventions. It should be noted that many of these systems are in disadvantaged area communities and may not have the resources or knowledge that they need to self-report. SWRCB and DWR should prioritize providing additional resources to these small systems. Having identified systems that lack the knowledge or capacity to self-report, SWRCB and DWR should enable non-profit consultants like the Rural Community Assistance Corporation (to a greater extent than they already have) to support these systems with training and technical assistance.

5. **Establish more detailed requirements and funding around drought planning for small CWS.** Currently, small CWS only need to maintain ENPs, which tend to be boilerplate documents that do not accommodate the detailed planning required to respond to a drought or water shortage. SB 552 and associated regulations should either require that small CWS maintain ERPs or be more prescriptive about the contents of drought-planning elements within ERPs or ENPs, while allowing for flexibility demanded by local conditions. In either case, systems will need financial support to properly plan.

6. **Develop stronger guidance around mutual aid participation for small CWS.** DWR should develop more robust guidance around being an active member of water system mutual aid organizations such as CalWARN. Meaningful membership in such a system could promote resilience in struggling systems for which consolidation is not an option due to cost and/or distance between systems.

7. **Integrate real-time data into UCLA's drought threshold analysis.** Many of the datasets that inform the threshold analysis get updated regularly (for example, the SAFER data gets updated daily). We recommend creating a version of the threshold analysis that updates with real-time data, which would allow researchers to track CWS performance within rather than simply between calendar years.

8. **Solicit feedback from small CWS operators on risk indicators and weights.** As we did with agency officials, researchers should interview small CWS operators to gather their opinions about the appropriateness of certain indicators and their weights for predicting water shortage. Their feedback can inform future versions of the threshold analysis.

9. **Collect data on specific infrastructure and interconnection costs at more refined geographies**. More targeted data collection for connection fees and other geographically specific cost components can benefit feasibility studies. More research is warranted on the extremely wide range of connection fees, and SWRCB can expand upon this research through existing data collection efforts.

10. **Expand funding, outreach, and accessibility for state-administered small CWS conservation programs.** The state should expand support for initiatives like DWR's Small Water Supplier Conservation Program, which helps small CWS implement conservation efforts. DWR currently initiates participation in this program, and it is not open for applications.

11. **Regionalize access to water recycling projects.** Agencies managing new or pending large water recycling projects should consider proactively engaging small water systems about collaborative agreements to share and receive recycled water to supplement uncertain water production in the region. SWRCB should also begin considering what possible incentives and encouragements can be provided for larger system and regional coalition recycled water sharing in light of the dire water supply needs of isolated CWS. This approach can also be applied to some major stormwater and desalination efforts.

Limitations to the Approach

While the recommendations above are grounded in available data and modeling, several limitations constrain the analysis.

Risk Assessment

Across all risk categories and indicators, data completeness remains a limiting factor, particularly in groundwater decline and source outage reporting. The binary scoring structure allows critical vulnerabilities to be identified, but improved data availability is needed to refine future assessments and avoid underestimating risk.

Feasibility Assessment

The imperfect nature of using CWS boundaries as a geospatial unit limits the physical proximity analysis. In the future, it would be helpful to have finer geospatial data, such as infrastructural connection points, to produce a more precise distance measurement for pipeline construction.

As noted in SWRCB’s Drinking Water Needs Cost Assessment, neither their cost model nor ours captures all potential costs associated with consolidation projects. Construction costs that are likely highly site-specific are abstracted to some degree. Including cost components such as inflation and contingency attempts to account for uncertainty conservatively, but this report does not grapple with the increasing cost of money over time. It is also important to note that the analysis primarily focuses on capital costs; operation and maintenance costs are not in the scope of this analysis.

Next Steps

Our work closely aligns with the water shortage risk and consolidation assessment that LA County, with the help of Stantec, will be conducting for state smalls and domestic wells. As LA County's water system landscape changes—whether due to consolidation, system improvements, or the continued risks of drought and wildfire—our analysis will need further refinement, and at the very least updating. That work should be closely integrated with the County's so that teams assessing state smalls and domestic wells can share lessons with those assessing small CWS. While not identical, state smalls/domestic wells and small CWS face many of the same risks and should be considered alongside each other in analyses and policy discussions.

The next chapter profiles the 10 CWS at highest risk of fire and water shortage, and analyzes the feasibility of different approaches to addressing that risk.

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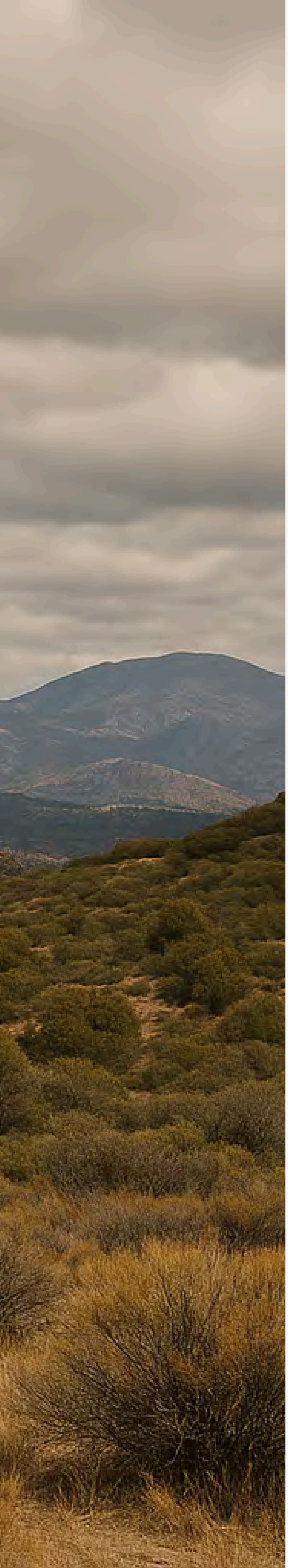

Chapter 4

Case Studies: Risk Assessments & Feasibility Insights of High Threshold of Concern (HTC) Water Systems

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04

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Background

Introduction

Water system consolidation encouraged or triggered by regulatory factors has traditionally focused on the failure and risk of systems to meet drinking water quality standards. This is evidenced in the focus of the State Water Resources Control Board (SWRCB) and the SAFER program over the last decade, detailed in Chapter 1. More recently, growing attention has been paid to drought and wildfire impacts—especially after the January 2025 wildfires in Los Angeles—which highlight different but equally serious system vulnerabilities: supply shortages and infrastructure damage.
This section thus builds on previous chapters to evaluate solutions and their feasibility for 10 water systems at most critical risk for drought and fire. These systems were selected out of a larger pool of CWS, ranked by risk levels for drought and or fire in our analysis conducted in Chapter 2 and Chapter 3. We develop short case studies for each system using a common template. This template could be refined for and applied to other "critical risk" systems identified in our Chapter 2 and Chapter 3 analyses, and also other counties in the state or the broader U.S. Southwest region.

The case studies begin with background information on the system's location, ownership, and service population, followed by an overview of the community's demographic and socioeconomic context using census and citywide data. The following sections will flag a system's risk status under state programs like SAFER, identifying key issues such as water quality violations, limited accessibility, financial constraints, or technical and managerial weaknesses. Furthermore, high-level capital cost estimates for consolidation and standalone infrastructure upgrades are provided to frame decision-making.

We note that these case studies are similar in approach and intent to the SAFER analyses. They provide neither a full analysis of operations and maintenance costs for receiving systems, nor a detailed economic evaluation of the potential costs to receiving systems and related rate impacts, including considerations such as the value of groundwater rights in some cases. The case studies do not replace the need for preliminary engineering analyses or estimated rate studies.

At the same time, it is important to note that while consolidation is expensive upfront, feasibility evaluations rarely consider that it can and often does lead to substantial reduced avoided costs over the long term. These avoided costs include expenditures by residents for bottled or vended water, emergency repair and crisis support expenditures by regulators when systems fail, and the patchwork costs of partial interventions which do not solve underlying problems sustainably.

Each case study also includes a profile of the proposed receiving water system, with information on its capacity, compliance history, and governance. Legal and regulatory considerations are outlined, as well as governance for specific consolidation structures such as physical interties or master meter connections. Each case concludes with a forward-looking discussion, identifying next steps and highlighting both obstacles and opportunities. These include community impact considerations, affordability and rate concerns, service continuity, and administrative or governance challenges.

We analyzed recently-completed consolidation cases in Chapter 1 of this analysis. Consolidation takes several years at best from agreement between necessary parties, and it can be difficult to assess where some systems are in the consolidation process, as different lists and databases at times contain inconsistent information. However, the State Water Resources Control Board and the County are clearly engaged in evaluating, supporting, and at times facilitating consolidation and other long-term solutions for systems that are either failing or seeking integration.

To that end, some of the cases we analyze below appear to have started the process of consolidation, but few details are available on their exact progress. Additionally, lesser-known early-stage efforts—such as those at Desert Palms Mobile Home Park and Lily of the Valley—are not well publicized and merit further study and support.

Furthermore, in Chapter 3, Alpine Springs Mobile Home Park was excluded from the list of 10 systems in order to prioritize systems not currently engaged in consolidation efforts (Alpine Springs is undergoing a master-meter consolidation with the Palmdale Water District). In its place, we selected Western Skies Mobile Home Park, which ranks among the top five systems at highest fire risk in Los Angeles County. The final list of 10 systems is highlighted in Table 1. None of these systems has interties, and all rely on groundwater as their sole source.

In all case studies, we note where data sources are inconsistent or conflicting and indicate when statistics need corroboration.

Table 3: Case Study Locations in Los Angeles County

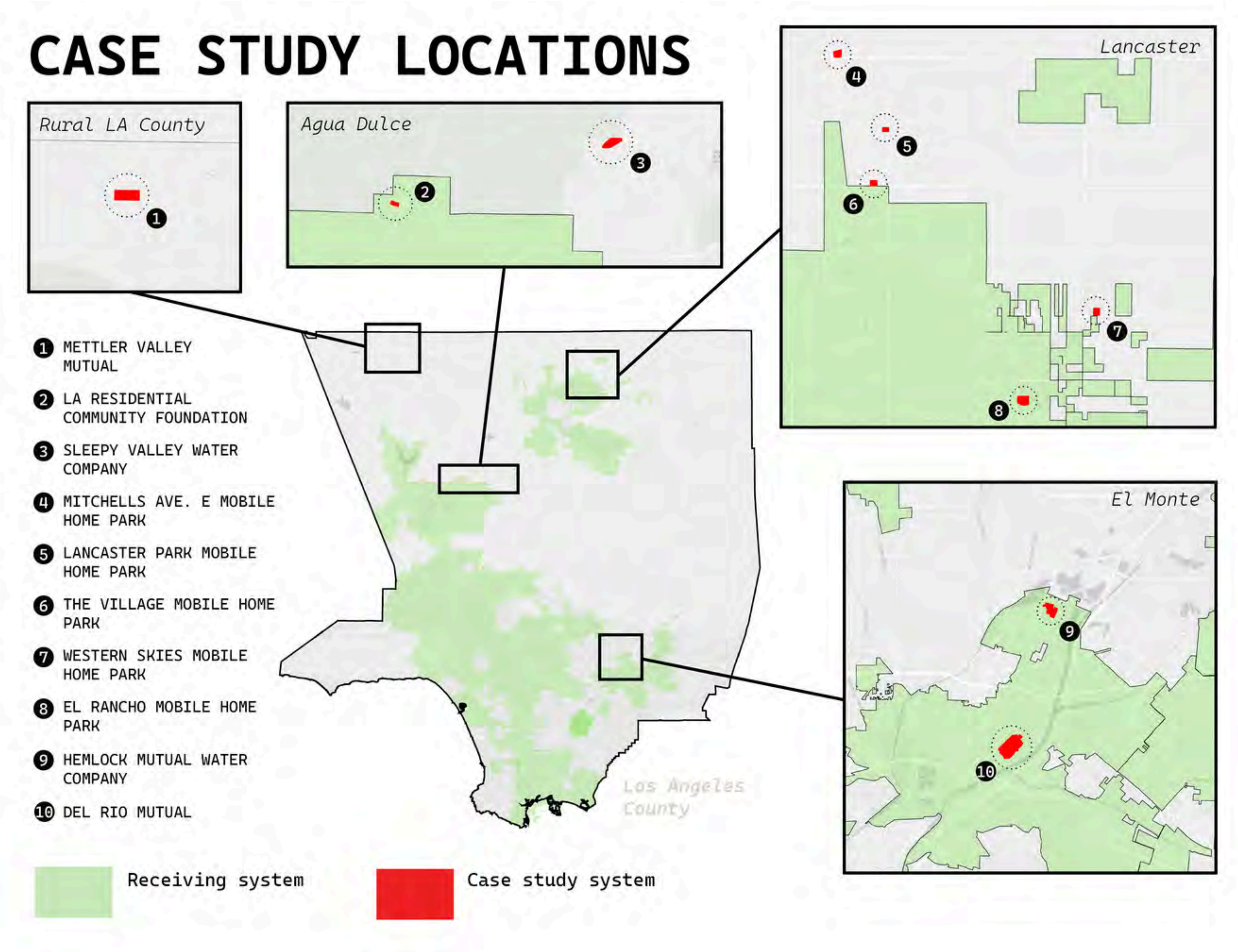


Table 1: Summary of Top 10 Water Systems identified to be at most critical risk for drought, fire, or both.

Case Study ID	Case Study Name	UCLA Drought Composite Index Score	UCLA Drought Risk Classification	UCLA Fire Composite Index Score	UCLA Fire Risk Classification	SAFER Status	Population	Service Connections
CA1900520	The Village Mobile Home Park	65	Critical Risk	0.78	High	Failing	71	34
CA1900038	Lancaster Park Mobile Home Park	55	Critical Risk	0.67	High	Failing	60	21
CA1900062	Los Angeles Residential Community Foundation	60	Critical Risk	0.7	High	At-Risk	184	22
CA1900541	Western Skies Mobile Home Park	35	Moderate Risk	0.76	High	At-Risk	198	61
CA1900636	El Rancho Mobile Home Park	50	Critical Risk	0.65	High	Potentially At-Risk	215	76
CA1900785	Mitchell's Avenue E Mobile Home Park	50	Critical Risk	0.76	High	Failing	24	24
CA1900130	Del Rio Mutual Water Company	50	Critical Risk	0.58	Moderate	Potentially At-Risk	700	133
CA1910053	Hemlock Mutual Water Company	50	Critical Risk	0.35	Low	Potentially At-Risk	686	208
CA1900903	Sleepy Valley Water Company	55	Critical Risk	0.3	Low	At-Risk	162	58
CA1900100	Mettler Valley Mutual Water Company	50	Critical Risk	0.57	Moderate	Failing	160	98

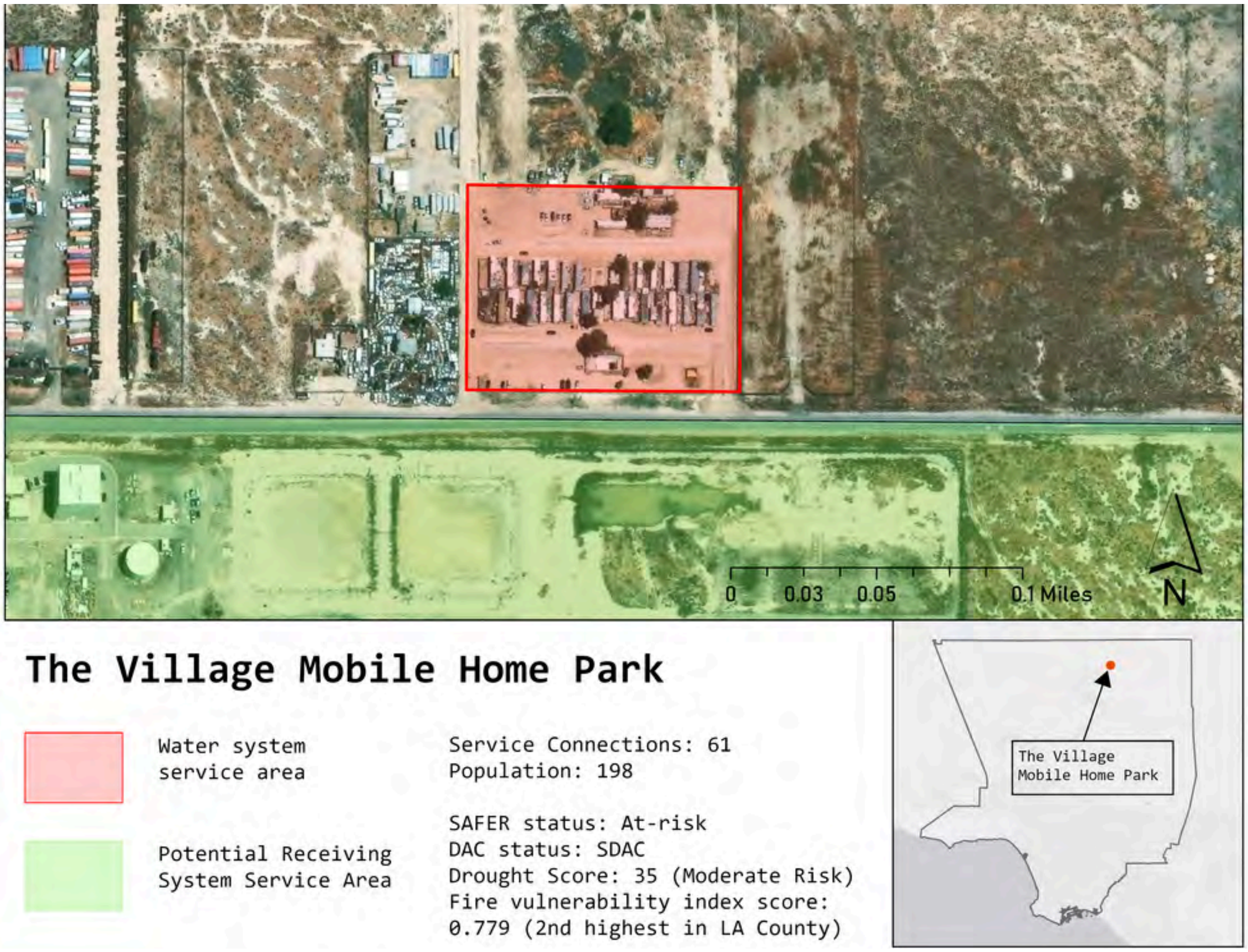
Methods

System Engagement Strategies and Observations

To better understand system-specific challenges and community perspectives, the project team conducted outreach to each water system included in this section. The team made multiple rounds of phone calls, sent emails, and submitted formal interview requests to property managers, board members, and system representatives. In a few cases, recipients acknowledged initial contact, such as confirming receipt of an email or verbally agreeing to participate, but did not respond to follow-up communications. The limited engagement reflects both our short timeframe to conduct this stage of the work as well as broader challenges commonly seen in small, under-resourced water systems, particularly in mobile home parks and shareholder-owned communities, where administrative capacity is often limited and mistrust of external agencies or perceived regulatory scrutiny is common.

