WaterSMART Planning and Project Design Grants for FY 2024

Funding Opportunity Number: R23AS00109

TECHNICAL REPORT
Increasing Water Resiliency through Mainline Upgrade and Improved Pressure Management
May 2024

Carmichael Water District
7837 Fair Oaks Blvd
Carmichael, CA 95608

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Acronyms and Abbreviations

ACP	Asbestos-Cement Pipe
AF	acre-feet
AFY	acre-foot per year
ASR	Aquifer Storage and Recovery
C900 PVC	Polyvinyl Chloride Plastic Pipe
CEQA	California Environmental Quality Act
County	Sacramento County
DDW	Division of Drinking Water California State Water Resources Control Board
DIP	Ductile Iron Pipe
DWR	California Department of Water Resources
DWSA	Drinking Water Source Assessment
GPM	gallons per minute
MG	million gallons
MGD	million gallons per day
NAHC	Native American Heritage Commission
NDMA	Nitrosodimethylamine
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NTUs	Nephelometric Turbidity Units
PCA	Principal Component Analysis
PSI	Pounds per Square Inch
Reclamation	United States Bureau of Reclamation
RDCP	North American Basin Regional Drought Contingency Plan
RWA	Regional Water Authority (Northern California)
RWQCB	Regional Water Quality Control Board, Central Valley Region
SCADA	Supervisory Control and Data Acquisition
SCEMD	Sacramento County Environmental Management Division
SGA	Sacramento Groundwater Authority
SGMA	Sustainable Groundwater Management Act
SMUD	Sacramento Municipal Utility District
Subbasin	North American Subbasin
SWPPP	Storm Water Pollution Prevention Plan
The District	The Carmichael Water District
USBR	United States Bureau of Reclamation
WSCP	Water Shortage Contingency Plan

Technical Proposal and Evaluation Criteria

Executive Summary

Date:	May 22, 2024	**Applicant:**	Carmichael Water District
City:	Carmichael (unincorporated)	**Applicant Category:**	Category A Applicant
County:	Sacramento	**Task Area:**	B - Project Design Grants
State:	California		

The Carmichael Water District (the District), located near Sacramento, California, is committed to minimizing water loss and increasing infrastructure resiliency through the strategic replacement of aging and leaking water distribution mains with improved materials, the development of new pressure zones, and pressure management. The District delivers water to over 41,000 residents through diversions from the American River (2 water licenses and 1 permit), 8 groundwater wells, and four interties to adjacent water districts. The groundwater wells have varying production limitations, requiring the District to rely heavily on the American River diversions which are limited based on flow rate, timing, and purpose. However, recent curtailments of the District's water rights to the American River has put the District's ability to serve water to customers through future droughts in jeopardy without significant investment in infrastructure improvement, water efficiency, and strategic planning. To address these significant concerns, the District proposes to develop: 1) planning documents and design plans for the replacement of 1.62 miles of critical, aging water mainlines with improved ductile-iron pipe (DIP) materials; and 2) planning documents and operation plans for pressure management at the southernmost pressure zone (Zone 3) through the isolation of two new pressure zones (Zones 3A and 3B), by closing 8 existing water mains at strategic locations, to achieve a reduction to customer service pressures by an average of 13 pounds per square inch (psi).

This project is supported by the Regional Water Authority of Northern California (RWA) and directly aligns with the California Department of Water Resources (DWR) goals for water efficiency and conservation (CA Senate Bill 606 and CA Assembly Bill 1668). This infrastructure efficiency project, in combination with water conservation efforts from customers and existing conservation programs, are essential to ensuing long-term resiliency of the District's water supply and compliance with required urban water use and efficiency objectives from the DWR. The proposed project is anticipated to require 10 months for all design efforts, thereafter the District will pursue funding for construction. The District is targeting to complete construction of the proposed project 12 months after the completion of the construction documentation, or by January 2027. The proposed project will not involve Federal land.

The District has served the Sacramento region for over 100-years and significantly relies on its two water licenses and one permit to divert water from the American River at allowed rates, periods, and purposes. The District's water rights to its American River surface water supply were curtailed for the first time in its 100-year history in 2014, 2015, and 2021. The risk of future curtailments and limitations to the District's water resources compels the District to identify opportunities to secure future water supply reliability through improved water management and water efficiency of the

distribution infrastructure. In 2023, the District had an average water loss rate of 20.3 million gallons (MG) per month within distribution infrastructure, which the District principally attributes to losses from pipe breaks and continual leakage. Through the improvement of water infrastructure this project will reduce water loss at the District, enable efficient use of the American River surface water, and benefit water supply for a large part of the Sacramento metropolitan by allowing more water to remain in the river.

Anticipated Benefits

The District estimates that the replacement of 1.62 miles of critical, aged mainlines with improved DIP materials will result in the immediate conservation of 10.35 acre-feet (AF) per year (AFY) by eliminating active leaks and water losses in those pipeline ranges. Furthermore, the proposed pressure management activities will reduce the flowrate of all active leaks and water losses in Zone 3, which the District anticipates will result in an additional annual conservation of 9.58 AFY. Across an anticipated 50-year life, the District expects the proposed project will altogether result in the conservation of at least 324.61 million gallons (MG) or 996.20 AF of water.

Additionally, the mainline replacement project sites were strategically selected to simultaneously target mainlines that are suspected of or known to be significant sources of water loss, as well as provide increased flow capacity for an Aquifer Storage and Recovery (ASR) well that is currently in development in the District. Therefore, the proposed project will simultaneously accomplish direct water conservation and support District efforts to increase resilience to climate change by reducing its dependence on water from the American River during periods of curtailment or extreme drought through banking during normal years into the groundwater aquifers.