The absence of direct responses may mirror patterns documented in other communities, especially mobile home parks, which constitute half of the case study communities. For instance, Pierce and Gonzalez found that residents of mobile home parks often experience poor water quality, more service shut-offs than the general population, frequently rely on bottled water when tap water is unsafe, and express frustration with limited opportunities to raise concerns about their exclusion from water access and governance decisions (2017). These findings may help explain the reluctance among water system representatives to participate in interviews. Future planning for these systems and the communities they serve will require dedicated, trust-building community engagement to ensure transparency and responsiveness to local needs.

The Village Mobile Home Park



Location
Lancaster, Los Angeles County

Proposed Receiving System
Los Angeles County Waterworks District 40 (LACWD 40)

Consolidation Structure
Physical Master Meter

Water System Type
Community Water System (Mobile Home Park)

34 Service Connections

Governance of Consolidated Entity
County Waterworks District (Independent Special District)

Water System Background

This case study examines consolidation opportunities and challenges for The Village Mobile Home Park (Village MHP), a small community water system in Lancaster, California. Lancaster has a population of approximately 166,236 residents and a semi-arid climate (U.S. Census Bureau, 2023). The Village MHP serves 71 residents through 34 service connections, is privately managed, and relies exclusively on one groundwater well for its drinking water supply. At the city level, 35% of Lancaster residents identify as White, 21.4% as Black or African American, 4% as Asian, and 45.9% as Hispanic or Latino. The median household income is $76,083, with 15.5% of residents living below the poverty line (U.S. Census Bureau, 2023).

At the census tract level of the Village MHP, about 69.5% of residents identify as people of color (residents who are not non-Hispanic White), placing this area in the higher range for Los Angeles County (U.S. Census Bureau, 2023). The median household income is $67,984, indicative of a low-income census tract under regional affordability thresholds (U.S. Census Bureau, 2023). Based on the SAFER Engagement Units' snapshot tool, the Village MHP is classified as a Severely Disadvantaged Community (SDAC), with a median household income of $48,333–significantly less than the census tract-level value of $67,984 (SWRCB, n.d.). Moreover, 41% of residents over age 25 lack a high school diploma, ranking this tract in the top quartile for low educational attainment in L.A. County (U.S. Census Bureau, 2023). These data underscore the environmental and socioeconomic vulnerabilities facing this community.

Addressing System Vulnerabilities

Under the State Water Resources Control Board's (SWRCB) Safe and Affordable Funding for Equity and Resilience (SAFER) program as of 2024, the Village MHP is classified as "failing" (SWRCB, 2024). Testing above the legal limit for arsenic, the Village MHP recently reported 56 parts per billion (ppb) in 2024, well above the EPA limit of 10 ppb (EPA, 2024). High levels of lead and copper were also detected in 2021 (EPA, 2024). Although the system is currently in compliance with federal drinking water standards, the persistently elevated arsenic levels and historical detection of other contaminants raise serious public health concerns, and data from the past five years show that the system has recorded arsenic violations annually, demonstrating a concerning pattern of noncompliance (EPA, 2024).

According to SWRCB's Drivers of Risk framework, 37% of Village MHP's risk is attributable to water quality issues, 44% to accessibility, 5% to affordability, and 15% to technical, managerial, and financial (TMF) constraints. Technical, Managerial, and Financial (TMF) capacity refers to a water system's ability to reliably provide safe drinking water through sound infrastructure, effective governance, and sustainable financial practices. These three interrelated areas assess whether a system can plan for, achieve, and maintain long-term compliance with drinking water standards (SWRCB, 2020).

Based on our analysis, the estimated physical consolidation capital cost between Village MHP and Los Angeles County Waterworks District 40 (LACWD 40) is $1,459,819, or $42,936 per connection for the MHP. If Village MHP pursued essential infrastructure updates as an alternative, the estimated costs would be~$6.9 million, not including additional storage costs should the system need it.

Potential Receiving System

Located directly across the street (0.012 miles) from LACWD 40, the Village MHP is an ideal candidate for water system consolidation. LACWD 40 is a County Waterworks District governed by the Los Angeles County Board of Supervisors and administered by the Los Angeles County Department of Public Works (DPW), and serves over 50,000 active connections across the Antelope Valley region. LACWD 40's water supply is largely sourced through the State Water Project, via the Antelope Valley–East Kern Water Agency (AVEK), as well as local groundwater wells (LACWD, 2023). Importantly, LACWD 40 has had no known health-based drinking water violations in the past decade, reflecting strong technical and regulatory performance.

Despite the proximity and favorable receiving system profile, according to the SWRCB's SAFER Engagement Units portal, consolidation was ultimately determined to be not cost-effective (SWRCB, n.d). Instead, the state proceeded with funding standalone infrastructure upgrades (SWRCB, n.d).

Governance & Policy

The Village MHP is currently under an EPA-administered order for arsenic exceedances, receiving technical assistance from the California Rural Water Association (SWRCB, n.d). Given that consolidation was evaluated by the state but ultimately ruled out, the system was approved for a $1,215,700 capital investment from the Drinking Water State Revolving Fund (DWSRF) (SWRCB, n.d). Funding from the DWSRF supports the construction of a new well, tanks, and pumps for arsenic remediation, and the project is listed as active and planned with approved funding, though no execution date has yet been posted (SWRCB, n.d.).

Paths Forward: Obstacles and Opportunities

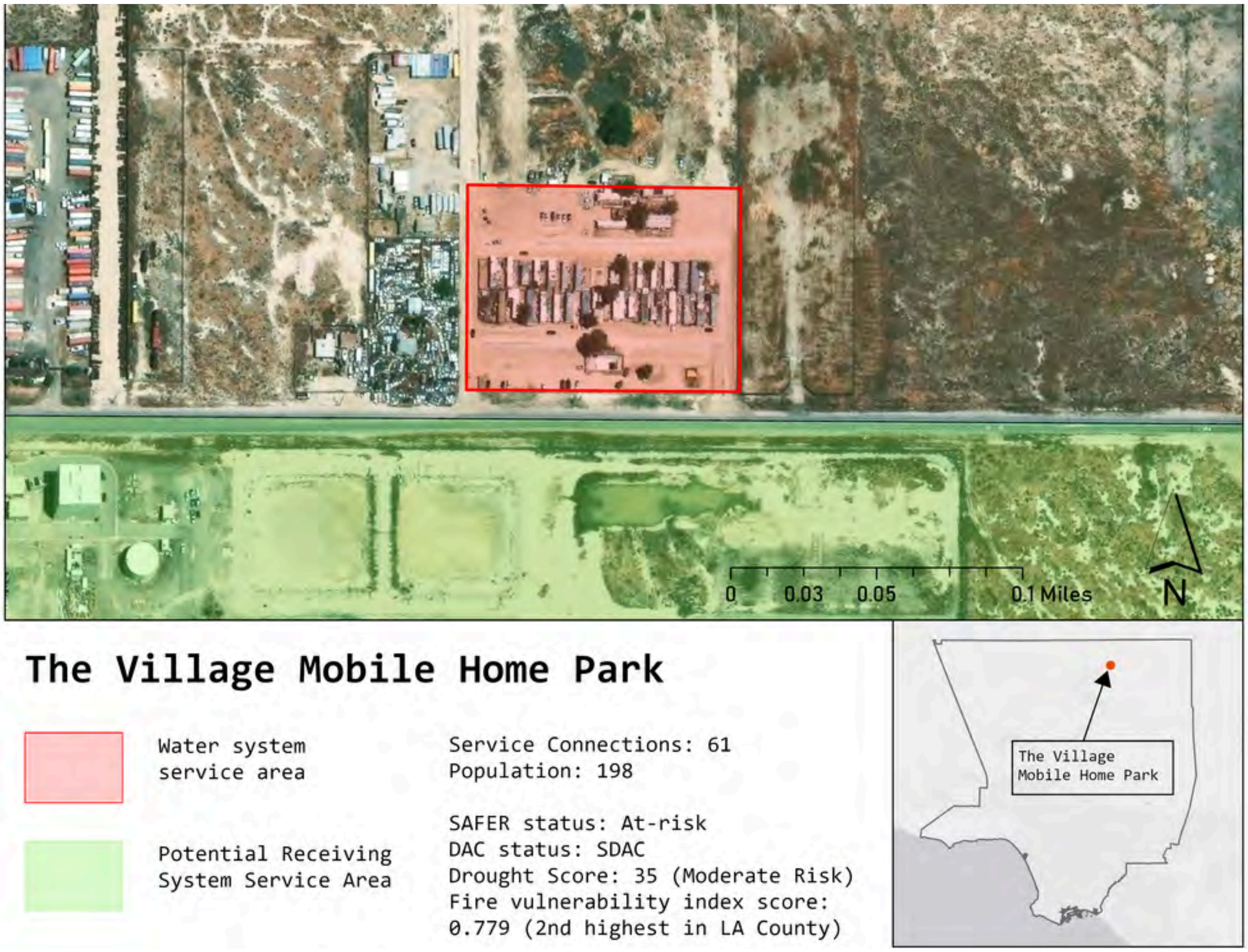
Village MHP's primary issue is arsenic contamination in its groundwater source. The State Water Board intervened with a targeted solution: funding the construction of a new well and associated infrastructure through the DWSRF program. While this intervention addresses the immediate compliance issue, it may also introduce unresolved challenges, such as broader TMF limitations, which may continue to undermine long-term sustainability.

Specifically, the installation of a new well does not address the root causes of system vulnerability such as its reliance on a single water source, and the lack of long-term operational sustainability. Without addressing broader governance and TMF limitations, if the new infrastructure deteriorates, compliance lapses, or costs rise, the system is at-risk of being locked into an independent trajectory that may require continuous external support. As such, physical consolidation with LACWD 40 may provide the most comprehensive long-term solution, offering enhanced water quality, institutional oversight, and financial sustainability. However, given unspecified cost concerns and lack of formal inclusion in a consolidation plan, the system will likely remain independent for the foreseeable future.

Alternative options such as interties, treatment, or additional backup wells could be explored by the state to provide supplemental reliability, but do not fully resolve the system's broader vulnerabilities. Thus, continued monitoring and a possible reevaluation of consolidation feasibility may be warranted, especially if costs for independent operation continue to rise.

In short, while the state's capital improvements could address the immediate water quality issue, the underlying structural issues facing Village MHP persist.

Lancaster Mobile Home Park



Location
Lancaster, Los Angeles County

Proposed Receiving System
Los Angeles County Waterworks District 40 (LACWD 40)

Consolidation Structure
Physical Master Meter

Water System Type
Community Water System (Mobile Home Park)

21 Service Connections

Governance of Consolidated Entity
County Waterworks District (Independent Special District)

Water System Background

This case study examines consolidation opportunities and challenges for Lancaster Park Mobile Home Park (Lancaster Park MHP), a small community water system in Lancaster, California. The Lancaster Park MHP serves 60 residents through 21 service connections, relying exclusively on two groundwater wells for its drinking water supply.

At the city level, 35% of Lancaster residents identify as White, 21.4% as Black or African American, 4% as Asian, and 45.9% as Hispanic or Latino. The median household income is $76,083, with 15.5% of residents living below the poverty line (U.S. Census Bureau, 2023). At the census tract level inclusive of Lancaster Park MHP, the median household income is $63,333, with 29.2% of residents living below the poverty line (U.S. Census Bureau, 2023). The most significant demographic of residents identify as Hispanic (63%), with non-Hispanic White accounting for 29%, followed by 4% identifying as Native American, 2% identifying as two or more races, and 2% identifying as Black (U.S. Census Bureau, 2023). Notably, no residents identify as Asian, Pacific Islander, or Other racial groups in this tract (U.S. Census Bureau, 2023). Moreover, the census tract is composed of a relatively low proportion of mobile home residents (12.8%), distinguishing it from areas with higher concentrations of mobile homes (U.S. Census Bureau, 2023).

Addressing System Vulnerabilities

Through community outreach, we learned that Lancaster Park MHP is privately owned and operated by Metter Rentals. In conversation, the system's representative emphasized that navigating complex regulatory requirements remains a persistent challenge. They noted that more accessible and practical guidance on compliance obligations would greatly enhance their ability to manage the system effectively.

This feedback reveals a critical gap in managerial capacity and points to the need for regulatory support to be a core element of any ongoing assistance strategy. Given the metrics-driven nature of this analysis, these community-based insights underscore the importance of pairing technical and financial interventions with accessible, user-friendly compliance support—particularly for small, privately operated systems.

While Lancaster Park MHP meets the criteria for a Disadvantaged Community (DAC) under California's affordability thresholds (California Public Utilities Commission, n.d.), according to the SAFER Engagement Units' Snapshot Tool, the system is further classified as a Severely Disadvantaged Community (SDAC), with a median household income (MHHI) of $48,333, which is substantially lower than the census tract-level MHHI of $63,333 (SWRCB, n.d.). This designation needs to be confirmed by further research.

Lancaster Park MHP is currently classified as "failing" under the State Water Resources Control Board's (SWRCB) SAFER program for drinking water violations and consistent failure to provide safe water over time. Arsenic concentrations in the drinking water have consistently ranged between 17 and 26 parts per billion (ppb)—more than double the federal Maximum Contaminant Level (MCL) of 10 ppb (EPA, 2024).

As of 2024, Lancaster Park MHP reported violations in 11 of the past 13 quarters, reflecting a chronic pattern of noncompliance. The system's compliance history includes federal and state administrative orders issued in 2015 and 2019, alongside historical exceedances for lead, copper, and nitrate, dating back to at least 2018. SWRCB's Drivers of Risk framework characterizes the system's vulnerabilities as 38% water quality, 46% accessibility, 5% affordability, and 10% technical, managerial, and financial (TMF) capacity (SWRCB, 2024).

The estimated physical consolidation capital cost between Lancaster Park MHP and LACWD 40 is approximately $4,059,105, or $193,291 per connection for the MHP. Should Lancaster Park MHP pursue essential infrastructure updates as an alternative, the estimated costs are $85,484, and we note that this figure excludes additional storage costs that may be needed and could add substantial cost.

Potential Receiving System

The Lancaster Park MHP is located 1.3 miles by road from Los Angeles County Waterworks District 40 (LACWD 40), which is operated by the Los Angeles County Department of Public Works (DPW). LACWD 40 has reported no major water quality violations in the past decade and demonstrates the technical, managerial, and financial (TMF) capacity to ensure stable and resilient water service (DPW, 2024). Serving over 50,000 active connections and a population of 204,673, LACWD 40 draws water from the State Water Project via the Antelope Valley-East Kern Water Agency (AVEK) and local groundwater wells (LACWD, 2023). Notably, the district has had no known violations in the past decade.

Governance & Policy

Under California Senate Bill 88, SWRCB has the authority to mandate consolidation for small, failing water systems—particularly those serving Severely Disadvantaged Communities (SDACs). While Lancaster Park MHP is classified by some sources as a Disadvantaged Community (DAC), it is unclear whether it is officially designated as a Severely Disadvantaged Community (SDAC). If confirmed, this designation would be relevant for potential eligibility under SB 88 and related consolidation mandates.

The proposed receiving system, LACWD 40, is a County Waterworks District governed by the Los Angeles County Board of Supervisors and administered by the Los Angeles County Department of Public Works (DPW). Because LACWD 40 is a subsidiary of the County, and not an independent special district, expansion of its service area can be approved internally by the County and does not require LAFCO approval. This structure offers a relatively streamlined path for incorporating systems like The Village MHP, though formal County action is still required, even if ownership of the mobile home park remains unchanged.

As of 2025, Lancaster Park MHP has received $843,288 in technical assistance funding, primarily for planning and capacity development (SWRCB, n.d.). Two technical assistance projects are active, according to the SAFER Engagement Unit Dashboard, but no infrastructure upgrades, capital construction, or remediation funding have yet been initiated (SWRCB, n.d.).

Paths Forward: Obstacles and Opportunities

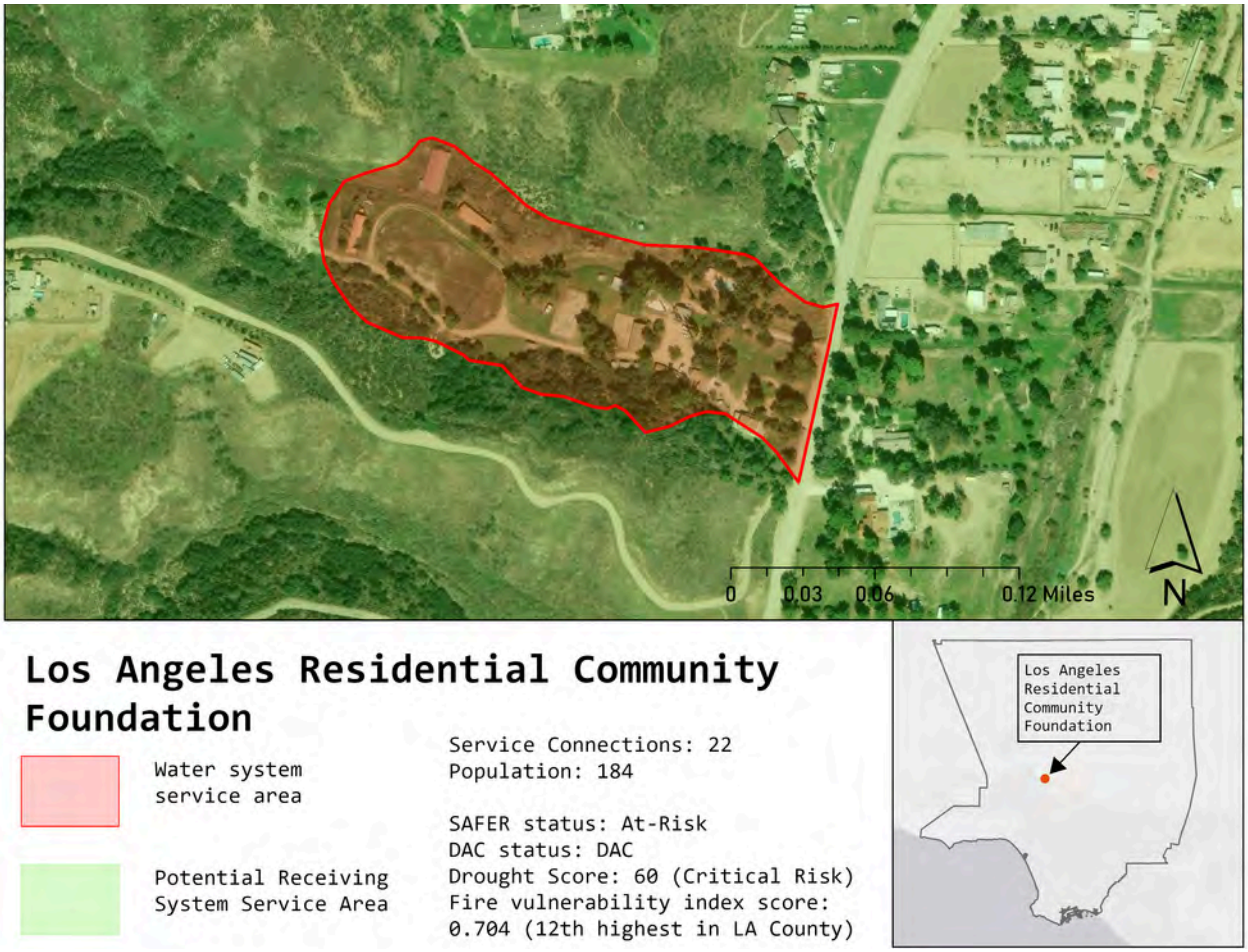
Lancaster Park MHP faces pressing challenges rooted in water quality violations, limited supply redundancy, and reliance on a single groundwater well. With consistently elevated arsenic levels and a history of regulatory violations, the system’s deficiencies likely stem from a combination of water source limitations and potential gaps in treatment or operational capacity. Moreover, the absence of interties or backup supply further compounds the system’s vulnerability during drought and emergency conditions. Given these structural and operational risks, temporary administrative oversight or receivership is unlikely to address the core challenges, which require capital-intensive improvements or connection to a more robust regional system. Instead, near-term efforts focusing on securing funding for engineering assessments, pre-consolidation planning, regulatory capacity-building, and community engagement could prepare the system for long-term solutions.

One potentially sustainable long-term pathway could consider a physical consolidation with LACWD 40, which possesses the infrastructure capacity, strong compliance history, and demonstrated TMF capacity to deliver reliable service. Although LACWD 40 is operated by the DPW, it is legally a County Waterworks District, so the process for consolidation may be streamlined.

Alternative approaches—such as drilling a new well, installing necessary treatment techniques, or constructing an emergency intertie (costs of which are estimated in Chapter 3)—may offer partial relief but would likely not address governance and financial sustainability. Without consolidation, the system would likely continue facing high compliance costs and affordability barriers, further straining households in a small and under-resourced community.

Through direct outreach with the property manager, it was confirmed that while the system has not been formally approached about consolidation, management previously inquired about the possibility. They were advised that the cost of consolidation would be prohibitively high, which discouraged further exploration. This response illustrates that system operators have considered long-term solutions but face perceived financial barriers that may limit proactive planning. These findings emphasize the need for clear, accessible cost information and early-stage funding support to keep feasible options on the table.

Los Angeles Residential Community Foundation



Location Santa Clarita, Los Angeles County	**Proposed Receiving System** Santa Clarita Valley Water Agency	**Consolidation Structure** Physical Master Meter
Water System Type Community Water System	**22 Service Connections**	**Governance of Consolidated Entity** Special District (Independent Special District)

Water System Background

This case study examines consolidation opportunities, challenges, and related recent developments for the Los Angeles Residential Community Foundation (LARC Ranch), a small community water system in Santa Clarita, California. LARC Ranch is privately owned, delivering purchased surface water to 184 residents through 22 service connections, and despite LARC Ranch's existing water infrastructure (wells, water storage tanks, and onsite piping networks), it has relied on hauling water to fulfill its residents' water needs since 2015 (*Santa Clarita Valley Water*, n.d.). The SAFER Engagement Units' Snapshot Tool confirms that LARC Ranch's wells are inactive, and that LARC Ranch is 100% reliant upon hauled water (SWRCB, n.d.).

At the city-level, Santa Clarita has approximately 224,028 residents, with 53.1% of residents identifying as non-Hispanic White, 4.4% as Black or African American, 11.4% as Asian, and 36% as Hispanic or Latino (U.S. Census Bureau, 2023). The citywide median household income is $119,926, with 7.7% of residents living below the poverty line (U.S. Census Bureau, 2023).

Based on data from the U.S. Census Bureau (2023), the census tract encompassing LARC Ranch reflects the following demographic and socioeconomic characteristics: approximately 57% of residents identify as non-Hispanic White, while 36% identify as people of color, including 4% Black or African American, 9% Asian, and 23% Hispanic or Latino. Roughly 19% of residents are foreign-born, notably lower than the Los Angeles County average of 33.4%, and educational attainment is relatively high: 42.7% of residents hold a bachelor's degree or higher, while only 7.2% lack a high school diploma. The median household income (MHHI) for the tract is $191,058, more than double the countywide average, although 7.7% of residents live below the poverty line. Additionally, approximately 6% of the population lives in mobile homes, slightly higher than the Santa Clarita city average of 4% (U.S. Census Bureau, 2023).

Addressing System Vulnerabilities

Although California's affordability metrics initially suggest LARC Ranch serves a Disadvantaged Community (DAC) (SWRCB, 2024), the SAFER Engagement Units' Snapshot Tool indicates otherwise, reporting that it does not meet DAC criteria

(SWRCB, n.d.). While the system has not experienced Maximum Contaminant Level (MCL) violations in the past five years (EPA, 2024), SWRCB's Driver of Risk Framework identifies LARC Ranch as 0% at risk for water quality, 80% for accessibility, 0% for affordability, and 20% for technical, managerial, and financial (TMF) capabilities. Its high accessibility risk is driven by the lack of interties, limited water sources, reliance on hauled or bottled water, and issues flagged in the Department of Water Resources' Drought and Water Shortage Assessment (SWRCB, 2024).

As of 2024, LARC Ranch is classified as "at-risk" under the SWRCB SAFER Program, due to its vulnerabilities in accessibility and long-term water supply reliability. Since 2017, it has received $2,622 in technical assistance funding and is currently backed by $3.93 million in approved financing for consolidation planning and services (FY 2024–25 Fund Expenditure Plan, 2024). In response to escalating project costs, the Santa Clarita Valley Water Agency (SCV Water) secured an additional $8.07 million from the SWRCB to support project implementation. The LARC Ranch Pipeline Project began in mid-2024, with completion expected by December 2025. Upon completion, LARC Ranch will be connected to SCV Water through a 1.8-mile pipeline, using a master meter consolidation model (Santa Clarita Valley Water, n.d.).

UCLA's drought and fire risk assessment categorized LARC Ranch as "critical risk" for drought and "high risk" for wildfire, reinforcing the importance of consolidation as a long-term resilience strategy.

Potential Receiving System

Santa Clarita Valley Water Agency (SCV Water) is a nearby independent special district located adjacent to LARC Ranch (0 miles). It delivers primarily surface water, sourced from Castaic Lake, and operates 44 active groundwater wells, serving 108,813 people through 32,473 active connections (CA Drinking Water Watch, n.d.). Notably, SCV Water has had no known drinking water violations in the past five years.

Governance & Policy

LARC Ranch has a unique governance structure: it operates as a privately owned community water system (CWS) within Los Angeles County, regulated by the Division of Drinking Water District 22 (Angeles) (Pierce & Gmoser-Daskalakis, n.d.). Under the current consolidation plan, LARC Ranch will retain private ownership, and is responsible for paying the costs associated with the service line, meter box, meter, and piping infrastructure (Santa Clarita Valley Water, n.d.).

SCV Water will serve as the retail water provider, with service agreements outlining the legal responsibilities for both parties under a master meter consolidation model (Guidance for Consolidation Projects Appendix A, n.d.). If LARC Ranch remains a private water system post-consolidation, it is still required to comply with Senate Bill 552 (SB-552), which mandates adequate infrastructure, drought resilience planning, and emergency preparedness. Our estimated cost for compliance upgrades, including meters, sounders, and backup power (excluding storage), is $84,817.

Paths Forward: Obstacles and Opportunities

The LARC Ranch Pipeline Project represents a key infrastructure milestone, expected to significantly reduce accessibility risk and enhance system resilience. A master meter connection to SCV Water will provide LARC Ranch with reliable access to blended surface and groundwater, better positioning the system to handle droughts, wildfires, and operational emergencies. Further integration with SCV Water is encouraged, but considerations remain.

In the short term, it will be essential to closely monitor the pipeline project's implementation and maintain active public engagement to ensure that community needs and concerns are addressed throughout the transition.

Over the longer term, fully realizing the benefits of consolidation will require deliberate attention to several key factors: ensuring affordability under the new rate structures, addressing community trust and expectations regarding service quality, and managing governance transitions and infrastructure handoff logistics. Moreover, a sustained focus on improving TMF performance, enhancing rate transparency, and fostering ongoing community involvement will be critical to the long-term success and sustainability of the consolidated system.

Western Skies Mobile Home Park

🌎

Location

Lancaster, Los Angeles County

🔗

Proposed Receiving System

Los Angeles County Waterworks District 40 (LACWD 40)

🛠

Consolidation Structure

Physical Master Meter

🚰

Water System Type

Community Water System (Mobile Home Park)

🏘

61 Service Connections

🏛

Governance of Consolidated Entity

County Water District (Independent Special District)

Water System Background

This case study examines consolidation opportunities and challenges for Western Skies Mobile Home Park (MHP), a small privately owned community water system in Lancaster, California. Lancaster has an estimated population of 166,236 (U.S. Census Bureau, 2023). Western Skies MHP serves approximately 198 residents through 61 service connections, drawing water from a groundwater source.

In Lancaster, 35% of residents identify as non-Hispanic White, 21.4% as Black or African American, 4% as Asian, and 45.9% as Hispanic or Latino (U.S. Census Bureau, 2023). The citywide median household income (MHHI) is $76,083, with 15.5% of residents living below the poverty line.

The census tract encompassing Western Skies MHP offers important context about the surrounding community. Approximately 72% of residents identify as people of color, including 43% Hispanic or Latino, 22% Black or African American, and 7% Asian. About 25% of residents identify as White. Additionally, 14.6% of residents are foreign-born. In terms of educational attainment, 18% hold a bachelor's degree or higher, while 19.2% do not have a high school diploma. The tract's median household income is $82,165, with 15.9% of residents below the poverty line. Notably, 25% of the population resides in mobile homes, significantly above the city average of 7% (U.S. Census Bureau, 2023).

Addressing System Vulnerabilities

Western Skies MHP serves a Severely Disadvantaged Community (SDAC) as defined by California's affordability thresholds (SWRCB, 2024). As of 2024, it is classified as at risk under the SWRCB's SAFER Program, although it has not received any state funding through SAFER to date (SWRCB, 2024). As of 2024,Western Skies MHP is classified as "at-risk" under the SWRCB SAFER Program, and the SAFER Engagement Units' Snapshot Tool confirms no active projects currently listed for the system and reports an MHHI of $72,271 (SWRCB, n.d.).

According to UCLA's drought and fire risk assessment, the system ranks in the highest category for fire risk. The system is regulated by the Division of Drinking Water District 22

(Central) and has no recorded maximum contaminant level (MCL) violations over the past five years (EPA, 2025). Although it complies with federal drinking water standards, SWRCB's Driver of Risk Framework identifies the system as being: 43% at risk for water quality, 38% for accessibility, 19% for affordability, and 0% for technical, managerial, and financial (TMF) capabilities (SWRCB, 2024).

Consolidation may present a potential solution to address these vulnerabilities. The estimated capital cost of physical consolidation with Los Angeles County Waterworks District 40 (LACWD 40) is approximately $2,108,712, or $34,569 per connection. If Western Skies MHP instead pursued standalone infrastructure upgrades, estimated costs would be ~$19,074,033, excluding additional storage needs.

Receiving System

Western Skies MHP is located directly across the street to LACWD 40, which simplifies the logistics of potential consolidation. Operated by the Los Angeles County Department of Public Works (DPW), LACWD 40 provides water to 204,673 residents through 52,476 active connections. It draws from purchased surface water (via Antelope Valley-East Kern Water Agency) and local groundwater wells (CA Drinking Water Watch, n.d.). Notably, the district has had no known violations in the past decade.

Governance & Policy

The proposed receiving system, LACWD 40, is a County Waterworks District governed by the Los Angeles County Board of Supervisors and administered by the Los Angeles County Department of Public Works (DPW). Because LACWD 40 is a subsidiary of the County, and not an independent special district, expansion of its service area can be approved internally by the County and does not require LAFCO approval. Given its immediate proximity to LACWD 40, Western Skies MHP is well positioned for physical consolidation, and the governance structure offers a relatively streamlined path for incorporating systems like The Village MHP, though formal County action is still required, even if ownership of the mobile home park remains unchanged.

In the event of consolidation, a master meter connection is likely the most feasible structure (Dobbin et al., 2022), allowing Western Skies MHP to retain operational control with minimal change to governance. However, further information about the park's internal management and capacity is needed to assess whether a managerial consolidation or future acquisition may be warranted for long-term sustainability.

Paths Forward: Obstacles and Opportunities

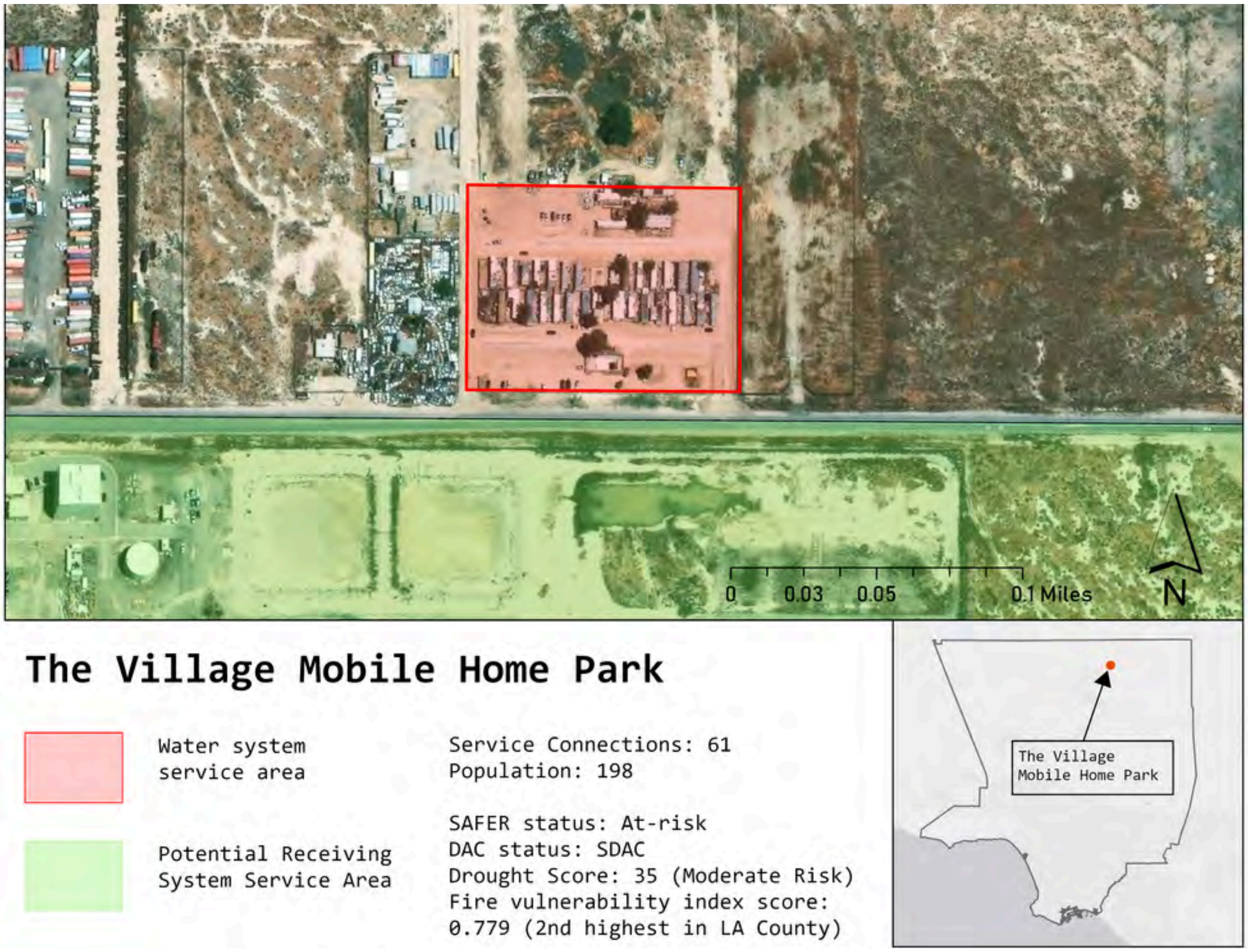
Western Skies MHP is well positioned for physical consolidation through a master meter connection that would allow LACWD 40 to supply water to residents while the park would retain its current governance structure. This structure could improve service reliability without requiring immediate ownership or operational control transfer. However, to determine the most appropriate consolidation pathway, state and local partners will need more information about the park's financial health, managerial readiness, and willingness to participate. Without these insights, it is unclear whether a managerial consolidation or full acquisition would be more viable in the long term.

To date, the system has not received SAFER funding. In the short term, technical assistance could support engineering assessments, feasibility studies, and cost analyses. If physical consolidation succeeds, appointment of a temporary administrator may be unnecessary. Still, LACWD 40 and the property owner would need to develop clear agreements on service responsibilities, water rates, and cost-sharing mechanisms.

In the long term, consolidation with LACWD 40 could yield greater benefits, including enhanced financial oversight, emergency preparedness, and access to public funding opportunities. While a master meter setup addresses reliability, it may not fully resolve affordability or governance concerns. If Western Skies MHP continues to operate independently without strengthening its TMF performance, state monitoring will be necessary to ensure compliance with water quality, affordability, and accessibility standards.

Overall, the system's proximity to LACWD 40 makes consolidation both logistically feasible and cost-effective. Moving forward, engagement with park management, ownership, and residents will be crucial to clarify goals, resolve legal and operational questions, and ensure any transition—partial or full—supports affordability, service reliability, and community trust.

El Rancho Mobile Home Park



🌎 **Location**
Lancaster, Los Angeles County

🔗 **Proposed Receiving System**
Los Angeles County Waterworks District 40 (LACWD 40)

🛠 **Consolidation Structure**
Physical Master Meter and Managerial Acquisition

🚰 **Water System Type**
Community Water System (Mobile Home Park)

🏘 **76 Service Connections**

🏛 **Governance of Consolidated Entity**
County Water District (Independent Special District)

Water System Background

El Rancho Mobile Home Park (El Rancho MHP) is a small community water system in Lancaster, California. El Rancho MHP serves 215 residents through 76 service connections, relying exclusively on multiple groundwater wells for its water supply. We draw data from both citywide and census tract levels to contextualize the area's demographic and socioeconomic conditions. In Lancaster, 35% of residents identify as non-Hispanic White, 21.4% as Black, 4% as Asian, and 45.9% as Hispanic or Latino (U.S. Census Bureau, 2023). The median household income in Lancaster is $76,083, with 15.5% of residents living below the poverty line (U.S. Census Bureau, 2023).

In the census tract home to El Rancho MHP, the median household income is $67,880, slightly lower than the citywide median (U.S. Census Bureau, 2023). Economic challenges are evident, with 19.4% of residents living below the poverty line. Notably, 46% of the total population resides in mobile homes, a significantly higher proportion than the citywide average (U.S. Census Bureau, 2023). Residents who identify as Hispanic or Latino account for 42% of the population, making this the largest demographic group. Those who identify as non-Hispanic White account for 24%, followed by 20% Black, 12% identifying as two or more races, and 3% who identify as Asian. No residents in this tract identify as Native American, Pacific Islander, or other racial groups (U.S. Census Bureau, 2023).

The SAFER Engagement Units' Snapshot Tool classifies El Rancho MHP as serving a Disadvantaged Community (DAC) with a median household income of $72,271 (SWRCB, n.d.). From this source, we also understand that the system is privately owned by Park Avenue Asset Management, who has expressed interest in consolidating the water systems of its mobile home parks, including El Rancho MHP (SWRCB, n.d.).