Furthermore, there are many benefits to pressure management beyond reductions to continuous leak rates, including: reduced frequency of pipe breaks; reduced frequency of leak development; increased lifespan of pipe materials; reduced flowrate of irrigation devices, and much more (American Water Works Association, 2016, pp. 220,259; Fanner, Thornton, Liemberger, & Sturm, 2007, p. 15). Moreover, the District has had difficulty in the past calibrating the pressure setpoints for the two pressure-reducing stations that currently supply Zone 3, due to the complex hydraulic grade lines connecting them. By isolating each pressure-reducing station into its own district (e.g. Zone 3A and 3B), in addition to accomplishing water conservation through reductions to active leaks, the District anticipates improvements to water service by providing more consistent and predictable service pressures and chlorine residuals.

Finally, if selected for funding, this project will be an excellent demonstration in the value of system rehabilitation, pressure management, and system-side innovations as strategies for water management and conservation which can be leveraged by water suppliers in a cost-effective manner to achieve their regulatory mandates and conservation objectives. The District believes that infrastructure improvement projects which target water efficiency, such as those proposed, in close combination with customer-level outreach and conservation are the best approaches to achieving state-wide conservation goals while maintaining the standard of living expected by our customers and communities.

Project Location

Carmichael, CA and the District are located in the northeast part of the Sacramento urban area adjacent to the American River. The District serves over 41,000 people through a 154-mile distribution pipeline network utilizing a 22 MG per day (MGD) surface water treatment plant, 8 groundwater wells, and 4 interties to adjacent water districts.

The District is located in the North American Sub-basin (Sub-basin) within the Sacramento Valley Groundwater Basin (see Figure 1). The Subbasin extends to portions of Sacramento, Placer and Sutter counties and is an important groundwater resource for water purveyors in Sacramento County serving approximately half of a million people in the region. As groundwater management is critical to regional water reliability, proactive management decisions to ensure the basin's health lead to the development of Water Accounting Framework in 1998 and the Water Forum Agreement in 2000. Forward thinking management strategies have advanced conjunctive use in the region resulting in stabilized and consistent groundwater levels while providing environmental benefits of preserving surface waters in the lower American River. The Sub-basin is classified as a medium priority basin under California's Sustainable Groundwater Management Act (SGMA) and managed by the Sacramento Groundwater Authority (SGA) within Sacramento County.

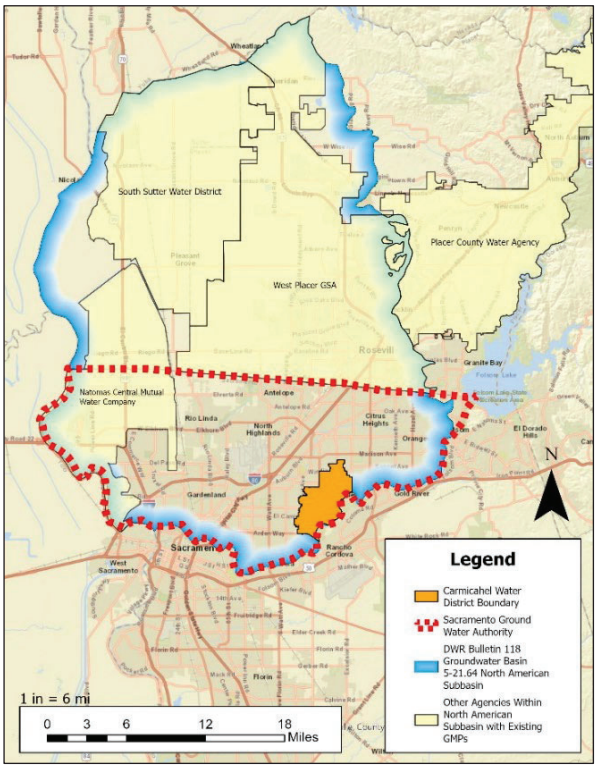

Figure 1: North Area Subbasin Map

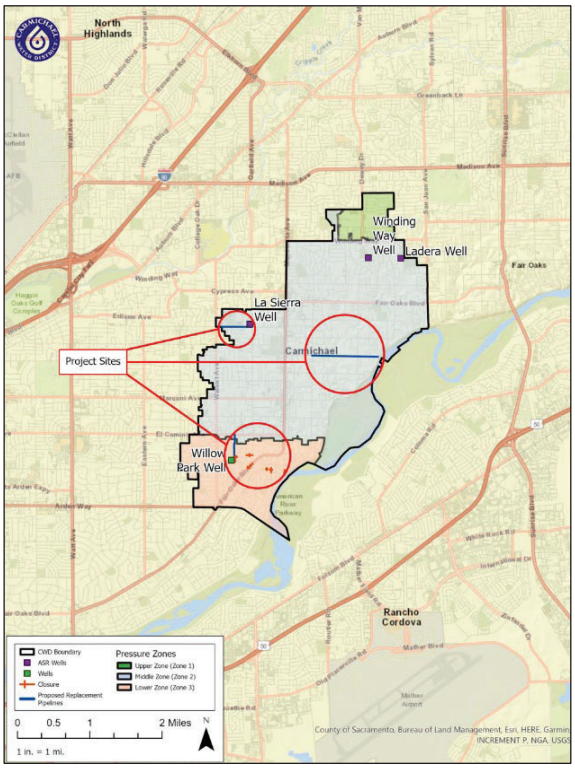

Figure 2: Project Location Map

The project is located within Zone 2 and Zone 3 of the District's service area (see Figure 2). The pipeline replacement components of the project will serve Zone 2 and are organized into three sections based on their primary or unique road: Gunn Rd, Landis Ave, and Engle Rd (see Figure 2). All of the planned closures for pressure management are within the boundaries of Zone 3. A total of 5 closures are required to isolate the proposed pressure zones 3A and 3B (see **Figure 3**), located