Addressing System Vulnerabilities

El Rancho MHP is regulated by the Division of Drinking Water District 16 (Central) and is classified as a Disadvantaged Community (DAC) under California's affordability thresholds (California Public Utilities Commission, n.d). Due to ongoing operational and water quality challenges, the system is currently classified as "at-risk" under the State Water Resources Control Board's (SWRCB) SAFER program, and UCLA's drought risk assessment places the system in the "critical risk" category, indicating heightened vulnerability to water scarcity events. SWRCB's Drivers of Risk framework reveals that, 19% of El Rancho MHP's risk is attributed to water quality issues, 38% to accessibility, 26% to affordability, and 17% to technical, managerial, and financial (TMF) constraints.

As water quality concerns have persisted at the system for several years, El Rancho MHP has consistently reported elevated iron levels (89 parts per billion [ppb]), which—though not posing a direct health hazard—cause aesthetic problems such as metallic taste, staining of fixtures, and discoloration (EPA, 2024). More significantly, the system has not completed required radiological sampling since 2017, raising compliance concerns with federal and state drinking water monitoring requirements (EPA, 2024).

As of August 2023, the SAFER Engagement Units' Snapshot Tool indicates that the system has received $367,016 in technical assistance funding, directed toward the development of water service agreements, engineering assessments, and community engagement activities across multiple properties and water systems owned by Park Avenue Asset Management (SWRCB, n.d.). The owner has expressed interest in pursuing consolidation for these systems under a shared solution (SWRCB, n.d.). While it is not explicitly stated whether the approach will be physical, managerial, or both, there is clear evidence of intent to move toward integration.

The proposed receiving system, LACWD 40, has indicated that it is not currently positioned to consolidate El Rancho MHP, though this may change based on future regional planning priorities or funding availability. Accordingly, the remainder of this case study is written under the assumption that conditions may eventually support reconsideration of consolidation (SWRCB staff, personal communication, May 29, 2025). Given El Rancho MHP's persistent compliance risks, lack of interties, and operational constraints, consolidation does represent a potential long-term solution, particularly given the system's immediate proximity to LACWD 40.

The estimated capital cost for physical consolidation is $2,358,134, or approximately $31,028 per connection, which falls within the State Water Board's cost-effectiveness threshold under its Consolidation Cost Assessment Model.

Receiving System

El Rancho MHP is located within the service area of Los Angeles County Waterworks District 40 (LACWD 40), which significantly enhances the feasibility of water system consolidation. Operated by the Los Angeles County Department of Public Works

(DPW), LACWD 40 provides water to 204,673 residents through 52,476 active connections. It draws from purchased surface water (via Antelope Valley-East Kern Water Agency) and local groundwater wells (CA Drinking Water Watch, n.d.). The district has a strong regulatory track record, with no known drinking water violations in the past decade.

Governance & Policy

The proposed receiving system, LACWD 40, is a County Waterworks District governed by the Los Angeles County Board of Supervisors and administered by the Los Angeles County Department of Public Works (DPW). As a subsidiary of the County, and not an independent special district, LACWD's expansion of its service area can be approved internally by the County and does not require LAFCO approval.

This structure offers a relatively streamlined path for incorporating systems like El Rancho MHP, though formal County action is still required, even if ownership of the mobile home park remains unchanged. Moreover, as system's owner, Park Avenue Asset Management, has formally expressed interest in consolidating El Rancho MHP with two additional mobile home parks it owns, we see LACWD's governance structure as particularly advantageous for time- or cost-sensitive efforts which could facilitate a more efficient transition for both systems.

Paths Forward: Obstacles and Opportunities

El Rancho MHP continues to rely solely on groundwater wells, with no interties or redundancy to buffer against supply disruptions, drought, or system failures. In light of this, consolidation with LACWD 40 represents a strong long-term solution, particularly given the low estimated per-connection cost of interconnection and the infrastructure already in place nearby.

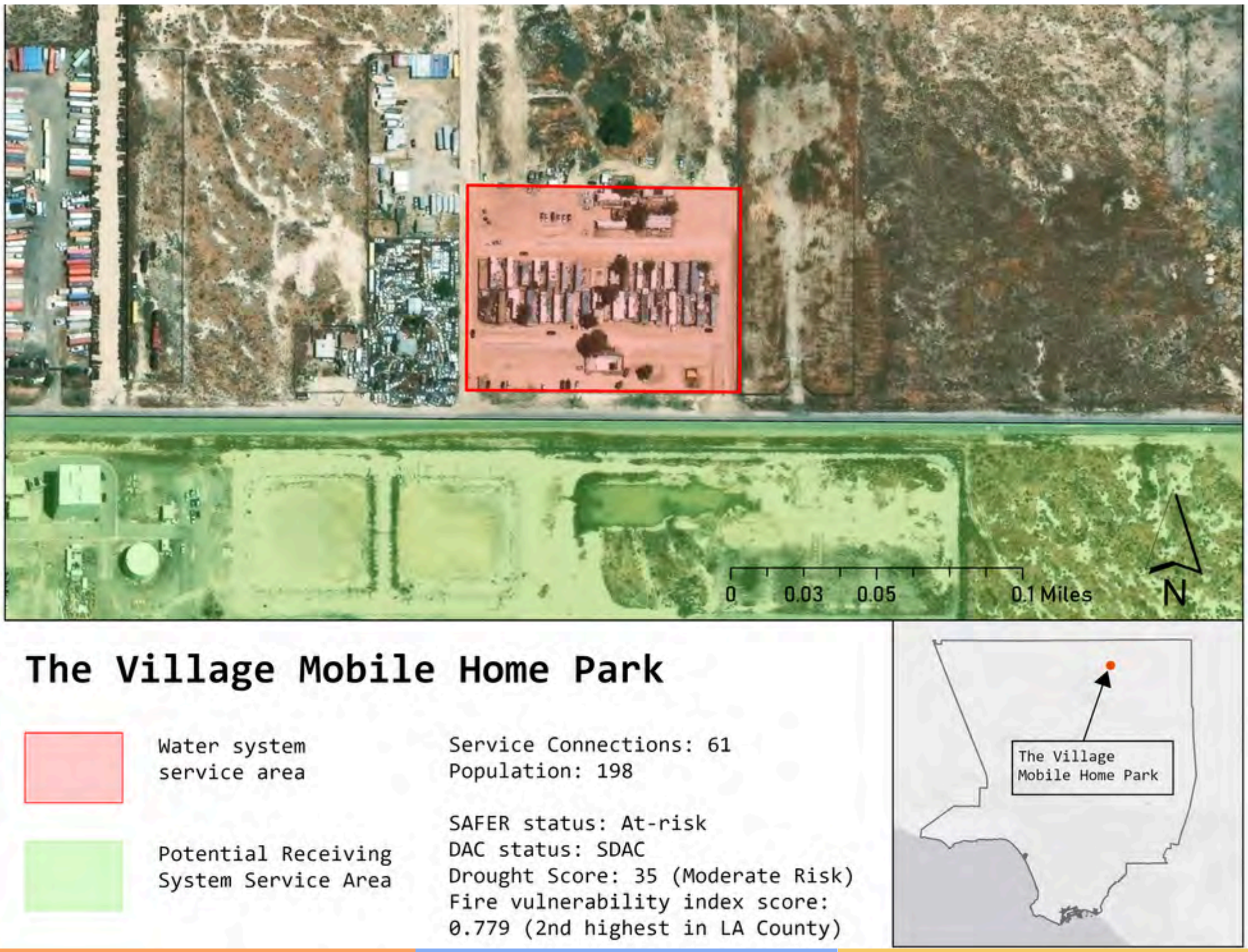
According to the SAFER Engagement Units' Snapshot Tool, the system's owner, Park Avenue Asset Management, has formally expressed interest in consolidating El Rancho MHP with other systems under its ownership: Clear Skies MHP and Terra Nova MHP (SWRCB, n.d.). This indicates a broader intent by ownership to pursue long-term solutions for all three communities. Recent engagement efforts through SAFER were focused on technical assistance and pre-consolidation planning. While, at the moment, LACWD 40 has declined to be the receiving system, SWRCB has indicated that could change with updated planning priorities (SWRCB, personal communication, May 29, 2025), and the existing collaboration between the state, the system, and LACWD 40 reflects a promising step toward implementation. Also, the three systems owned by Park Avenue Asset Management could potentially function as a mutual aid network during the planning or interim periods, especially in emergency response scenarios.

In the longer term, the possibility of a physical acquisition or full managerial consolidation by LACWD 40 could be explored. This would bring the full benefit of the district’s robust infrastructure, drought resilience, and professional oversight. Alternative approaches, such as drilling new wells or establishing limited interties with other systems, would likely fall short of addressing the systemic vulnerabilities and financial limitations currently facing El Rancho MHP.

Despite this momentum, more direct engagement with El Rancho MHP’s property management and residents is needed to assess consolidation readiness and potential implementation barriers. The research team attempted outreach via phone and email but did not receive responses, a common challenge when working with small, privately owned systems. Building trust and ensuring transparent communication will be essential moving forward.

Ultimately, any transition must take into account how consolidation would affect customer rates, service reliability, and access to safe drinking water. Further technical, financial, and legal assessments will be important to ensure the long-term viability of any selected path forward, particularly as state and local agencies continue to support consolidation planning through SAFER and other funding programs.

Mitchell’s Avenue E Mobile Home Park



Location
Lancaster, Los Angeles County

Proposed Receiving System
Los Angeles County Waterworks District 40 (LACWD)

Consolidation Structure
Physical (Acquisition)

Water System Type
Community Water System (Mobile Home Park)

24 Service Connections

Governance of Consolidated Entity
County Water District (Independent Special District)

Water System Background

This case study examines consolidation opportunities and challenges for Mitchell's Avenue E Mobile Home Park (MHP), a small community water system in Lancaster, California. Mitchell's Avenue E MHP delivers groundwater to 24 residents through 24 service connections.

In Lancaster, 35% of residents identify as non-Hispanic White, 21.4% as Black or African American, 4% as Asian, and 45.9% as Hispanic or Latino (U.S. Census Bureau, 2023). The city's median household income (MHHI) is $76,083, with 15.5% of residents living below the poverty line (U.S. Census Bureau, 2023). The census tract encompassing Mitchell's Avenue E MHP provides further insight into local conditions. Approximately 60% of residents identify as non-Hispanic White, 32% as Hispanic or Latino, 2% as Black or African American, and virtually 0% as Asian (U.S. Census Bureau, 2023). Roughly 12% are foreign-born, significantly lower than the Los Angeles County average of 33.4%. Educational attainment is relatively mixed, with 27.6% holding a bachelor's degree or higher, and 14% lacking a high school diploma. The tract's median household income is $68,276, with 4.4% of residents living below the poverty line. In contrast, the SAFER Engagement Units' Snapshot Tool reports a system-specific median household income of $28,750—significantly lower than both the tract-level and citywide averages (SWRCB, n.d.).

Notably, 29% of residents live in mobile homes, four times the citywide average.

Addressing System Vulnerabilities

Mitchell's Avenue E MHP is classified as 'failing' under the State Water Resources Control Board's (SWRCB) SAFER Program due to primary maximum contaminant level (MCL) violations for arsenic. As of 2024, the system serves a Severely Disadvantaged Community (SDAC) and is under a Compliance Order for water quality (SWRCB, n.d.). The Division of Drinking Water District 16 (Central) regulates the system. Most recently, water samples from April to June 2024 showed arsenic levels of 21.4 parts per billion (ppb), which is more than double the EPA's maximum limit of 10 ppb. While no new health-based violations were reported after September 2024, the system remains under enforcement.

Mitchell’s Avenue E MHP qualifies as “failing” under SWRCB ‘s Risk Framework, with 43% of risk stemming from water quality, 43% from accessibility, 7% from affordability, and 7% from technical, managerial, and financial (TMF) capabilities. The system’s high accessibility risk is attributed to limited water sources, the absence of interties, and the DWR’s Drought & Water Shortage Assessment results (SAFER, 2024).

To address these issues, Mitchell’s Avenue E MHP has received a total of $1,720,701 in state support, but with key distinctions. Of this amount, $128,157 has been disbursed through an executed interim water treatment project, and the remaining $1,592,544 funding for arsenic treatment has been approved but is not yet disbursed, with the project currently in planning (SWRCB, personal communication, May 29, 2025). These improvements include the installation of arsenic treatment equipment and the development of new wells—efforts intended to stabilize the system’s source water quality and improve drought resilience (SWRCB, n.d.).

Receiving System

Mitchell’s Avenue E MHP is located 1.25 miles by road from Los Angeles County Waterworks District 40 (LACWD 40). While the distance places it at the higher end of feasibility for physical interconnection, consolidation remains technically possible. LACWD 40, operated by the Los Angeles County Department of Public Works (DPW), serves over 50,000 active connections and sources water from both the State Water Project (via AVEK) and local groundwater wells.

Notably, the district has had no known health-based drinking water violations in the past decade (LACWD, 2023).

Governance & Policy

Under California Senate Bill 88, SWRCB has the authority to mandate consolidation for small, “failing” systems serving SDACs like Mitchell’s Avenue E MHP.

The proposed receiving system, LACWD 40, is a County Waterworks District governed by the Los Angeles County Board of Supervisors and administered by the Los Angeles County Department of Public Works (DPW). As a subsidiary of the County, and not an independent special district, LACWD’s expansion of its service area can be approved internally by the County and does not require LAFCO approval.

Paths Forward: Obstacles and Opportunities

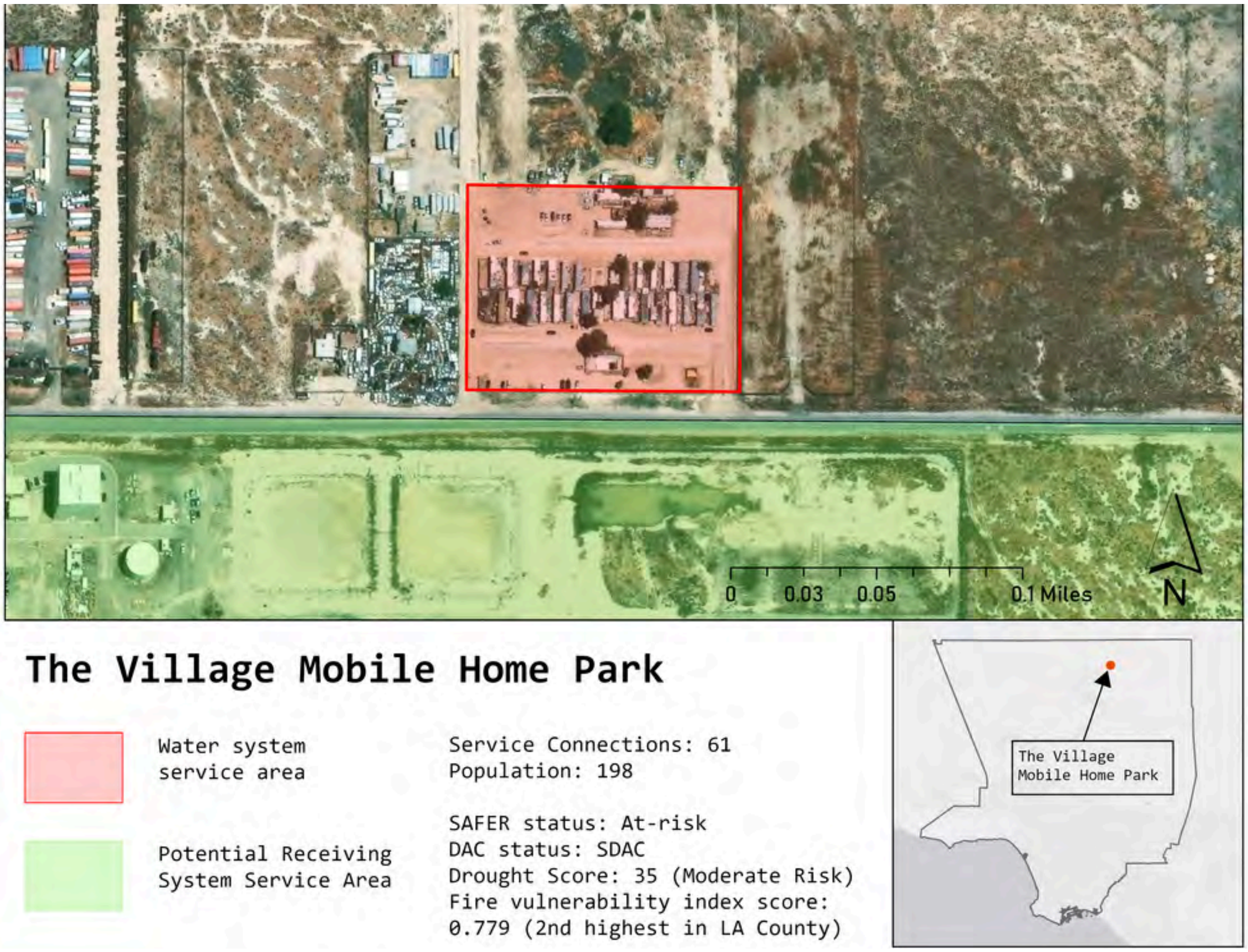
Mitchell's Avenue E MHP remains in a precarious position despite receiving significant state attention and funding approvals. The system has secured $1.7 million through the SAFER program, but only $128,157 has been disbursed to date for interim arsenic treatment (SWRCD, n.d.). Notably, disbursement does not equate to timely implementation, and any delay in deploying interim solutions increases the urgency for accelerated treatment efforts (SWRCB staff, personal communication, May 29, 2025).

The remaining $1.59 million, approved for construction of a permanent arsenic treatment facility, remains undisbursed, with the project still in the planning stages (SWRCB, n.d.). As a result, while technical solutions are under development, residents may remain exposed to chronic arsenic exceedances and ongoing TMF (technical, managerial, and financial) constraints. Given the system's long-standing vulnerabilities and its designation as both "failing" and serving a Severely Disadvantaged Community (SDAC), a more sustainable, long-term intervention is urgently needed.

Physical consolidation with LACWD 40 may offer a viable pathway toward sustained regulatory compliance and service reliability. Although the systems are separated by 1.25 miles, the estimated capital cost of $3.99 million (~$166,296 per connection) remains within SWRCB's feasibility thresholds. However, this option poses near-term challenges, as the high cost of physical interconnection may make in-place upgrades appear more attractive initially.

Compounding this uncertainty is the limited engagement with the system owner, and the current lack of clarity around whether either party, Mitchell's Avenue E or LACWD 40, is open to pursuing consolidation. Additional outreach to both the property management and residents will be essential to better understand community priorities, including concerns over rates, governance, and long-term service expectations.
While the approved infrastructure projects may stabilize the system in the near term, their long-term sufficiency remains uncertain, particularly if water quality challenges or operational costs persist. In such a scenario, state and county agencies may need to consider consolidation as a more durable and comprehensive solution. Given the system's persistent classification as "failing", its critical drought risk designation, and SDAC designation, proactive planning for potential consolidation now may help avoid costly and more disruptive emergency interventions in the future.

Del Rio Mutual Water Company



Location
El Monte, Los Angeles County

Proposed Receiving System
San Gabriel Valley Water Co. - El Monte

Consolidation Structure
Physical and Managerial (Acquisition)

Water System Type
Community Water System (Mobile Home Park)

34 Service Connections

Governance of Consolidated Entity
Investor Owned Utility

Water System Background

This case study examines consolidation opportunities and governance considerations for Del Rio Mutual Water Company (Del Rio), a small community water system in El Monte, California. The system serves approximately 700 residents through 133 service connections, including residential, institutional, and commercial units.