at: River Oak Way; Claremont Rd; Shelfield Dr; Fair Oaks Blvd, and; Halsted Ave. An additional 3 closures are required to intertie the Willow Park groundwater well with Zone 2 (see **Figure 3**), and are located at: Glancy Ct, Gunn Rd, and Home Ct. All 8 of these closures are possible utilizing the existing gate valves installed within their respective mainlines, and will not require the installation of new gate valves to accomplish the isolations.

To compensate for the isolation of the Willow Park groundwater well within the new pressure zone 3A, and to maximize the beneficial use of this healthy and high-quality groundwater well, the District will connect the well to Zone 2 through the Gunn Rd mainline, which will require increasing its size from the current 6- and 8-inch diameter to a 10-inch diameter across 1,496 feet. This is a strategic choice that both replaces a significantly aged and leaking mainline while maximizing the potential benefit of the District's most reliable and highest-quality production well.

The Landis Ave and Engle Rd pipelines are known to be plagued by significant corrosion to their steel, and the District believes the real water losses are likely greater than the estimates produced in this proposal. Furthermore, these pipelines are critical to the operation of the distribution network by connecting the District's Bajamont Treatment Facility to the in-construction ASR well, a storage tank, and the area's water consumers, and are therefore a key section of the District's network which is critical for system operation and reliability.

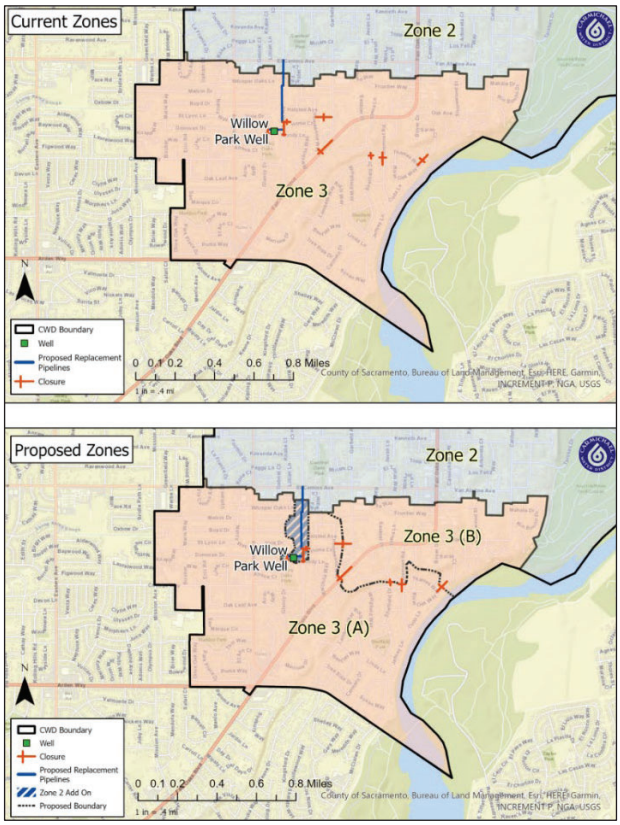

Figure 3: Pressure Management Map, Before and After Isolations

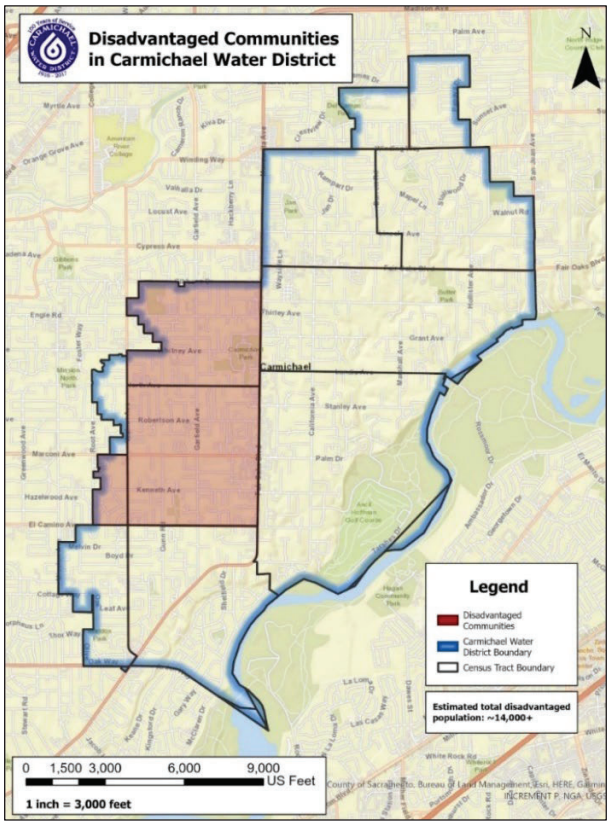

Figure 4: Disadvantaged Communities in the District Service Area

Project Description

The District will develop planning documents and design plans for a total of 6 activities to accomplish 2 objectives, including:

1. The development of planning documents and design plans for the replacement of approximately 1.62 miles of water mainline with new ductile iron pipe (DIP), including:
   A. The replacement of approximately 4,789 feet of 24- and 30-inch steel pipe along Landis Ave with DIP of equivalent diameters;
   B. The replacement of approximately 2,292 feet of 14-inch steel pipe and asbestos-cement pipe (ACP) along Engle Rd, between Garfield Ave and Affirmed Way, with DIP of equivalent diameter; and
   C. The replacement of approximately 1,496 feet of 6- to 8-inch steel pipe, ACP, and polyvinyl chloride plastic pipe (C900 PVC) along Gunn Rd, between Willow Park Ct and El Camino Ave, with 10-inch DIP.
2. The development of planning documents and operation plans for the isolation and operation of two new pressure zones (Zone 3A and 3B, served by the El Camino and California pressure reducing stations, respectively) from Zone 3, including:
   A. The closure of 8 gate valves at existing water mains along River Oak Way, Claremont Rd, Shelfield Dr, Fair Oaks Blvd, Halsted Ave, Glancy Ct, Gunn Rd, and Home Ct;
   B. The development of operational plans for the new, isolated pressure zones including maintenance and emergency response plans, and evaluating any necessary changes to the water quality management plan; and
   C. Engineering analysis to develop new pressure setpoints for the El Camino and California pressure reducing stations to accomplish a minimum service pressure of 40 psi at all customer connection and hydrants, including data gathering and calibration of the computer water distribution model.

Objective 1: Planning Documents and Design Plans for Water Main Replacements

The District plans to replace approximately 8,577 feet of 6- to 30-inch diameter water mainlines with new DIP across three sites (Landis Ave, Engle Rd, and Gunn Rd). The existing pipelines are located within existing easements and public right-of-way and all new pipe will follow the same alignment. As a result, the only property acquisition or access clearance required is to obtain one or two temporary easements for material and equipment staging during construction per site. The District will utilize its computer distribution system water model to ensure the pipeline is properly sized for energy efficiency and to ensure water age in the system is limited to preserve good water quality and avoid unnecessary flushing waste.

On average, the pipelines proposed for replacement were originally installed in the 1940's, and are now 70 – 80 years old. They are far beyond their original expected service life, and are known to be plagued with corrosion issues which result in regular emergency leak repairs and unnecessary water waste. It is difficult to estimate the volume of wasted water specific to these pipe segments as the duration of leaks is often unknown until water appears on the ground surface before the leak is finally discovered. However, crews are averaging fifteen emergency repairs each

year on the existing pipeline this project will replace. These pipelines are key components of the network which connect the Bajamont Treatment Facility and existing groundwater wells to the in-construction ASR well, a storage tank, and the area's water consumers. As a result, the rehabilitation and reliable operation of these pipelines are critical to the long-term strategy and reliability of the District.

The pipelines are located in urban areas along minor collector roads that are surrounded primarily by residential homes. Water service shut downs during the project will be scheduled and coordinated to minimize their impacts on consumers. Long-term outages are not expected due to the looped nature of the distribution system in the project area and should be limited to re-establishing connections that exist on the new pipeline. Service interruptions should be limited to a few hours at most. The construction work will be coordinated with all other underground utilities using the pipeline's alignment and include natural gas, sewer, and storm drainage systems operated by other utilities. Electric and communication services in the area are generally provided by overhead lines and will not be impacted by excavation or pipeline alignment.

Once construction easement(s) and necessary permits are established, the project will begin by mobilizing equipment and materials to the staging area(s). The old pipeline will be excavated and removed in sections and then immediately replaced with DIP so that service connections can be re-established as soon as possible after proper disinfection. The District's construction standards require contractors to complete underground work of each section, including backfill daily. This requirement prevents a construction contractor from excessive trenching that would leave a trench open overnight thereby eliminating safety concerns. Should a trench need to be open overnight, it is securely covered with steel plate to avoid creating a hazard. All excavations will require shoring to maintain worker safety during construction. Roadway pavement will be repaired temporarily immediately following trench backfill and then permanently repaved once all project excavation is complete. Sacramento County's requirements dictate that the full width of a disturbed lane be repaired for final paving. On average, this will require a 15-foot pavement width.

Objective 2: Planning Documents and Operation Plans for Pressure Management in Zone 3

Currently, the southernmost pressure zone of the District, Zone 3, is supplied water simultaneously from two pressure reducing stations (PRS) at California Ave and El Camino Ave, with two pressure-reducing valves (PRV) each, drawing from the higher-elevation Zone 2. During the night, Zone 3 is also served by a single variable-speed groundwater pump at Willow Park Ct, depending on seasonal availability. Neither PRS is capable of servicing the entirety of Zone 3 independently due to complications with chlorine residual, water age, and minimum service pressures. Furthermore, the Willow Park groundwater well cannot be relied on to serve the entirety of Zone 3 independently due to concerns with seasonal availability.

To resolve these challenges, the District plans to split Zone 3 into two smaller zones, Zone 3A and 3B, to be served by the El Camino PRS and California PRS respectively. Furthermore, the Willow Park groundwater well, which currently exclusively services Zone 3, shall be isolated and connected to service Zone 2.

To isolate Zone 3A from 3B, a total of 5 closures will be necessary at existing water mainlines located at River Oak Way, Claremont Rd, Shelfield Dr, Fair Oaks Blvd, and Halsted Ave. The gate valves necessary to isolate the zones already exist and no additional infrastructure will be necessary to accomplish isolation. These pipelines are located within existing easements and public right-of-way. As a result, no property acquisition or access clearance will be required to access and turn the risers for each gate valve. The District will utilize its computer distribution system water model and in-field hydrant pressure tests to ensure the service pressures at critical service connections, including high-elevation or distant customers and hydrants, exceed 40 psi at all times. Furthermore, the District will perform water quality sampling and testing at distant points in each newly generated pressure zone to evaluate water quality and ensure no negative impacts to customer water quality.

With the creation of the new Zone 3A, the Willow Park groundwater well located within its boundaries would be oversized and would not be able to service the zone at its target flowrate of 1400 gallons per minute (gpm). To maximize the potential benefit of the Willow Park well and still retain the management benefits of the pressure zone isolation, the well shall be routed to service Zone 2 by isolating the Gunn Rd water main through to Willow Park Ct utilizing: the closure of three existing gate valves in water mains at Glancy Ct, Gunn Rd and Home Ct, and; opening the currently closed gate valve between Gunn Rd and El Camino Ave. The water mains along Gunn Rd, however, are currently too small and too aged to act as transmission lines for the Willow Park well to Zone 2, and will require the mainline replacement activities described in activity 1.C. The District anticipates that with these changes, the Willow Park well shall have an available flow capacity of 1300 gpm to contribute to Zone 2, with negligible impact on the energy efficiency of the well due to its functionality at a variable-speed pump. In addition to the work outlined in activity 1.C, the closures at Glancy Ct, Gunn Rd and Home Ct are located within existing easements and public right-of-way. As a result, no property acquisition or access clearance will be required to access and turn the risers for each gate valve.

Project Benefits

Estimating reductions to water loss from main replacement.

To estimate the reductions to water losses from replacing aged or leaking water mains, the District assumes the leak rate per mile of water main can be assigned proportionately to the inner diameter or volume of water pressurized within each mainline, as shown in Equation 1:

$$LeakRate = \frac{Diameter * AnnualLosses_{System}}{(\sum_{n=0}^{N} Length_n) * AvgDiameter_{Weighted}} \quad \text{Equation 1}$$

where $LeakRate$ is the assumed monthly rate for a mainline targeted for rehabilitation or replacement (MG per month per mile), $Diameter$ is the inner diameter of the mainline to be rehabilitated or replaced (inches), $AnnualLosses_{System}$ is the overall District's real water losses (MG per month) which for 2023 was 20.3 MG per month, $n = 0\ to\ N$ is the indexed list of all water mains in the District, $Length_n$ is the total length of water main n (in feet), and $AvgDiameter_{Weighted}$ is the weighted-average diameter of water mains in the District (in inches) based on the cylindrical volume of water within the mains, as shown in Equation 2:

$$AvgDiameter_{Weighted} = \frac{\sum_{n=0}^{N}\left(\frac{PI}{4} * Length_n * Diameter_n^3\right)}{\sum_{n=0}^{N}\left(\frac{PI}{4} * Length_n * Diameter_n^2\right)} \quad \text{Equation 2}$$

where $n = 0\ to\ N$ is the indexed list of all water mains in the District, $Length_n$ is the length of water main n (in feet), and $Diameter_n$ is the inside diameter of water main n (in inches).

Equation 1 provides an estimate for the rate of water loss attributable to water mains in the District as a function of inner pipe diameter, and does not consider the age, material, or break history of water mains. The actual water loss rate of all water mains targeted by this proposal are not known, however they are identified by District staff as key strategic mainlines that are believed to be significant sources of water loss, and the District believes their actual water loss is significantly higher than the estimates generated by Equation 1. Therefore, when estimating benefits from water main replacement, the District assumes that all leakage previously attributable to the replaced water main is effectively resolved for 50 years.

Estimating reductions to water loss from pressure management.

There is a known relationship between service pressure and water leakage flow rate, which can be leveraged by water systems to reduce their water losses from continuous leaks in distribution networks (Rupiper et al., 2022). The change to the rate of continuous water leaks in a system can be formulated as a function of changes to water pressure, the infrastructure condition, and the material types (Cassa et al., 2010; Thornton & Lambert, 2005; Lambert et al., 2013). In their supplemental information, Rupiper et al. outlined a formula to estimate the change to water leakage rates as a function of pressure management per pressure zone, presented in Equation 3:

$$\gamma = \left(\frac{P_1}{P_0}\right)^{N_1} \quad \text{Equation 3}$$

where γ is the fraction of the leakage rate that remains after pressure reductions, P_0 is the initial service pressure, P_1 is the new service pressure after pressure reductions or interventions, and N_1 is the pressure-leakage relationship exponent given by Equation 4:

$$N_1 = 1.5 - \left(1.0 - \frac{2.0}{3.0} * \frac{ICF}{ILI}\right) * F_{rigid} \quad \text{Equation 4}$$

where ICF is the infrastructure condition factor (assumed to be 1.5 for the District), ILI is the infrastructure leakage index (assumed to be 1.429727 for the District), and F_{rigid} is the fraction of pipes in the network that are constructed of rigid materials (assumed to be 0.75 for District). These factors were published by Rupiper et al. in their supplemental information for 800 water suppliers in California, Georgia, Tennessee and Texas, and which included this District (Rupiper et al. 2022).

There are many benefits to pressure management beyond reductions to continuous leak rates, including reduced frequency of pipe breaks, reduced frequency of leak development, increased lifespan of pipe materials, reduced flowrate of irrigation devices, and much more (American Water Works Association, 2016, pp. 220,259; Fanner, Thornton, Liemberger, & Sturm, 2007, p. 15). Therefore, when estimating benefits from pressure management utilizing Equation 3, the District

will assume that all leakage reductions will remain effective for a minimum of 50 years.

Reductions to real water loss from the proposed projects.