Located in eastern Los Angeles County, the city of El Monte presents a mix of demographic and economic characteristics. Citywide, 65.1% of residents identify as Hispanic or Latino, 13.7% as non-Hispanic White, 2.8% as Asian, and 0.6% as Black or African American (U.S. Census Bureau, 2023). The city's median household income is $64,484, with a poverty rate of 17.2%.

Granular data from the census tract-level where Del Rio is located, include 54% of residents identifying as Hispanic or Latino and 39% as Asian. Nearly 50% of residents are foreign-born—substantially higher than the county average of 33.4%. The tract's median household income stands at $76,250, with 15.1% of residents living below the poverty line. Educational attainment remains relatively low, with only 14.7% of adults holding a bachelor's degree or higher and 35.8% lacking a high school diploma.

Addressing System Vulnerabilities

Del Rio's water is supplied from a single active groundwater well (Well 01), while a second well (Well 02) remains inactive. While the system has not experienced any Maximum Contaminant Level (MCL) violations in the past decade, it has accrued five monitoring and reporting (M&R) violations—one of which occurred in the past five years. Notably, Del Rio does not operate any on-site treatment infrastructure. These findings suggest that the system, while not in active failure, shows characteristics that threaten long-term sustainability.

According to the State Water Resources Control Board's (SWRCB) SAFER Program, Del Rio is classified as a Severely Disadvantaged Community (SDAC) and is currently designated as "at-risk" (SWRCB, 2024), and SWRCB's Risk Assessment Framework reveals four primary vulnerabilities: accessibility (32%), water quality (32%), affordability (21%), and technical, managerial, and financial (TMF) capacity (14%).

Such risks are compounded by the system's reliance on a single well, lack of interties, absence of backup supplies, and aging infrastructure. Importantly, Del Rio has not received any state funding since 2017, despite these clearly documented needs (SWRCB, 2024a).

Complementary data from UCLA's vulnerability assessment tools adds further context. Del Rio is classified as being at "critical risk" for drought resilience, due to limited supply redundancy and poor emergency preparedness. It also ranks as "moderate risk" for wildfire exposure based on its infrastructure and demographic vulnerability indicators (UCLA Luskin Center, 2023).

Receiving System

Del Rio Mutual Water Company lies entirely within the service area of San Gabriel Valley Water Company (SGVWC) – El Monte Division, a large investor-owned utility (IOU) regulated by the California Public Utilities Commission (CPUC). SGVWC serves over 481,000 residents across Los Angeles County and Fontana and has a history of successfully incorporating smaller systems. A notable example is its 2019 consolidation of Rurban Homes Mutual Water Company.

Preliminary cost estimates suggest that physically consolidating Del Rio into SGVWC would cost approximately $3,728,019, or $28,030 per connection. These costs are within the SWRCB's current cost-effectiveness thresholds for consolidation support, suggesting that physical and financial feasibility are not major barriers (SWRCB, 2023).

Governance & Policy

San Gabriel Valley Water Company, as an IOU, is structurally well-positioned to absorb small, struggling systems like Del Rio. Its CPUC-regulated status allows for consistent rate recovery and operational flexibility, enabling it to potentially act more effectively than public or mutual systems when implementing infrastructure improvements or addressing regulatory concerns (CPUC, 2021).

Governance consolidation with SGVWC may offer several advantages. It could relieve Del Rio's volunteer board of the operational and regulatory burdens associated with managing a small system, and ensure more professional management, streamlined regulatory compliance, and enhanced infrastructure investment. SGVWC's experience with similar consolidations suggests that this transition could be accomplished without significant administrative or legal hurdles.

While Del Rio is not currently under an enforcement action, its status as “at-risk” system under SB 88 places it within the State Water Board’s discretionary authority to mandate consolidation should conditions worsen to “failing”. Importantly, consolidation with SGVWC would not require Local Agency Formation Commission (LAFCO) approval, since the receiving system is an IOU, not a public district (CPUC, 2022).

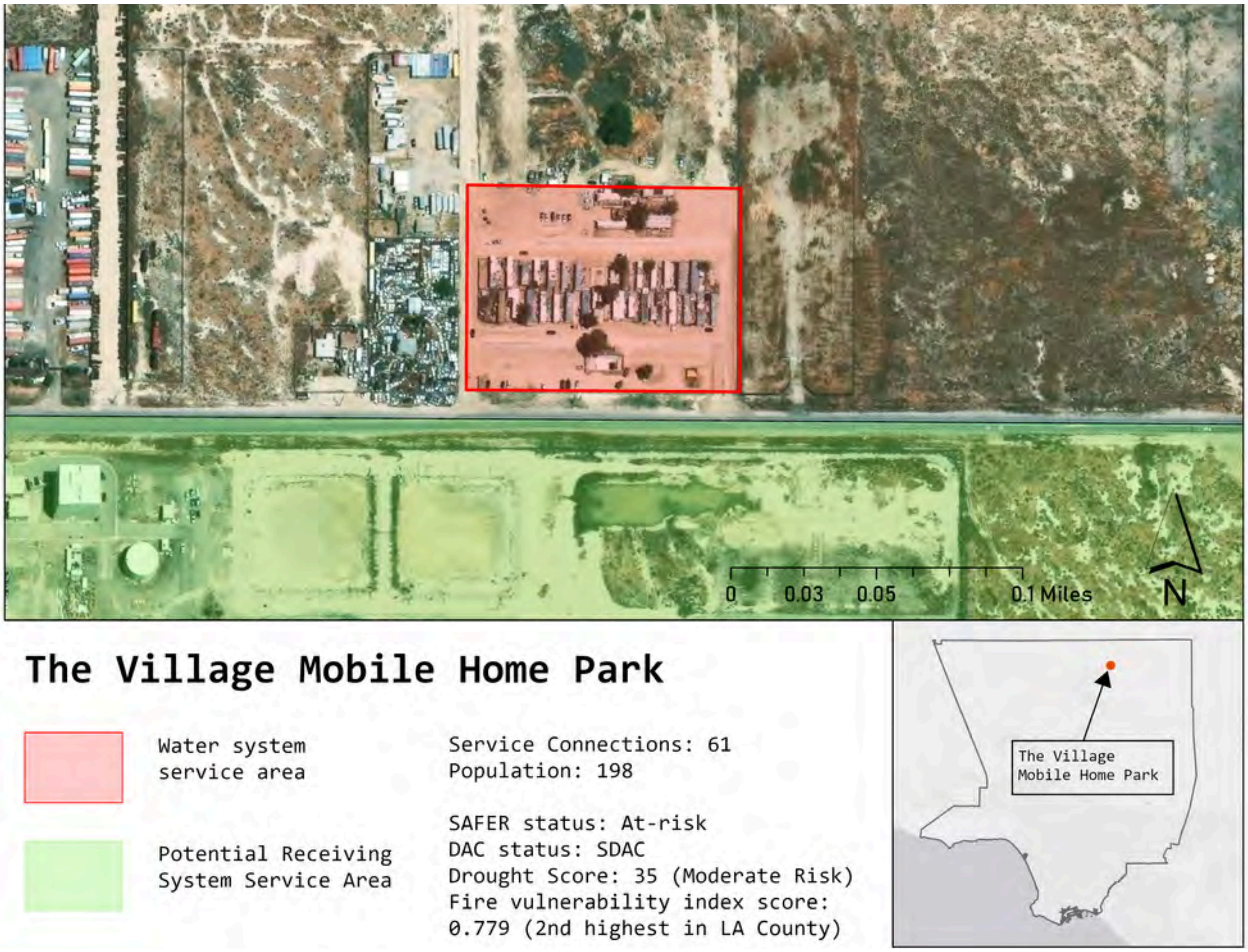
Paths Forward: Obstacles and Opportunities

While Del Rio Mutual Water Company is not currently designated as “failing” and therefore does not meet the statutory threshold for mandatory consolidation under Senate Bill 88, its classification as a Severely Disadvantaged Community (SDAC) and “potentially at-risk” under the State Water Board’s SAFER program makes it a strong candidate for early, voluntary intervention. With the system already exhibiting clear infrastructure and governance limitations—and located entirely within the service area of a capable receiving system—targeted planning, technical assistance, and funding now could prevent the need for emergency action later.

State-supported proactivity could protect residents, reduce future regulatory exposure, and deliver long-term water system stability in a vulnerable community. In the short term, Del Rio could benefit from immediate technical assistance, feasibility planning, and community engagement.

Because the system is not in active failure under the SAFER program, engagement may proceed cooperatively rather than as a corrective measure, while UCLA’s classification of “critical risk” for drought resilience further supports the urgency of planning for backup supply options. Over the long term, exploring a full physical and managerial consolidation with SGVWC could place Del Rio’s infrastructure, compliance obligations, and infrastructure under a more capable and better-resourced utility.
In short, Del Rio’s classifications create an opportunity for proactive and strategic intervention, ensuring reliable water service for a vulnerable community before more serious issues arise.

Hemlock Mutual Water Company



Location
El Monte, Los Angeles County

Proposed Receiving System
San Gabriel Valley Water Co. - El Monte

Consolidation Structure
Physical and Managerial (Acquisition)

Water System Type
Community Water System

208 Service Connections

Governance of Consolidated Entity
Investor Owned Utility

Water System Background

Hemlock Mutual Water Company (HMWC) is a privately owned community water system located in Los Angeles County, originally established in 1976. The system serves approximately 686 residents through 208 service connections (SWRCB, n.d.). As a mutual water company, HMWC is governed by a board of directors elected by its shareholders—typically the property owners within the service area. This governance model, while community-based, may be characterized by structural limitations in terms of technical, managerial, and financial (TMF) capacity, especially when navigating infrastructure upgrades or regulatory compliance. Because directors are also customers, there may be reluctance to raise rates, even when necessary to fund critical improvements.

Located in eastern Los Angeles County, the city of El Monte presents a mix of demographic and economic characteristics. Citywide, 65.1% of residents identify as Hispanic or Latino, 13.7% as non-Hispanic White, 2.8% as Asian, and 0.6% as Black or African American (U.S. Census Bureau, 2023). The city's median household income is $64,484, with a poverty rate of 17.2%. The Census tract encompassing Hemlock Mutual Water Company (Tract 4330.03) provides further insight into local conditions. Approximately 14% of residents identify as White, 2% as Black or African American, 41% as Asian and 42% as Hispanic or Latino (U.S. Census Bureau, 2023). Roughly 52% of residents are foreign born, which is significantly higher than the Los Angeles County average of 33.4%. Educational attainment is modest, with 21.3% of adults holding a bachelor's degree or higher and 19.1% lacking a highschool diploma (U.S. Census Bureau, 2023). The tract's median household income is $74,332 and 12.3% of residents live below the poverty line (U.S. Census Bureau, 2023).

Addressing System Vulnerabilities

HMWC has not received any state funding since 2017 and is not currently under a compliance order. According to the State Water Resources Control Board's (SWRCB) SAFER Program, HMWC is classified as a Severely Disadvantaged Community (SDAC) and is currently designated as "potentially at-risk" (SWRCB, 2024). The system has not reported recent Maximum Contaminant Level (MCL) violations but shows increasing detections of constituents of emerging concern (CECs) and contaminants trending toward MCL thresholds, including arsenic and bromodichloromethane, both of which exceed state health-based advisory levels.

According to the State Water Board's risk scoring, 88% of HMWC's total risk is attributed to water quality, and 12% to accessibility. The system scores 0% in both affordability and TMF categories, suggesting that financial and managerial risks may not be currently acute but could intensify without external support (SWRCB, 2024). HMWC's dependence on a single water source, absence of interties, and limited capital reserves place it in a structurally vulnerable position—similar to many small mutual systems across California. UCLA's drought vulnerability assessment classifies HMWC as "critical risk," citing its limited supply redundancy, small system size, and gaps in emergency planning (UCLA Luskin Center, 2023). The system's Fire Risk Index score of 0.5836 places it in the moderate risk category, suggesting exposure to wildfire hazards that, while not in the highest tier, still present serious concerns given HMWC's lack of backup infrastructure.

Receiving System

HMWC is located entirely within the boundary of San Gabriel Valley Water Company–El Monte, a large investor-owned utility (IOU) regulated by the California Public Utilities Commission (CPUC). SGVWC serves over 481,000 residents across Los Angeles County and Fontana and has experience consolidating small systems. For example, in 2023 it successfully expanded its certificate of public convenience to formally incorporate the Montebello 2 Water System into its service area (San Gabriel Water Co., 2023).
The estimated cost of physically consolidating HMWC into SGVWC's system is $5,530,499, or approximately $26,589 per connection—figures that fall within the State Water Board's cost-effectiveness thresholds for consolidation eligibility (SWRCB, 2023). This positions HMWC as a financially viable candidate for physical and managerial consolidation, subject to willingness on the part of the receiving system.

Governance & Policy

As a CPUC-regulated utility, SGVWC offers several structural advantages over mutual water systems, particularly with respect to capital project execution and regulatory compliance. IOUs are not dependent on local bond measures or grant cycles for funding. Instead, they may seek cost recovery through general rate cases, allowing for more responsive infrastructure investment timelines and smoother integration of small systems (CPUC, 2022).

A physical and managerial consolidation with SGVWC would alleviate the governance burden on HMWC's local board while placing system oversight in the hands of a utility with demonstrated technical and financial capacity. Regulatory protections under CPUC ensure ratepayer safeguards and mandate service quality standards, while also enabling operational flexibility not typically available to municipal or special district systems. This structure would allow SGVWC to implement necessary upgrades without facing governance-related delays or localized resistance to rate changes.

While Hemlock is not currently "failing" and thus not subject to mandatory consolidation under Senate Bill 88, its classification as a "potentially at-risk" system under SAFER, coupled with a critical risk score for drought, provides a reasonable rationale for proactive intervention and state-supported planning.

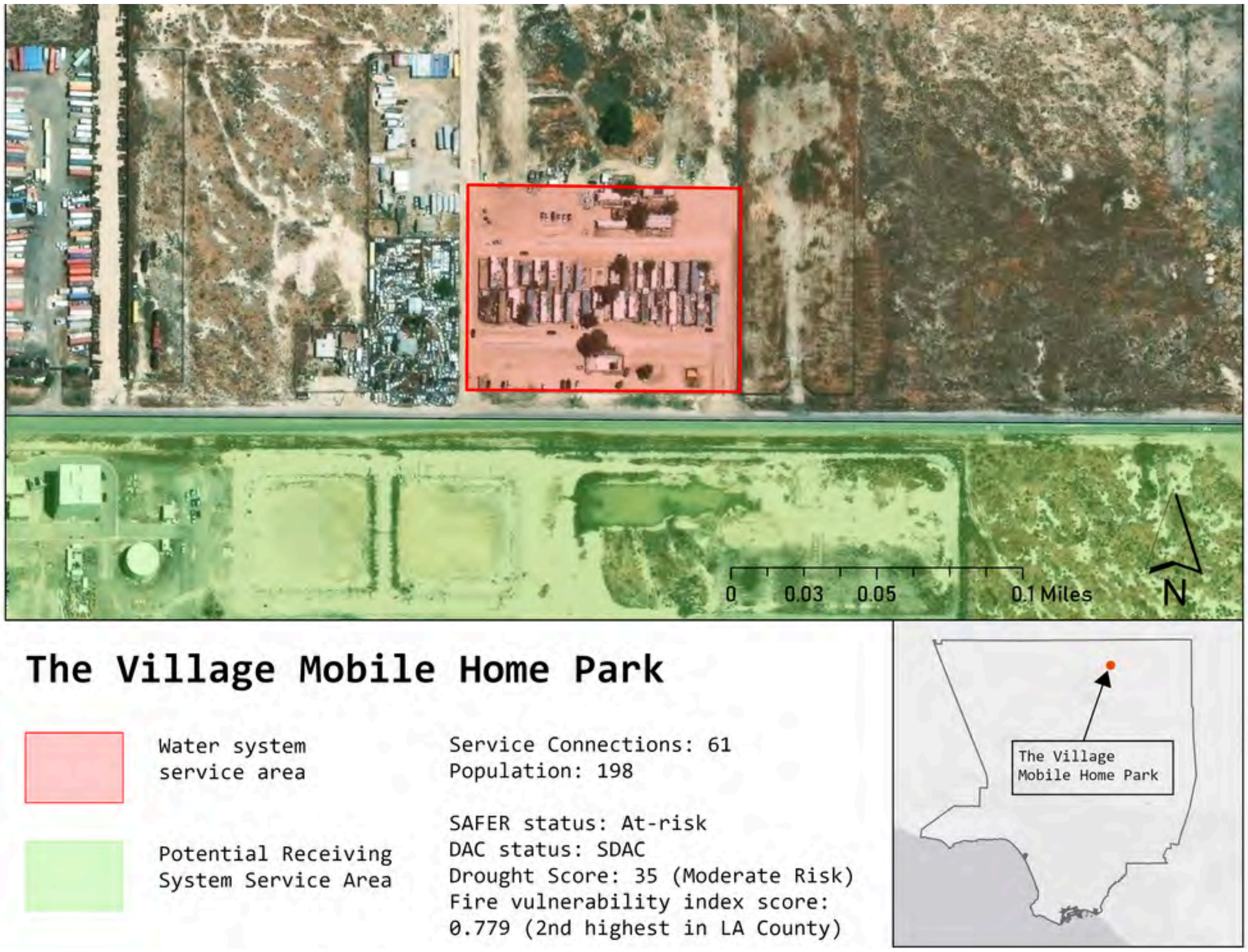
Paths Forward: Obstacles and Opportunities

Although HMWC is not in violation of federal drinking water standards, its long-term trajectory is concerning. The detection of contaminants exceeding health-based guidelines and its vulnerability to both drought and fire events point to a system at the edge of regulatory and operational stress. Its SDAC designation, lack of funding history, and limited TMF capacity reduce its ability to respond proactively to changing water quality or infrastructure challenges.

Given its location within SGVWC's service area, governance compatibility, and cost-effective consolidation potential, HMWC represents a strong candidate for voluntary integration into a larger, more stable system. Thus, the State could consider early-stage engagement, feasibility planning, and technical assistance to support HMWC's path toward long-term sustainability.

In short, Hemlock's classifications make a strong case for early and strategic intervention. While Senate Bill 88 does not apply, the system's SDAC status and vulnerability profile indicate that state-supported proactivity could prevent deterioration, enhance public health outcomes, and ensure long-term service reliability for hundreds of residents.

Sleepy Valley Water Company



🌎

Location

Sleep Valley (Unincorporated Santa Clarita Valley), Los Angeles County

🔗

Proposed Receiving System

Santa Clarita Valley Water Agency

🛠

Consolidation Structure

None Recommended

🚰

Water System Type

Community Water System (Mobile Home Park)

🏘

58 Service Connections

🏛

Governance of Consolidated Entity

County Water District (Independent Special District)

Water System Background

This case study examines the consolidation challenges and opportunities for Sleepy Valley Water Company (SVWC), a small community water system located in Sleepy Valley, an unincorporated community in the Santa Clarita Valley region of Los Angeles County. SVWC serves 162 residents through 58 service connections and is managed as a shareholder-owned nonprofit mutual water system. The system relies entirely on two privately owned groundwater wells as its sole source of supply.