In 2023, the District reported a real water loss rate of 20.3 MG per month to the CA DWR. As part of this funding opportunity, the District proposes to replace a total of approximately 1.62 miles of water mainline across three sites, which is estimated by Equation **1** to have an active leak rate of 10.35 acre-feet per year, or 168.55 MG per 50 years, as presented in Table 1:

Table 1: Proposed Water Main Replacements and Estimated Water Savings

Project Site	Material List	Diameter (Inches)	Average Age (Years)	Total Length (Feet)	Total Leak Rate[8] (MG / Year)[1]	Water Conserved[9] (MG / 50 Years)[2]
Landis Ave[3]	Existing[6]					125.86
	ODP[10]	24" – 30"	77	4,789	2.52	
	Proposed[7]					
	DIP[12]	30"	N/A	4,789	N/A	
Engle Rd[4]	Existing[6]					32.51
	ODP[10]	14"	80	2,282	0.65	
	ACP[11]	14"	66	10	0.0029	
	Proposed[7]					
	DIP[12]	14"	N/A	2,292	N/A	
Gunn Rd[5]	Existing[6]					10.18
	ODP[10]	6"	89	923	0.11	
	C900[13]	8"	39	466	0.076	
	DIP[12]	8"	39	67	0.011	
	ACP[11]	6" – 8"	58	40	0.0050	
	Proposed[7]					
	DIP[12]	10"	N/A	1,496	N/A	

[1]Million gallons per year. [2]Million gallons conserved over an assumed 50-year life of the project. [3]Approximately 0.91 miles of water mains to be replaced along Landis Ave, between the treatment facility and California Ave. [4]Approximately 0.43 miles of water mains to be replaced along Engle Rd, between Garfield Ave and Affirmed Way. [5]Approximately 0.28 miles of water mains to be replaced along Gunn Rd, between the Willow Park well and El Camino Ave. [6]Approximate material take-off of the water main materials to be replaced as part of the proposed project. [7]Approximate material take-off of the new water mains to be installed as part of the proposed project. [8]Total leak rate for each of the existing materials utilizing Equation **1**, utilizing the diameter and length of each water main. Assumes that newly installed water mains will not present major water losses for a period of 50 years. [9]Assumes that the water conserved equals the current leak rate of all existing water mains at each project site if held constant over the assumed 50-year life of the new water mains. Does not take into consideration that without intervention, leak rates are expected to increase over time and would not remain constant. [10]Steel pipe. [11]Asbestos cement pipe. [12]Ductile-iron pipe. [13]Polyvinyl chloride plastic pipe.

Furthermore, the District proposes to perform pressure management at Zone 3 by isolating and operating two smaller zones (e.g. Zones 3A and 3B) whose pressure setpoints will be more accurately engineered to achieve water savings while maintaining a minimum service pressure of 40 psi. The characteristics and analysis results for these proposed zones are presented in Table 2:

Table 2: Proposed Pressure Management Analysis and Estimated Water Savings

	Zone 3 (Total)[1]	Zone 3A[2]	Zone 3B[3]
Approximate Length of Water Mains (miles)	29.10	23.06	6.04
Max-Day Water Demand (acre-feet per day)	10.78	7.93	2.85
Pressure Reducing Station Setpoints (PSI) [4]	68 – 72 & 51 – 54	62 – 66	41 – 43
Average Customer Service Pressure (PSI) [4, 10]			
Before Pressure Management[10]	63.09	N/A	N/A
After Pressure Management[10]	N/A	53.32	47.03
Water Leak Rate (acre-feet per month)			
Before Pressure Management[7]	3.63	2.82	0.811
After Pressure Management[8]	2.84	2.28	0.558
50-year Water Savings (MG / 50 years)[9]	156.06	106.51	49.56

[1]Original pressure zone, without splitting into smaller zones. Served by the El Camino and California pressure reducing station as well as the Willow park groundwater well. [2]The larger of the two zones created after the split, served exclusively by the El Camino pressure reducing station. [3]The smaller of the two zones created after the split, served exclusively by the California pressure reducing station. [4]Pounds per square inch. [5]Before splitting the pressure zone or reducing service pressures. [6]After splitting the pressure zone and reducing service pressures. [7]Estimated water leak rate (Equation 1) utilizing the diameters and length of pipes within the pressure zones. [8]Determined by multiplying the leak rate before pressure management with the fraction of the leakage rate that remains after pressure reductions (Equation 3). [9]Determined by taking the difference between the leak rates and scaling it for 50 years. [10]Customer pressures were estimated utilizing a hydraulic model of the District, which is actively used for fire flow analysis for the District.

Over 50 years, pressure management at Zone 3 through the creation of Zones 3A and 3B is anticipated to directly result in the water savings of 156.06 MG. Combined with the benefits from replacing aged and leaking water mainlines (see Table 1), the proposed projects would directly result in a net water savings of approximately 324.61 MG, or 996.2 acre-feet, achieved entirely on the system-side and without requiring customer action or negatively impacting water customer experience.

Performance Measures

This project is anticipated to leverage the cost sharing with the United States Bureau of Reclamation to achieve the development of: 1) final design for the replacement 1.62 miles of aged, leaking and critical water pipes mains along three reaches of mainline in Zone 2 with new ductile-iron pipe materials; and 2) operation and design plans for pressure management in Zone 3 through the isolation of two new pressure zones with engineered, reduced service pressures. The continued beneficial use of the Willow Park groundwater well following pressure management in Zone 3 requires the successful replacement of the mainlines in Zone 2, and therefore the District is pursuing both complimentary water management strategies simultaneously to achieve maximum benefit, water savings, and system reliability. Together, the proposed projects target water efficiency and reduce water losses within the District's distribution network through rehabilitation and improvement of aged, critical water mains with known issues of leakage and pipe breaks as

well as the reduction of customer service pressures through pressure management at two smaller, new pressure zones.