Sleepy Valley is not recognized as a separate census-designated place by the U.S. Census Bureau, but falls within ZIP code 91390, which has an estimated population of 224,028 residents, with 53% of residents identifying as White, 36% as Hispanic or Latino, 11.4% as Asian, and 4.4% as Black or African American (U.S. Census Bureau, 2023). The median household income is relatively high at $119,926, with 7.7% of residents living below the poverty line.

These community-level demographics contrast with the system's operational challenges, highlighting potential affordability concerns for lower-income households within an otherwise higher-income region.

Addressing System Vulnerabilities

As of 2024, SVWC is classified as "at-risk" under the State Water Board's SAFER (Safe and Affordable Funding for Equity and Resilience) Program (SWRCB, 2024). It is regulated by the Division of Drinking Water's District 22 (Angeles). As Sleepy Valley is not recognized as a separate census-designated place by the U.S. Census Bureau, it is not eligible for SAFER funding.

In 2021, the system reported nitrate levels of 13.9 mg/L—exceeding the federal Maximum Contaminant Level (MCL) of 10 mg/L, as established by the U.S. Environmental Protection Agency. That same summer, SVWC experienced a documented water outage spanning July and August, in violation of California Code of Regulations §64602, which mandates minimum reliability during drought conditions (SWRCB, n.d.). Despite the system's return to compliance through corrective measures, SWRCB's Risk Assessment Framework suggests that systemic challenges remain.

SVWC's water system risk profile is broken down as follows: 65% attributed to water quality, 24% to affordability, 11% to accessibility, and 0% to technical, managerial, and financial (TMF) factors (SWRCB, 2024). The elevated water quality risk is largely due to the historical nitrate exceedance, while affordability concerns reflect the cost burden on a small customer base with limited revenue flexibility.

Potential Receiving System

The potential receiving system for SVWC would be the Santa Clarita Valley Water Agency (SCV Water), a large regional utility formed in 2018 through the consolidation of the Newhall County Water District, Castaic Lake Water Agency, and Valencia Water Company (California State Legislature, 2017). SCV Water serves over 75,000 active service connections and a population of approximately 294,000, sourcing water from a the State Water Project (via AVEK), groundwater basins, recycled water, and water banking initiatives. In addition to a diversified water portfolio, SCV Water has had no known health-based violations since its formation (SCV Water, n.d.).

While SCV Water is the logical candidate for consolidation, a modeled analysis finds that consolidation between SVWC and SCV Water currently exceeds financial feasibility thresholds. The systems are located 3.23 miles apart by road, slightly above the 3-mile upper limit used for assessing cost-effective physical connection routes. Although straight-line distance is 2.36 miles, placing it near the threshold, the projected capital cost of physical consolidation is $9,972,076—or $171,932 per connection. This figure substantially exceeds the State Water Board's viability threshold for systems with fewer than 75 service connections, which is $96,000 per connection (SWRCB, 2023).

Governance & Policy

SCV Water's formation under Senate Bill 634 provides a legislative foundation for annexing and consolidating nearby smaller systems (California State Legislature, 2017). Governed by a publicly elected board, SCV Water offers a transparent and accountable structure that contrasts with SVWC's current governance model, in which decisions are made by a private mutual board elected by shareholders. Integration into SCV Water would provide Sleepy Valley residents with increased oversight, public participation, and access to long-range capital improvement planning.

SCV Water's annexation policy outlines requirements for infrastructure compatibility, service area contiguity, and compliance with environmental review under the California

Environmental Quality Act (SCV Water, 2022). Importantly, annexation would require approval by the Local Agency Formation Commission (LAFCO) if SVWC lies outside SCV Water's current boundary. LAFCO's mandate is to promote efficient public service delivery and orderly growth while ensuring consistency with regional land use plans (LA LAFCO, 2020).

Paths Forward: Obstacles and Opportunities

Sleepy Valley's reliance on just two groundwater wells, without source redundancy or interties, leaves the system vulnerable to water quality fluctuations and service interruptions.

Interim solutions could be supported through SAFER technical assistance and planning grants, and these interventions would help build resilience while more permanent governance solutions are evaluated. SWRCB may also consider appointing a temporary administrator or placing SVWC under receivership, allowing a qualified third party to stabilize operations, address compliance issues, and begin planning for a longer-term transition. A temporary administrator would not assume ownership but could help manage regulatory risk, improve service reliability, and prepare the system for future integration.

Although physical consolidation between SVWC and SCV Water is technically feasible, the per-connection cost and road distance place it outside of SWRCB's cost thresholds. Costing ($171,932 per connection) nearly double the allowable maximum for a system of SVWC's size, annexation into SCV Water remains a promising, albeit complex, path. Annexation would still require coordination between SVWC, SCV Water, LAFCO, and local stakeholders.

In short, SVWC's classification as an "at-risk" system and its prior nitrate exceedance make a compelling case for early state-supported intervention. While physical consolidation is not presently viable under standard funding thresholds, a phased approach involving administrative support, technical assistance, and planning could position the system for long-term stabilization and eventual integration into a more resilient regional provider.

Mettler Valley Mutual

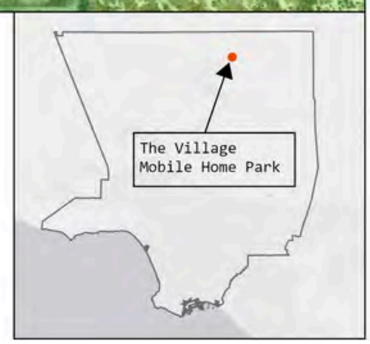
The Village Mobile Home Park

Water system service area

Potential Receiving System Service Area

Service Connections: 61
Population: 198

SAFER status: At-risk
DAC status: SDAC
Drought Score: 35 (Moderate Risk)
Fire vulnerability index score: 0.779 (2nd highest in LA County)



Location Lancaster, Los Angeles County	**Proposed Receiving System** Santa Clarita Valley Water Agency	**Consolidation Structure** Not Feasible
Water System Type Community Water System (Mobile Home Park)	**98 Service Connections**	**Governance of Consolidated Entity** County Water District (Independent Special District)

Water System Background

Mettler Valley Mutual (MVM), is a small community water system located in the rural outskirts of Lancaster, California. The system serves 160 residents through 98 service connections, MVM is a privately owned, shareholder-governed mutual water system, operated by a volunteer board. It relies exclusively on a single groundwater well to supply drinking water and does not have any on-site treatment facilities.

The community around Mettler Valley is sparsely populated and agricultural, located in the broader Lancaster area, known for its arid climate. The nearest town, Neenach, has an estimated population of 800 (Los Angeles Times, 2014). The community is racially and ethnically diverse, with 35% identifying as White, 21.4% as Black or African American, 4% as Asian, and 45.9% as Hispanic or Latino (U.S. Census Bureau, 2023). The median household income is $76,083, with 15.5% of residents living below the poverty line (U.S. Census Bureau, 2023). According to the State Water Board's SAFER Engagement Units' Snapshot Tool, it serves a Severely Disadvantaged Community (SDAC) with a median household income of $56,257, substantially below county and statewide averages (SWRCB, n.d.).

Addressing System Vulnerabilities

As of 2024, MVM is classified as failing under the State Water Resources Control Board's SAFER Program due to persistent violations of the primary maximum contaminant level (MCL) for arsenic. The system is regulated by the Division of Drinking Water District 15 (Metropolitan) and is currently under a compliance order. The SAFER dashboard also flags the system as needing support, with no formal consolidation plan underway (SWRCB, n.d.).

According to SWRCB's Risk Assessment Framework, MVM faces compound challenges: 40% of its total system risk is attributed to water quality, 32% to accessibility, 17% to affordability, and 11% to technical, managerial, and financial (TMF) capacity. Arsenic contamination continues to pose a significant health risk, while reliance on a single well and absence of redundancy exacerbate drought vulnerability.

MVM has received $1,191,677 in state funding through the SAFER Program, including

$990,000 for arsenic remediation planning and $201,677 for interim bottled water service, with the latter already disbursed (SWRCB, n.d.). These projects remain active, and the state's current plan includes drilling a new well and potentially replacing the system's tank (SWRCB, n.d.). As a solution, consolidation was deemed not cost-effective, and nearby systems—such as West Valley County Water District—were determined to be unsuitable as receiving systems (SWRCB, n.d.).

The system also ranks among the top 10% of California water systems most vulnerable to drought, according to the DWR's Drought & Water Shortage Assessment, further underlining the urgency of long-term planning. Despite state investment, these persistent vulnerabilities suggest that standalone upgrades may not be sufficient to ensure long-term sustainability without further institutional support or governance transition.

Potential Receiving System

MVM is located approximately 25 miles by road from the Santa Clarita Valley Water Agency (SCV Water), a large regional utility formed in 2018 (California State Legislature, 2017). SCV Water serves over 75,000 active connections and a population of 294,000, drawing water from the State Water Project via the Antelope Valley-East Kern Water Agency (AVEK), local groundwater wells, recycled water, and water banking initiatives (SCV Water, n.d., SCV Water, n.d.).

SCV Water has not recorded any known health-based drinking water violations since its formation and maintains robust infrastructure, staffing, and institutional capacity to absorb smaller systems. However, MVM lies outside SCV's current service area, and the 25-mile distance presents a significant cost and logistical hurdle. SCV Water has not been identified by the state as a near-term consolidation partner for MVM.

Governance & Policy

Under California Senate Bill 88, the State Water Resources Control Board (SWRCB) may mandate consolidation for small, "failing" water systems—particularly those serving Severely Disadvantaged Communities (SDACs). The proposed receiving system, SCV Water, is a public water agency governed by an elected board and subject to California's rate-setting and transparency laws. While MVM is listed as serving a Severely Disadvantaged Community (SDAC) by some sources, there are inconsistencies across datasets. If this SDAC designation is formally confirmed, it would be highly relevant to potential eligibility for mandated consolidation under SB 88 and related long-term planning and funding programs.

Because MVM lies outside SCV Water's current boundaries, any consolidation would likely require approval by the Local Agency Formation Commission (LAFCO). However, SCV Water's enabling legislation and history of prior consolidations suggest that a legal and administrative pathway exists (California State Legislature, 2017). With state support and community participation, such a process may be procedurally viable.
As of 2025, MVM has received over $1.1 million in state funding, but has not been included in any formal consolidation initiative. The SAFER Engagement Units' Snapshot Tool explicitly notes that consolidation was considered but rejected as not cost-effective, given available nearby options.

Paths Forward: Obstacles and Opportunities

In the short term, the SWRCB has taken steps to stabilize Mettler Valley Mutual by funding bottled water delivery and initiating plans for arsenic remediation. According to the SAFER Engagement Unit Portal, the state allocated over $1.1 million, including $990,000 for a new well and possible tank replacement. These upgrades directly target the system's most urgent contamination issue. However, because MVM relies on a single groundwater well, the system remains structurally vulnerable to supply disruptions and long-term drought impacts.

The state previously evaluated consolidation but ruled it out due to high costs and the limited capacity of nearby systems like West Valley CWD. SAFER materials do not detail why alternatives like SCV Water were excluded, and future evaluations may need to revisit whether regional partnerships remain infeasible (SWRCB, n.d). Thus, MVM and its state partners may now focus on completing the planned arsenic remediation project, and addressing broader issues related to governance and affordability. The system's volunteer-run structure and lack of treatment facilities limit its ability to manage ongoing risks without external support, and over the long term, the community may still need governance assistance, technical support, or regional coordination to maintain service stability.

While SCV Water could offer a future consolidation opportunity, that path would require renewed state interest, substantial capital investment, and LAFCO approval. For now, the most practical path forward involves completing the infrastructure upgrades identified by SAFER and building operational resilience for this severely disadvantaged community.

Conclusion

Methodological Reflections & Improvement Opportunities

At the outset of this portion of the project, the process of gathering and analyzing case studies appeared clear. We began by organizing key information—such as water system background, governance structure, community insights, risk classification, and potential receiving systems—into a shared spreadsheet. This structured format helped ensure consistency and made comparisons across systems more manageable.

However, as we moved deeper into the work, a number of unanticipated challenges emerged that complicated the research process and revealed broader systemic barriers to transparency and coordination—particularly for smaller systems flagged under the SAFER program.

One immediate but anticipated hurdle given our positionality and timing was unresponsiveness from system representatives and local contacts, which is acknowledged and contextualized in prefacing of the case studies. As part of due diligence, we attempted an informal web search to supplement official data with local news coverage, publicly available planning documents, or informal community reports. The available information lacked the depth, consistency, or verification necessary to justify inclusion in a formal analysis, and thus we ultimately decided to omit a separate "Community Details" section from our case studies due to insufficient, unverifiable, or outdated information. This again underscores the need for ongoing engagement and two-way dialogue with system operators and community representatives to support effective, community-informed solutions over the long term.

As we undertook the drafting process, we relied primarily on the State Water Board's centralized SAFER Dashboard as our core data source. The SAFER unit and the data it produces is unparalleled in other states in its transparency, quality and recency. However, we later discovered that the dashboard does not include project-specific information from the SAFER Engagement Unit's Snapshot Tool—details that could have significantly improved our understanding of system-specific developments and stakeholder engagement. In addition, some basic data (system operations, project status) and key metadata (last updated) were missing, making it difficult to fully assess the currency of the information.

This gap only became apparent during the final phases of our research, requiring us to revisit and revise several “Paths Forward” sections to reflect the most accurate and comprehensive picture available. We also consulted with State Board staff, who generously gave their time on short notice, on the status of particular systems to ensure accuracy.

Another recurring challenge was the inconsistency or lack of clarity in the SAFER Dashboard’s "Drivers of Risk" data. In some cases, risk driver percentages were technically available through public documentation. However, a team member noticed discrepancies in the immediately-displayed percentages and discovered that more detailed figures appeared only after scrolling and clicking through pop-up elements. This highlighted a broader navigational and user experience (UX) issue: while the data exists, it is not presented in an intuitive or consistently accessible way, making it easy to overlook critical information unless users know exactly where to look.

For systems regulated by the California Public Utilities Commission (CPUC), there were web-accessible spreadsheets that included ownership and other relevant details. However, we limited how much we relied on these sources in the final write-ups, as our initial goal was to avoid creating large discrepancies in the level of information presented across systems, especially when similar data wasn’t available for smaller non-CPUC-regulated systems.

Another sourcing challenge involved determining whether systems qualified as Disadvantaged (DAC) or Severely Disadvantaged Communities (SDAC)—a key factor under SB 88, which typically applies only to “failing” systems serving DACs or SDACs. However, data sources often conflicted or lacked clarity. For example, Lancaster Park Mobile Home Park appeared as a DAC in some datasets but was a SDAC in others, making it difficult to assess its eligibility for mandated consolidation and related funding pathways.

Finally, conversations with county stakeholders revealed more ground-level challenges not captured in public documents, such as delays in delivering interim solutions and the need for better coordination in long-term planning and funding. As conversations highlighted how limited project coordination or funding bottlenecks can slow progress even when urgent needs are well-documented, they also underscore the importance of real-time, transparent project tracking and the need for more accessible communication between agencies, communities, and regulators.

Taken together, these challenges underscore a broader and more urgent insight: if a team of urban planners—with policy training, research experience, and institutional support—struggles to track project status, funding, and eligibility, the burden on communities and small system operators is significantly greater.

Residents and families relying inadequate water systems face the day-to-day realities of water insecurity: shut offs, boil notices, unreliability, contamination risks, and uncertainty about when or whether solutions will arrive. For communities that are already underserved, unincorporated, or historically marginalized, the challenges of utilizing accessible and transparent information not only deepen structural inequities but also can compound the stress and health risks of an already vulnerable situation. We are grateful to agencies like the State Water Resources Control Board and DPW for the data that is available and for the hard work of technical staff who continue to address longstanding infrastructure challenges. However, our undertaking of this section strongly suggests a real opportunity, and urgent need, for even more improved data centralization, transparency, and accessibility, which may require coordination between the Board and the County's Small Water System Task Force. A shared, regularly updated, and more publicly-usable data platform would not only enhance state and regional oversight but also empower communities to understand, track, and participate in decisions that directly impact their water future.

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Report Appendices

UCLA Research Administration

Appendix A

IRB Local Study Documents

Item 1.

Outreach/Contact Form: UCLA Water System Consolidation Request For Interview

To Whom It May Concern,

I hope this email finds you well. My name is Alexander Sun. I'm a Master of Urban and Regional Planning student at UCLA. I am reaching out to request an opportunity to speak with you regarding the management and challenges of water systems in the Antelope Valley. My colleagues and I are working to inform the County's Small Water System Task Force, specifically looking at opportunities for regionalization.

As part of this effort, we are conducting a limited number of interviews with key stakeholders, and we would greatly appreciate the opportunity to speak with you. We aim to gather insights on regional water management, historical context, policy impacts, future sustainability efforts, and consolidation. Your expertise and perspective would be invaluable in helping us develop a well-rounded understanding of these issues.

If you are available, we would greatly appreciate the opportunity to schedule a 45-minute to 1-hour interview at your convenience. Please let us know a time that works for you, and we would be happy to coordinate accordingly.

Thank you for your time and consideration. I look forward to your response.

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Item 2.

Oral Consent Script

You are invited to participate in a research study about (water system consolidation in the Antelope Valley and Greater Los Angeles Area). You will be asked to participate in interviews regarding your affiliated water system, water systems in your administrative purview, and efforts around consolidation. The interview will be virtual and will take approximately one hour to complete.

There are no known risks associated with this interview.

Please understand your participation is voluntary, and you have the right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. You have the right to refuse to answer particular questions. Your name will be documented and included within the study, unless you request otherwise during our interview. If you want to be off the record, your name will be struck from the transcript, and I will assign you a "code name" instead. The interview used and cited in the study will be included in the appendix of the publication. I will provide you with my contact information if you have any questions for me about this study or anything else. The card also has the contact information for the UCLA Office of the Human Research Protection Program if you have any questions about your rights as a participant.

Hand out a separate business card or contact sheet to subjects that includes the following contact information:

If you have any questions, comments, or concerns about the research, you can talk to one of the researchers. Please contact Alexander Sun at (818)-573-7927 or asun25@g.ucla.edu. If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA OHRPP by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail: Box 951406, Los Angeles, CA 90095-1406.

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Item 3.

Outreach and Recruitment

The research team primarily contacted potential participants via email and phone, using initial outreach messages to explain the purpose of the study and the relevance of their participation. They designed recruitment efforts to ensure a balanced representation of technical experts, policymakers, and community-oriented stakeholders. The team also conducted follow-up communications to confirm availability and schedule interviews.

Systems Selected for Outreach

We conducted outreach to a carefully curated group of water systems and agencies to ensure a comprehensive understanding of the dynamics surrounding community water systems. These included:

- Antelope Valley-East Kern Water Agency: A major regional wholesale water supplier, critical for understanding the broader infrastructure and water supply dynamics that affect multiple smaller systems.
- California Water Service Company (Cal Water): As a large investor-owned utility, Cal Water provides insight into private-sector involvement in water system management and consolidation.
- Los Angeles County Waterworks: Represents one of the largest public water providers in the region, offering a government perspective on system management, regional planning, and regulatory challenges.

Our outreach to water districts focused on capturing both large and small-scale operations. We conducted outreach to:

- Palmdale Water District: A significant municipal water district that plays a key role in urban water supply, infrastructure investment, and policy decisions related to consolidation.
- Quartz Hill Water District: A smaller district that adds perspective on the challenges and benefits of consolidation for mid-sized water providers.