The development of these design plans will support the District in pursuing construction funding. If selected for funding, the design and construction of the proposed project will result in direct and continual water savings within the District's water distribution system throughout the reduction of active and continuous water leaks in the water mains. The District determines and reports system-wide water loss to the State Department of Water Resources annually, with a rate of real water loss rate in the distribution network of 20.3 MG per month in 2023. The District estimates, utilizing Equation 1 and Equation 3, that it will achieve a net water savings of 324.61 MG, or 996.2 acre-feet, over the expected 50-year life of the project, eliminating large volumes of wasted water from being extracted from the American River, as well as eliminating large amounts of energy and District resources utilized in its treatment, pressurization, and distribution. Furthermore, these savings will directly support the District in meeting its mandated water loss and water efficiency targets.

Evaluation Criteria

Criterion A: Project Benefits

If selected for funding, the design and construction of the proposed project will result in direct and continual water savings within the District's water distribution system throughout the reduction of active and continuous water leaks in the water mains. The District estimates that the replacement of 1.62 miles of critical, aged mainlines will result in the immediate conservation of 10.35 AFY by eliminating active leaks and water losses in those pipeline ranges of Zone 2 (see Table 1). Furthermore, the proposed pressure management activities will reduce the flowrate of all active leaks and water losses in Zone 3, which the District anticipates will result in an additional annual conservation of 9.58 AFY (see Table 2).

The mainline replacement sites were strategically selected to simultaneously target mainlines that are suspected of or known to be significant sources of water loss, as well as provide increased flow capacity for an Aquifer Storage and Recovery (ASR) well that is currently in development in the District. Therefore, the proposed project will simultaneously accomplish direct water conservation and indirectly support District efforts to increase resilience to climate change by reducing its dependence on water from the American River during periods of curtailment or extreme drought through banking during normal years into the groundwater aquifers. Furthermore, there are many benefits to pressure management beyond reductions to continuous leak rates, including: reduced frequency of pipe breaks; reduced frequency of leak development; increased lifespan of pipe materials; reduced flowrate of irrigation devices, and much more (American Water Works Association, 2016, pp. 220,259; Fanner, Thornton, Liemberger, & Sturm, 2007, p. 15). For these reasons, the District believes an estimated lifetime of 50 years is a conservative estimate for the beneficial life of the proposed project. Across this anticipated 50-year life, the District expects the proposed project will in total result in a conservation of at least 324.61 million gallons (MG) or 996.20 AF of water, which would remain in the American River for future beneficial use.

Finally, if selected for funding, this project will be an excellent demonstration in the value of system

rehabilitation, pressure management, and system-side innovations as strategies for water management and conservation which can be leveraged by water suppliers in a cost-effective manner to achieve their regulatory mandates and conservation objectives. The District believes that infrastructure improvement projects which target water efficiency, such as those proposed, in close combination with customer-level outreach and conservation are the best approaches to achieving state-wide conservation goals while maintaining the standard of living expected by our customers and communities.

Available Water Supplies and Water Better Managed

The District's water sources include the American River (2 water licenses/ 1 permit), 8 wells, and four interties to adjacent water districts. The District's diversion from the American River has limitations based on flow rate, timing, and purpose. The groundwater wells have varying water quality limitations. The District's municipal water supplies have been explicitly challenged in recent years in large part due to the curtailment of the District's water rights to its American River surface water supply, for the first time in its 100-year history, in 2014, 2015 and 2021. The risk of future curtailments and limitations to the District's water resources compels the District to identify opportunities to secure future water supply reliability through improved water management and water efficiency of the distribution infrastructure. If the American River diversion is reduced or eliminated through curtailment, then the District must rely on the wells and interties to make up the difference to meet water demand. Although the interties have been used before, they are the least favorable option due to the cost of transferring water from one district to another. While the District is committed to increasing utilization of groundwater resources during future curtailments, which is currently being pursued in part by the construction of a new ASR groundwater well, the performance and capacity flowrate of that ASR well depends highly on the capacity of the mainlines highlighted as part of this project. The proposed project is necessary for the District to maximize the beneficial use of our ASR well, in addition to the expected reductions to water loss due to the advanced age and degradation of their materials. Furthermore, depending on the level of shortage and need to purchase water, the District has outlined in its current budget to increase water rates to its customers up to 30% of the normal rate.

The proposed project is critical to the long-term reliability of the District's water service, through providing more efficient water service to customers and maximizing the beneficial use of existing infrastructure and water sources. If and when our diversion from the American River source is reduced or eliminated in future drought conditions, it will become critical that the District has taken all available measures to maximizing system-side efficiency and support customer conservation through pressure management, in addition to direct customer-level conservation, efficiency, and outreach programs.

Benefits to the North American Sub-basin

The Sustainable Groundwater Management Act (SGMA) was signed into law in September 2014. SGMA requires development of Groundwater Sustainability Agencies (GSA) and Groundwater Sustainability Plans (GSP) to achieve sustainability in the state's groundwater basins. In 2016, the Sacramento Groundwater Authority (SGA) became the GSA for the North Basin. To meet State

requirements under SGMA, SGA had to prepare a GSP in compliance with SGMA by January 2022. Currently, the primary planning document for the groundwater basin is SGA's 2014 GMP. As such, the guiding principles in that document govern the District's groundwater planning in the North Basin.