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Item 3. (cont.)

To understand the agricultural dimension, we contacted:

- Littlerock Creek Irrigation District: Represents agricultural water interests, which are crucial for understanding the balance between urban and rural water needs in consolidation efforts.

Finally, a significant portion of our outreach was directed at mutual water companies, including:

- Antelope Park Mutual Water Company
- Averydale Mutual Water Company
- El Dorado Mutual Water Company
- Green Valley Mutual Water Company
- Lake Elizabeth Mutual Water Company
- Land Projects Mutual
- Landale Mutual Water Company
- Shadow Acres Mutual
- Sundale Mutual Water Company
- Sunnyside Farms Mutual Water Company
- Westside Park Mutual Water
- White Fence Farms Mutual Water

Each interview followed a structured protocol while allowing flexibility for respondents to elaborate on key issues. Questions focused on:

- Governance and financial challenges affecting small water systems.
- Previous experiences with consolidation efforts, including successes and failures.
- Perceived barriers and incentives related to consolidation's regulatory, financial, and operational aspects.
- Community attitudes and trust toward potential consolidation initiatives.

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Item 4.

Interview Questions By Stakeholder

*For **Major Water Systems** (Utility Providers, Water Districts, Municipal Water Departments)*

1. *What are the biggest challenges your water system currently faces?*
2. *How would you describe the status of your system, considering infrastructure, the resources needed for operations, maintenance, and upgrades, and other factors that come to mind?*
3. *Has your agency engaged in discussions around water system consolidation before, and the potential to absorb smaller systems in the region? [If yes] Can you generally share how those discussions went? [If no] Do you think your agency would be open to such discussions?*
4. *What are the biggest benefits and concerns regarding consolidation from your perspective?*
5. *What are the biggest concerns regarding consolidation from local residents perspective?*
6. *How do regulatory requirements (e.g., State Water Board, EPA) impact your system's ability to operate independently?*
7. *How do you think consolidation might affect water quality, reliability, affordability,, infrastructure investments, and staffing?*
8. *What role do community needs and public input play in agency decisions around consolidation?*
9. *Have you explored alternative solutions to consolidation, such as shared service agreements?*
10. *Who else would you recommend I talk to?*
11. *What are the primary challenges your water system has experienced during times of drought?*

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Item 4. (cont.)

*For **Mutual Water Companies***

1. *Can you provide an overview of your mutual water company's history and current operations?*
2. *What are the biggest challenges your water system currently faces?*
3. *Has your mutual water company been approached about consolidation, or has it considered consolidating with a larger system?*
4. *What are the biggest benefits and challenges you foresee in a potential consolidation?*
5. *How would consolidation impact shareholder control and governance of your water system?*
6. *What financial implications—both positive and negative—would consolidation have for your company and ratepayers?*
7. *How do you ensure that customer needs and local concerns are addressed in a consolidation process?*
8. *What alternative solutions to consolidation have you explored to improve infrastructure and service reliability?*
9. *What regulatory or legal hurdles would need to be addressed before consolidation could occur?*
10. *What steps would be needed to transition assets, liabilities, and operations to a larger system?*
11. *What role should customers and shareholders play in deciding whether to consolidate?*

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Item 4. (cont.)

Interview Questions By Stakeholder

For City Officials (Mayors, City Managers, City Council Members)

1. *What are the primary water supply challenges in your jurisdiction, and how have these changed in recent history?*
2. *Your jurisdiction is served by X, Y, and Z water providers. What would you say are the main challenges they face?*
3. *Has your [city, district, etc] discussed the water system consolidation as a possible solution to some of the water challenges you mentioned?*
4. *How does water system consolidation align or not with your city's long-term infrastructure and development plans?*
5. *What are the major political and financial considerations surrounding consolidation in your city?*
6. *Have you engaged residents and businesses in discussions about potential consolidation? If not, what are your thoughts about how to engage them?*
7. *Are there existing regional partnerships or cooperative agreements around water that could serve as a model?*
8. *What funding sources or financial incentives might support consolidation efforts?*
9. *What are the legal and governance challenges in merging water systems across different jurisdictions?*
10. *Who else would you recommend I talk to?*

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Item 4. (cont.)

Interview Questions By Stakeholder

*For **County Supervisors / Supervisorial District Representatives***

1. *How does water system consolidation fit into the county's broader infrastructure strategy?*
2. *What role should the county play in facilitating consolidation discussions among local water systems?*
3. *What economic or environmental factors make consolidation a priority (or a challenge) in your district?*
4. *How does consolidation align with regional planning efforts, including groundwater sustainability and climate resilience?*
5. *Have there been previous consolidation efforts in the county? What were the lessons learned?*
6. *What funding mechanisms or state/federal programs could support water system consolidation?*
7. *Who else would you recommend I talk to?*

*For **LAFCO** (Local Agency Formation Commission) Representatives*

1. *How does LAFCO evaluate and facilitate water system consolidations?*
2. *What are the key legal and procedural steps in merging water systems?*
3. *What criteria does LAFCO use to assess whether consolidation is in the public interest?*
4. *What are the most common challenges that arise in consolidation efforts? Can you provide examples of successful or unsuccessful water system consolidations in this region?*
5. *How do small and large water systems differ in their approach to consolidation?*
6. *How does LAFCO engage with stakeholders—including residents, water agencies, and elected officials—during the process?*
7. *Who else would you recommend I talk to?*

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Item 5.

Completed Interviews

Shadow Acres Mutual Water Company

Q: <u>Can you provide an overview of your mutual water company's history and current operations?</u>

Shadow Acres was incorporated around 1980 – before then it was Sunnyside 186 properties, almost a square miles. 166 connections. Two wells at a well site in the community. We also purchase treated water from AVEK. They get the water from the aqueduct. We're under a water master in the AV. We are in the subbasin of the total aquifer. We provide well water and underwater master have a limited amount of water we can pump; blend with the water from AVEK—all 2.5-acre parcels except for 2, which are 5 acres each.

As for our day-to-day operations, we have a maintenance person who is a part-time contractor, and the manager is also a contractor.

We are flanked by several other mutuals. We monitor the wells and have to do water sampling every so often for the state water board. We also field customer issues, such as a leak on the property or a rare water main break. We make sure people are getting clean, potable water. We mention keeping an eye on the equipment.

Q: <u>What are the biggest challenges your water system currently faces?</u>

There are plenty of challenges. Biggest: trying to keep up with the state regulations on small water systems. In recent years, they have included small water systems. EPA is looking for lead – state imposed to identify what the private side pipe material was. We got everything done. Most of the lead pipes are on the East Coast – we don't have them. It was a lot of work. With regulations comes a big expense that the state expects us to – they possibly offer a loan. Backflow/inspections – small water companies have not had to do those until recently. We are working with our SWRCB representative right now – we are contracting with a company to do this – that's going to cost us 20k to do that. State regs that have a big price tag. We're just a small homeowners group that, since COVID, a much

Item 5. (cont.)

smaller number of contractors who work on smaller systems have disappeared during COVID. Finding qualified contractors to perform major equipment maintenance. We're keeping up with the regs, but it takes a lot of time, the bigger thing is the huge price tag. Sometimes it feels like they don't seem to care about the price imposed. We have to raise rates in order to cover that. Residents aren't always able to keep up financially.

Q: Has your mutual water company been approached about consolidation, or has it considered consolidating with a larger system?

That's a word that people up in Scramento who sit behind their desks like to use. Sure it's a viable option for at-risk small water companies that have water quality problems. Here's the deal about mutuals. You can connect the system – who's going to be managing the system? Pipe diameters. The rest of the board and I are volunteers. What group of volunteers wants to take on another neighborhood's

What is the incentive to consolidate besides the state wants it?

All the mutuals around us – nobody wants to consolidate. I have enough problems to deal with in my community, sure they feel the same way. Unless it's absolutely necessary, nobody wants to do it b/c the logistics, extra problems, and extra infrastructure that must be re-examined. If you're adding another system, the expense of doing that can be really overwhelming. The state may offer some grant money, but you usually have to be in a low-income area – we don't have that area here. When I hear the word consolidation, I cringe. Hate to hear it as a blanket statement.

It's an excellent option for at-risk systems with infrastructure or water issues.

Q: What are the biggest benefits and challenges you foresee in a potential consolidation?

I don't think the state really considers the actual implementation that would be faced: pumping capacity and well capacity. You're essentially doubling. That price tag can be huge. If that's the only option, I understand. But, consolidating the mutuals is doubling the headaches for volunteers. Don't think the state thinks about that. They just look at a map and see that there are a bunch of mutuals near each other.

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Q: What is your relationship with nearby mutuals like?

Good. We used to meet once a month and share issues with the companies, talk about regulations, network, discuss similar problems and solutions. Haven't met since Covid bc of social distancing, and it went away. We still talk to people. We're well aware and discuss things with other water providers (like agriculture) - I don't think anyone wants to consolidate unless you absolutely have to.

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Item 6.

Palmdale Water District

Q: Can you provide an overview of your mutual water company's history and current operations?

Palmdale Water District was formed in 1918, after being a private water company for 30 years before that, to develop a local surface water source, Little Rock Dam. Over the years, we have served about two-thirds of the city of Palmdale and unincorporated LA County. I guess we're probably considered a medium-sized water district, with about 27000 connections and roughly 126,000 people that we serve.

Q: How would you describe the status of your system considering infrastructure, resources needed for operations, maintenance, and other factors that come to mind?

I think we're in a good place. One example is that in 2010, we've got about 400 miles of pipeline in the ground. In 2010, we had 800 leaks in those main lines; last year, we only had 11. We had a pretty aggressive replacement plan to get rid of the 1950s pipes, and so we're in a pretty good spot with that.

We're also a state water contractor, which gives us some flexibility in times of water shortage. We just passed a five-year water rate plan and recently upgraded our fees so we can expand the system for future connections and take care of existing customers.
Prop 218 applies to water rates in public water agencies, which have to go through that process and do a cost-of-service study, going as far as five years for water rates, a process we went through last year. As far as connection fees, the district has a pretty good history of doing master planning for transmission mains, booster stations, storage tanks, which are what we included in our master plan, and are funded by new connections.

On the water supply side, we had a strategic water resources plan conducted in 2010 that we based our water supply fee on. We just upgraded that over the past few years, with the final approval in December last year. Just last year, the board approved the updated connection fees. It's a long road, but I'm proud of the fact that we go through programmatic EARs so that everything is clear.

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Item 6. (cont.)

Q: Has your agency engaged in discussions around water system consolidation before — and the potential to absorb smaller systems in the region? [If yes] Can you generally share how those discussions went? [If no] Do you think your agency would be open to such discussions?

Part of the County Water plan, separate from that, there is one small system that we've been working with the state for about four years now to be able to consolidate with, and that's a privately owned mobile home park. The consolidation there will be adding one service to serve their system. Make some improvements on our existing water supply system to do that. So that's in process. We're working fairly closely with the water resources control board on that.

Just more recently, there's a small mutual that's a 40-acre mutual that's come to us that's expressed the desire to become part of Palmdale. So we're just starting to work through that.

Q: What are the biggest benefits and concerns regarding consolidation from your perspective?

The customer's most significant benefit is having a reliable, safe water supply. A lot of these, the mutual that came ot us, the people who have run that for decades are moving on or passed away, so there's not a lot of interest within that small area to take over and handle that, so the benefit is those people having the reliable, safe water supply. With the trailer park, very similar, they had a well that had water quality problems, and then also went dry.

I'd be concerned about forced consolidations. If there's no history of violations and whatever organization is providing this service is doing the job it needs to do for its customers, I'd be concerned. In our case, both of these people want to get service, so we're working with them to try and make that happen.

Several years ago, the water resources control board was given that ability, but I'm not aware of any in that area. There was one agency down in LA that did go through with that, but that was a bad example of a public agency serving water.

The Antelope Valley has a large number of mutuals. Most of them are doing a good job.

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Item 6. (cont.)

They're pretty well organized and an active part of the adjudication that went on here for decades—got themselves the groundwater rights they felt they needed. Some probably aren't as well run, but the problem you run into in the valley is that they're so spread out and not necessarily near any central water system, so it's hard to try and find an alternate way to serve them.

Q: What are the primary challenges your water system has experienced during times of drought?

Some mutuals have a connection they can fall back on without using groundwater from a wholesale agency. So they already have what you could call a backup water supply. Other ones may not even be close enough to have any other system. They need to ensure that their groundwater production systems are maintained and in good shape, and they manage their groundwater connection rights well enough to bridge short-term supply gaps. Similar to what public water agencies have to do with the urban water plan.

Q: In your opinion, when is consolidation justified?

Violations, whether the people being served can rely on that water and it's safe to drink, whether it's run by people doing a good job and staying within the conditions of their permits. If somebody purposefully does not put the effort or the money back into the system, that should open them up to being looked at a little closer.

If the system is trying to do all it can and in good faith to help its customers, maybe there's a way for it to become part of a bigger system. Maybe that would be a good first step. There are many mutuals in the AV, and that's just a reflection of how this place was populated. Isolated groups and properties would be developed, and I always hear: "There are so many in the AV, why don't we just have a big one?" Looking at the context, caution is advised not to just look at the number of systems, but some systems are not keeping up with what they need to do.

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Item 7

Sunnyside Farms Mutual Water Company

Q: What are the biggest challenges your water system currently faces?

The amount of paperwork required by the state is the amount of paperwork and the lack of funding. We don't get a lot of money from anywhere else. We can't afford to have anyone new take on the paperwork. The State now requires onsite power generation, which will require $350,00 with engineering, air quality approvals. We don't need it because we have an alternate supply source, and our secondary source is much more reliable. If the state wants to buy one, bypass the legalities and the forms, the state just wants to dropship one, we'll take it. But to require us to take it when we have a source of supply, when we have a more reliable generator, is ridiculous

And in terms of recent legislation regarding MWCs and requirements on a state level. We have been managed by the county health department for the last 50 years. County Health just transferred them all to the state. The State has no accommodation for people serving fewer than 300 households. For small companies to generate the same amount of paperwork as large municipalities that get extra money from the federal government, the state government is just ridiculous.

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Item 8

Lincoln Avenue Water Company

Q: Can you provide an overview of your mutual water company's history and current operations?

Lincoln Avenue is a private, nonprofit mutual company. A five-member board of directors, property owners, and shareholders reports to the board members. Our company was established as the Malar Canyon Water Company in 1883. It was then merged with the Lincoln Avenue water company in 1896 and started to support agriculture. During the 1920s population boom, the company moved to a retail operation to support the growth. We've just continued to develop ever since. We do have 3 sources of water, groundwater that we pump from the adjudicated Monk Hill basin. We also import water from MWD and have surface and local canyon water that we collect, treat, and put into our water purification system.

Q: What are the biggest challenges your water system currently faces?

Historically, a significant issue was drought: access and water availability. Now, post-fire, that's our primary focus. Historically, it's been a drought. In times of drought, especially in the last decade, the state has been very proactive in limiting or restricting how much water customers can use daily. We're responsible for getting that message out, and our customers are staying below a certain gallons per day per person. That's very difficult to do. We're not allowed to assess any penalties for customers who are. The state still holds the water company responsible.

Regulation has always been a significant contributing factor to our operation. We had 4,500 service connections serving a population of about 16,000 people. We must comply with many regulations and all the exact requirements of the City of Pasadena. That also includes water quality compliance that we need to address.

We lost 2600 homes in our service area, almost 60%. We're faced with a revenue loss and an increase in workload. Post-fire, those are the concerns moving forward. It's moving forward and stabilizing our operation, ensuring our needs can be met.

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Item 8 (cont.)

We've grown accustomed to being vulnerable to specific events, such as wind and fire. We are very conscious of those events. We are very proactive at our facilities, which are up in the foothills. We have one that's in the forestry area. Something we focus on is removing combustible materials and defensible space. We're always looking out for redundancy—backup Reservoirs.

We have 10.5 million gallons of storage and can't move that around. It is gravity-fed, so we have to pump it up the hill. However, we do have the capability of moving water.

Increased workload: Following the fire, we had to stabilize our system to repressurize it. In addition to damaged and destroyed homes, we had over 1,000 properties that had their water running. We had to go street by street, turning off the damaged water. We then moved into the water quality compliant space, trying to get out of the do not drink order listed. We took over 400 samples throughout the distribution system, requiring us to flush every storage line to a damaged or destroyed property. Those flushing activities still have to continue to keep stagnant water out of the system. We also have a lot of repairs that need to be done. Shut off valves, new service lines. Customers are trying to return to the community to turn on their water and are trying to come back to their standing homes. We have a lot of different scenarios that take up a lot of time for our field staff. 11 full-time, 7 in the field department.

All of this on top of the regular work.

We have to be ready in the event of an emergency. You can live without water. They understand the importance of what needs to be done and the work that needs to be performed. We switched to a 24-hour operation with 12-hour rotating shifts. We put in the work to get the community back up and running.

Q: Has your mutual water company been approached about consolidation, or has it considered consolidating with a larger system?

All the water companies here are over 100 years old. We work very well individually. Consolidation has always been a topic for consideration, most recently with this fire.

Item 8 (cont.)

Those are ongoing discussions. At this time, it's still under review. I can't say it's under review, but there's no immediate plan at this point.

MWCs get a bad name because there are some challenging MWCs throughout California. We mutuals in Altadena are some of the best ones in the state. There hasn't been an immediate need as well. Companies will consolidate because one is deficient, which is definitely not the situation in Altadena. Some of our agencies have suffered significant damage, but I think that any company that would sustain this kind of damage would be in a vulnerable situation. I don't want to speak for other agencies. We've also prepared. We have a very extensive emergency response manual. We've prepared financially. We do have catastrophic funds we do have reserve funds.

Our board of directors—they're shareholders—three of them lost their homes, and two employees lost their homes. We're really close with our community. We're right here in the middle of Altadena. We still have customers come in and pay their bills in person. We do have a really close customer base. We feel it. We feel it with them.

Q: What are the biggest benefits and challenges you foresee in a potential consolidation?
The immediate challenge is our shareholders. Our board, myself included, needs to do what's best for our shareholders. But we also want to know where they see their water company moving. We'd engage our shareholders to see what they want for our future. We have three different companies, and we're all evaluated differently. All these shareholders would have to be made whole.

That may not be the situation. We all have different rates because we have various operating expenses. There may be opportunities for more operational efficiency.

Q: How would consolidation impact shareholder control and governance of your water system?
You don't need three different companies and three different boards in the event of a consolidation. There would have to be another election. I believe one of the other agencies

Item 8 (cont.)

does a two-year election. Again, I think that I've been at Lincoln Avenue for about 22 years. I truly believe that Altadena is a very unique community. They like the small-town feeling.

Even after this fire, many shareholders contacted me personally to check on us and see how we're doing.

Q: What steps would be needed to transition assets, liabilities, and operations to a larger system?

The one major thing is that they have to be a connection between the three water agencies, one from each system to the other. Our whole distribution system has to connect.

We already have interconnections with the other agencies that we use for emergency purposes, we're actually doing that right now with the Las Flores water company. We have the ability to provide them with water. Their customers were out of water for the first three months. That's something we've been able to assist them with. We would have to look at the financial aspect, how shareholders will be affected. How do we deal with staff management? Yeah, our assets. I assume each company would have to go through a valuation to determine how it could be equally spread out between all the shareholders.

This goes back to our emergency preparedness, making sure that there are some redundancies and ways for us to help each other. We have three with the city of Pasadena, where we can provide certain areas of their distribution system with water in the event of an emergency. A lot of these were put in place a long time ago. It's basically just opening a valve, and they handle it on their end.

We have different pressures, and all our service areas are against each other. Again, we have differing pressures, so we are sometimes limited on where to make those connections. If we're in a consolidation situation, we'd want more than one connection to each agency for that redundancy. We'd have to engineer the heck out of that one.

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Item 8 (cont.)

Las Flores and Rubio Canyon: The general manager of RC is the chair of an association called Cal Mutuals. They were developed to support MWCs and are very well-versed in consolidation.

In the face of such destruction, I think Lincoln Avenue was very fortunate that we didn't lose any major infrastructure. We lost one reservoir that services our surface water treatment facility. I think that we fared very well, and we continue to make progress. We all continue to make progress. We're in it for the long run.

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IRB Local Study Documents

Item 9

Los Angeles Local Agency Formation Commission (LA LAFCO)

Q. Can you tell me a bit about the relationships between different CWSs in LA County and the AV?

When you look at the Antelope Valley, there are 3 or 4 major water providers. County Waterworks District 40 compiled smaller water entities into one big district. So it's kind of spread out. You have them, AVEK, Palmdale Water District, and Quartzhill, but there's also at least one Investor-Owned Utility. But we don't regulate them, they're supposed to update us on their maps. I'm more aware than most, primarily just because I used to work for the county. They usually come onto our radar only when they're in trouble.

I can't speak to them today, but a larger mutual out there had a huge storage sink. There was a retired LADWP Water employee who lived there, and they had a pretty robust system, that's as big as one of the mutuals out there. It was pretty well run, but they were sort of the outlier. They had anywhere from 4-6 on the low side. They're not necessarily near another water district or any nearby water providers. I will say, I can't speak to it directly, I think there's more awareness of these issues at the state level. I think there are at least conversations; we've had some with public works and the state water control board. I think there's more of an awareness that the county and its district might be able to consolidate, but the state would have to help these small systems connect to the district.

I don't think Pasadena Water and Power is interested in providing outside its borders without people annexing into Pasadena. The increasing regulatory environment, whether state standards, affects all small water providers. If a MWC has 4,000 customers, but the regulations that make it hard for many mutuals also make it hard for many public water agencies. The increased destiny, change in contaminant standards, and the example I give people. In the Antelope Valley, there were two wells, and the MCL was below the standard. So they blended it with another water source, but then the standards changed again. Now imagine how that happens to a small mutual or public system. As much as it has impacted mutuals, it impacted all small water agencies. There are small systems that are desperately in need of grants or loans, but don't have those resources. If you're a

Item 9 (cont.)

small water system with 3 employees, you don't have the 35 or 40 hours to apply for those grants and loans. That certainly hits mutuals, but it can hit any small water system. And I don't see that trend changing. I don't see small water systems getting more resourced, and the regulatory environment is only going to get more burdensome.

Q. What are the primary water supply challenges in your jurisdiction, and how have these changed in recent history?

There are so many problems that people don't think of, I think primarily... what happens when a catastrophe occurs? Say a water main in the AV fails, and they have to dig up 1,000 feet of pipe, and end up having to raise prices to cover that. If you have a small system with only 1,00 or 1,500 customers, they can handle a $50,000 replacement, but probably not a $500,000 replacement. At some point, you have a repair that's very, very expensive and needs to be done quickly. Where I've seen it happen has been less in the pipeline, but usually, well failures. "Our well isn't working at 400 feet, we have to drill another 500 feet down." "Our well system is failing, we have to spend money to get in there and fix it". It gets increasingly expensive to drill a new well and more costly to retrofit an old well. They get brittle and fail. In less extreme cases, they deteriorate. You can only bandage them for so long before you have to repair parts or all of it.

Q. What's a good way of addressing this?

One of the things that's amazing about all water providers universally, when we think of cooperation among government agencies, the first one I think of is mutual aid. If there's a small fire in Sierra Madre, the County will commit, Arcadia will commit, and when you know what hits the fan, they will respond. Those are emergencies. Most water managers think that way in the rest of the government service world. I'll share a story with you that is almost working in reverse. I live in East Pasadena. Pasadena Water and Power owns two huge tanks up here. They were damaged to the point they were currently unusable. PWP, this was sort of at the edge of their service periphery. They're getting water from Kinneloa Irrigation District, a very small district. We talk about everyone trying to help the mutuals, but for a problem that's only going to exist for 3 months, 6 months, or a year, it was much more convenient to rely on and buy water from a nearby smaller water system.

Item 9 (cont.)

When I started, when people thought of small water systems, they thought of the Central Valley. They're rural and spread out, and many communities are socioeconomically disadvantaged. But I think local legislators have brought this to Sacramento and LA. The AV has a similar landscape to the Central Valley. These small systems are rural and widespread, and many communities are socioeconomically disadvantaged. But they've also realized we have these similar problems in urban areas. They have a small customer base, and it's hard to raise prices because the area can be socioeconomically disadvantaged. Your pipes are old, your water district is old, and your tech is old.

The other thing I will say is that LAFCO, the water resources control board, and some of the water districts need to do a better job of talking to each other, because when there's an emergency, it's too late. I'm aware of Mutuals(again, mutuals aren't in our purview) that are challenged that the city is looking at, or the county is looking at, or CalMutuals is trying to assist them, or realize that they might not work. We have to look at a consolidation effort. If we're looking at a challenged agency, LAFCO can only turn that over to a water agency(county water district, municipal water district, irrigation district); we can't turn it over to an Investor-Owned Utility. The State Water Resources Control Board can do that, however.

There are some well-run mutuals. I worry that mutuals are in this gray zone between private and public. They're not subject to the Brown Act, but they're responsible for their shareholders. I don't know if they all have websites, but a few years ago, some of them didn't. In some cases, they're not being as transparent with their shareholders as they should be. A law passed in 2012 by Senator Selorio, an OC State Senator, said all mutual water companies must provide a map of their service territory to LAFCOs in their area. We came up with a list of about 75, 10 to 20 wrote back to us and said they weren't MWCs. We heard from about a third of them, we sent a second letter, and a third. They were very, very secretive. Sometimes, we got a professionally drawn map, and in some cases, we got an assessor's parcel map printout highlighted. For those who didn't respond, we just marked them and moved. Most are very cooperative, but some are a lot more secretive and not as transparent as they probably should be.

Appendix A

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Item 9 (cont.)

As soon as the Forced Consolidation law was passed. They haven't. To their credit, they've been very good at reaching out to the local LAFCO office, very proactive, very transparent, and very much so, reaching out to inquire after alternatives and local wisdom. Sometimes we have mutuals run by the same person or group for a long time. They may not be as tech proficient. It isn't necessarily that anyone is doing anything wrong, but they're just underresourced and haven't done succession planning, and I think that suspicion they have is natural.

If you're used to the way you're doing things for 20 years and now everyone is asking you questions, I might be nervous to.
It's not happened here in LA County, but even amongst public water agencies, there are places where someone is the GM of two because neither can afford a general manager on their own. But you know, one of them pays them 40% of the time, and the other pays them 60% of the time.

I really can't say much about Altadena. At least one mutual in the southeastern part of the county is running into some challenges. We've had some local issues, nothing I'm aware of, and nothing recently. There's at least one city-owned water system that they're looking at potentially investing in. We have many of these conversations, unless someone directly comes to us and says this is what we want to do, it's all just speculation. I will share with you, we recently had an application filed. Within the past year or so, we had an applicant annex a small water system at a trailer park, annexed into the county water works district 40. The trailer park, actually the residents themselves, their board brought in an engineering firm and looked at where the 40's nearest pipeline is. It worked out that the cheapest would also be the quickest. That's the first application from a trailer park that connects to District 40. They realized we should not be in the business of trying to deal with our own sewage and providing our water, but they recognized they were too small and needed help. Some trailer parks have talked to county water works, but this was the first one I thought was getting across the finish line.

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Item 10

Los Angeles County Waterworks District 40

Q: Can you provide an overview of WWD40's history and current operations?

There are five different waterworks districts. We have many districts, and each is unique in its location and water supply, and exceptional in its customer base. They're all unique in their separate ways. Overall, all districts have about 71,000 connections. From a population perspective, we serve close to 280,000 people. What we do with our resources, whether engineering or field staff, we share those resources between the districts to support them financially. The larger the customer base, the more we can spread our costs. We're probably at 40-45,000 connections with WWD40. It's our largest district by far, in land mass, the number of customers we have, and the amount of infrastructure. It's made up of multiple regions, and it's our largest district.

40 was originally multiple different districts before the 1980s. When we consolidated those districts, we ended up calling it District 40. The original districts are now regions. They were once independent waterworks districts that consolidated.

Q: How did that consolidation work?

It happened back in the early or mid-80s. It was intended to examine the benefits of a combined system rather than a fragmented system. Ultimately, the Board of Supervisors decided that consolidating would be the best way for our customers to benefit, so that we could increase the resources provided to each region.

Q: Has there been any consolidation since?

We've worked with quite a few smaller water mutuals and mobile home parks to provide them. We've done multiple over the years. The most recent one was Palm Desert Mobile Home Park.

Q: How has consolidation affected Mutuals and MHPs?

MHPs and MWCs are key in providing these isolated rural communities with water services. Some of them are at risk, whether due to inadequate water supply, lack of resources, etc. From our perspective of water quality, many new regulations put strains on those systems, which then risk failing. So, the state inquires how we can consolidate and assist these systems.

Appendix A

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Item 10 (cont.)

If we already have infrastructure that can serve them, that's one thing that allows us to move faster. We consistently work at the state to ensure it doesn't affect our existing customers. Once we consolidate, our ability and resources can be diverted to emerging contaminants and emerging infrastructure needs at these previously small independent systems as well.

Q: Have there been any recent discussions on consolidation in the AV?
The state has approached us with multiple small water agencies that might be at risk of failure. They've asked us to work with some of their consultants to discuss what infrastructure improvements would be needed for consolidation to happen. Supply can be limited up in the AV with the groundwater rights adjudication. Pipeline conveyance, making sure the infrastructure is suitable for additional demand. The vicinity of small water systems is another concern. Some rural agencies are very small and further away from our system. The further away they are, the more difficult it is for us to provide that service. If their demand isn't high enough, there's a potential for stagnation in the pipe infrastructure.

Q: How has drought and wildfires affected understanding of risk?
With the state's SAFER program, there are financial, water quality, and technical ways of measuring risk. Making sure you have emergency connections is one of the most critical ways of preparation. Mutual aid is critical in these situations. Being able to provide nearby water systems with mutual aid has been critical in combating droughts, structural fires, and wildfires. That doesn't address their normal day-to-day quality issues, but those tend to be more complicated and must be taken on a case-by-case basis.

Q: What are some examples of case-by-case quality issues?
Say a water agency has a small well that provides water to its service area. As water quality regulations tighten and there's more coming up, it becomes more difficult for small water agencies to meet these regulations. Those tend to be difficult from the capital infrastructure, the operation, and the maintenance. If they had to do any type of water quality treatment, it could be difficult for them to obtain proper certifications. Each different type of contaminant requires an additional certification. Whether someone can

Item 10 (cont.)

obtain it, if they can afford an accredited worker, or if they can afford the operation of treatment, can impact affordability.

Q: What have been concerns from local residents' perspectives?

MWCs have always staked their ownership in the community as community members. If a mutual can provide quality water to its residents and constituents, then consolidation should not be on the table. There's no reason to discuss consolidation if they're not at risk. I did hear from one MWC constituent trying to redevelop his property, and the fire department required higher fire flow. The constituent was concerned because their MWC was not able to provide that. It's mostly folks who feel that there are some challenges that the small water system was facing and they couldn't address them on their own because of inadequate infrastructure, inadequate in the sense of what these residents wanted, but still adequate in terms of meeting regulations and serving customers.

Q: What are some of the barriers or obstacles that small systems in the AV face in regards to consolidation?

The Village MHP is right outside our service area. A study was done back in 2012. I don't recall the dollar value, but it was in the one-million neighborhood. If the infrastructure is addressed, we can have access to our infrastructure. We felt that the water demand from the MHP was small enough that it would cause water stagnation issues. We're still working with the state, and it's an ongoing discussion.

Lancaster Park MHP is a little further out, which goes back to that same concern of a long water service line. The capital costs are one thing, but then there are the water quality concerns of stagnation. The cost-benefit analysis of such a long pipeline and trying to maintain it was another concern.

For Western Skies MHP, we'd have to talk about annexing into the service area in addition to a long stretch of pipeline.

The state approached us to give some feedback on what it would take for us to consolidate El Rancho MWC. Clear Skies, Terra Nova, and El Rancho were three MHPs that

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the state had hired the Provost and Prichard consulting group to do an engineering report on. We've been working with the state on those three.

Mitchell's is even further north than the Village. I'm unaware of discussions between us and the state, but we'd have some of the same concerns I've highlighted.
Our biggest concern is the water supply being able to gain the water rights to provide them service, two is the infrastructure to be built and the O&M concerns, and three, of course, is making sure there aren't impacts to our existing customer base. We do want to support the state in assisting these failing water systems; I continue to work through the county water plan to find a way to support, with the understanding that we want to minimize impacts to our existing customers while also providing safe, reliable drinking water to these small water systems.

Appendix B

Item 1.

Methodology for Identifying Recent Consolidated Systems in Los Angeles County

1. We are identifying recent consolidated systems in LA County within the last 5 years. To identify the systems, we used the California Water Partnerships online tool and the dataset from Panacea or Placebo? The Diverse Pathways and Implications of Drinking Water System Consolidation.
2. Six systems in LA County were identified using the California Water Partnership tool, while five were retrieved from the dataset. Five of the systems overlap between the two resources. The additional system, the Sativa Water System, was identified using the California Water Partnership tool. This section reviews the following six LA County systems.
    a. Sativa Water System (Community Water System)
    b. Gorman Elementary School (Non-transient non-community water systems)
    c. Mesa Crest Water Company (Community Water System)
    d. Rurban Homes Mutual Water Co (Community Water System)
    e. Environmental Care Industries-VLY Crest (Non-transient non-community water systems)
    f. Adams Ranch Mutual (Community)
3. The following attributes will be collected for each system:
    a. Attributes
        i. System Name
        ii. City
        iii. Date of merger
        iv. Connections
        v. Population
        vi. Receiving Water System
        vii. Issue Summary
        viii. Physical and Managerial Consolidation
4. News articles, archival documents, and meeting notes will be collected and examined to enhance the narrative.

Appendix B

Item 2.

Methodology for Identifying Potential Receiving Systems in Los Angeles County

1. The selection criteria for selecting 15 potential receiving systems in LA County are as follows:
   a. System Population:
      i. Larger systems can leverage economies of scale for distribution, treatment, infrastructure, and technical and managerial capacity. Therefore, our top 15 potential receiving systems will be large community water systems with over 30,000 service connections and serving a population of over 100,000 (California State Water Resources Control Board, 2024). The research team sourced the population size for Los Angeles County Systems from the SAFER Dashboard (SWRCB, 2025).
   b. Maximum Contaminant Level (MCL)
      i. The team examined MCL violations in the last 5 and 10 years using the 2024 Water Atlas Update Data.
   c. Spatial Relationship
      i. Examining the relative distance between a receiving system and, generally speaking, smaller and/or at-risk systems. The median of physical consolidation is 0.174 miles, whereas managerial consolidation is 0.751 miles (Dobbin et al., 2023). Consolidation is not a feasible option if smaller systems are isolated. Therefore, GIS is used to identify the number of systems within a 1, 3, 5, and 10-mile buffer among the Top 15 Potential Receiving Systems. The initial GIS process will result in duplicate systems among the identified Top 15 Systems.
      ii. The team conducted an additional analysis to identify unique systems within a 1- and 3-mile buffer.

Appendix B

Item 3.

Methodology for Identifying the Number of Unique Systems for the Top 15 Potential Receiving Systems in Los Angeles County

1. The team is identifying the number of unique systems for each of the top 15 receiving systems in Los Angeles County:
   a. Using ArcGIS Pro, the team exported each receiving system from the Los Angeles County Community Water System shapefile.
   b. The team created a 1- and 3-mile buffer for each receiving system.
   c. The team then used the “Select by Location” tool with the “Intersect” relationship to find the number and name of water systems in Los Angeles County intersecting with the designated buffer (1- or 3-mile).
2. The team conducted a series of steps to find the number of unique systems.
   a. The team used conditional formatting to highlight duplicate systems in Excel.
   b. The team reviewed the duplicate systems, starting with the most extensive receiving system, LADWP. For each duplicate found, one was kept in the LADWP column, and all other duplicates were removed from the following receiving systems' columns. For example, if “Lynwood-City, Water Dept.” appeared in the LADWP column, it was removed from later columns, such as the Long Beach Utilities Department. This process continued until each water system appeared only once in the spreadsheet.

Appendix C

Item 4. Small Water Systems in the Antelope Valley

Water System	Type	Number of Connections Served	Primary Water Source
Colorado Mutual Water Company	Mutual water company	13	Groundwater
Lancaster Park Mobile Home Park	Mobile home park water system	21	Groundwater
Lancaster Water Company	Private water supplier	22	Groundwater
Golden Valley Municipal Water District	Municipal water district	22	Groundwater
Reesedale Mutual Water Company	Mutual water company	23	Groundwater
Tierra Bonita Mutual Water Company	Mutual water company	32	Groundwater
Aqua J. Mutual Water Company	Mutual water company	49	Groundwater
North Trails Mutual Water Company	Mutual water company	49	Groundwater
Llano Mutual Water Company	Mutual water company	81	Groundwater Purchased
Antelope Park Mutual Water Company	Mutual water company	146	Groundwater
Sunnyside Farms Mutual Water Company	Mutual water company	159	Groundwater
Shadow Acres Mutual Water Company	Mutual water company	164	Surface Water Purchased

Appendix C

Item 4. Small Water Systems in the Antelope Valley (cont.)

Water System	Type	Number of Connections Served	Primary Water Source
Westside Park Mutual Water Company	Mutual water company	171	Groundwater
Landale Mutual Water Company	Mutual water company	186	Groundwater
Leisure Lake Mobile Estates	Mobile home park water system	211	Groundwater
El Dorado Mutual Water Company	Mutual water company	240	Surface Water Purchased
LA County Waterworks District 40, Reg. 35 - Northeast LA	County-operated water district	243	Groundwater
White Fence Farms Mutual Water Company No.3	Mutual water company	253	Surface Water Purchased
Averydale Mutual Water Company	Mutual water company	306	Groundwater
LA County Waterworks District 40, Reg. 39 - Rock Creek	County-operated water district	368	Surface Water Purchased
White Fence Farms Mutual Water Company	Mutual water company	457	Surface Water Purchased
Lake Elizabeth Mutual Water Company	Mutual water company	725	Surface Water Purchased
Westside Park Mutual Water Company	Mutual water company	171	Groundwater
Landale Mutual Water Company	Mutual water company	186	Groundwater

Appendix 2 A

Item 1. Fire Vulnerability Index Results for LA County CWS