The SGA GMP assessed the groundwater levels in the North Basin. For 40-50 years up through the mid-1990s, groundwater production in the North Basin resulted in a general lowering of the groundwater levels near its center. As groundwater management is critical to regional water reliability, proactive management decisions to ensure the basin's health lead to the development of Water Accounting Framework in 1998 and the Water Forum Agreement in 2000. Forward thinking management strategies have advanced conjunctive use, managed use of both surface water and groundwater, in the region resulting in stabilized and consistent groundwater levels while providing environmental benefits of preserving surface waters in our rivers. Recent regional conjunctive use and water efficiency activities, like those undertaken by the District, have resulted in providing new surface water supplies to water purveyors historically producing groundwater in the central portion of the North Basin.

Supporting Disadvantaged Communities, Tribes, and Insular Areas

Three Census tracks within the District's boundary are considered to be Disadvantaged or Underserved Communities. These communities were identified using the White House Council on Environmental Quality's interactive Climate and Economic Justice Screening Tool (see **Error! Reference source not found.**).

The proposed project will have a positive impact on these Disadvantaged or Underserved Communities, as well as others outside of the District. Water efficiency and support for conjunctive use programs through the ASR well not only allows surface water to be managed to greatly improve the District's ability to mitigate the impacts of drought, but it keeps water service affordable for all customers. Through improved water efficiency and water management, the District avoids the need to purchase costly water from other sources during droughts when surface water supplies are limited. These investments will help keep the cost of water low for all customers, but especially benefits low-income customers by ensuring that water service is as affordable as possible.

In addition, water efficiency which keeps water in the American River or maximizes the potential capacity of our ASR well will have a regional effect by stabilizing groundwater levels throughout the entire Sub-basin and help neighboring water districts who also have Disadvantaged or Underserved Communities by preventing over drafting. By storing water in the aquifers for future use and not overtaxing them ensures that groundwater levels are maintained and not in decline. This is important to prevent subsidence and to not impact natural processes which ultimately impact everyone, especially Disadvantaged or Underserved Communities.

Although there are no tribes within the District's boundary, there are numerous tribes within the area. These tribes hold great value to the fisheries and natural function of the American River. For example, the Wilton Rancheria has requested that any project that the District undertakes related

to water and the diversion of flow from the American River be notified for their awareness.

The proposed project would support District's efforts to maximize the cultural benefits. The pipelines support the movement of water from the American River at proper times and conditions to minimize the impacts to fisheries and downstream habitat which are a priority for local tribes. The "Fisheries and In-Stream Habitat (FISH) Management and Restoration Plan for the Lower American River" developed by the Water Forum and updated in 2019 is supported by local government, environmental NGOs, environmental regulatory agencies.

Criterion B: Inclusion of Stakeholders, Stakeholder Support, and Previous Planning Efforts

The proposed project is explicitly supported by the Regional Water Authority of Northern California, which agrees with the District about the importance of infrastructure projects such as those proposed to increase system-side water efficiency and reduce real water losses (see the letter of support signed by the RWA, Figure 5). The Regional Water Authority is a joint powers authority representing two dozen water providers and affiliates in the greater Sacramento region. The District through RWA is associated with the Federal, State and local district efforts that support water management at all levels.

Regional Water Authority
Building Alliances in Northern California

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RWA

Brett Ewart, Chair
Bill Roberts, Vice Chair

Members

California American Water
Carmichael Water District
Citrus Heights Water District
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El Dorado Irrigation District
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Fair Oaks Water District
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Georgetown Divide Public Utility District
Golden State Water Company
Lincoln, City of
Nevada Irrigation District
Orange Vale Water Company
Placer County Water Agency
Rancho Murieta Community Services District
Roseville, City of
Sacramento, City of
Sacramento County Water Agency
Sacramento Suburban Water District
San Juan Water District
West Sacramento, City of
Yuba City, City of

Associates

County of Placer
El Dorado County Water Agency
Sacramento Area Flood Control Agency
Sacramento Municipal Utility District
Sacramento Regional County Sanitation District
Yuba Water Agency

May 20, 2024

Cathy Lee
General Manager
Carmichael Water District
7837 Fair Oaks Blvd.
Carmichael, CA 95609

Subject: Letter of Support for Carmichael Water District's WaterSMART project proposal-Increasing Water Resiliency through Mainline Upgrade and Improved Pressure Management

Dear Ms. Lee,

The Regional Water Authority (RWA) supports the Carmichael Water District's proposal for the subject project and urges the Bureau of Reclamation to fully fund the project through the WaterSMART: Planning and Design Grant for the FY 2024 funding opportunity.

Improving the District's resiliency against drought by installing new mainline pipe capable of carrying increased flows that are targeted for Aquifer Storage and Recovery (ASR) as well as improving pressure management are a necessity for improving water supply availability, especially for water suppliers located in California facing multiple climate change and reliability challenges like drought, flood, and wildfire. Pipelines that are optimally designed and pressure that is better managed benefits water suppliers by increasing reliability of water during years when surface water availability is low. Increases in efficiency and reliability aligns with and supports environmental priorities such as fish health within the American River and Delta systems of California.

We strongly support funding for the Carmichael Water District's Increasing Water Resiliency through Mainline Upgrade and Improved Pressure Management Project as it will bring multiple benefits to the District, the District's customers, and the larger Sacramento region by improving the reliability of the region's water supplies now and in the future.

Sincerely,

James Peifer
Executive Director
Regional Water Authority

Figure 5: Letter of Support from the Regional Water Authority

Furthermore, the proposed project directly aligns with or was developed in response to several planning efforts and collaborative management plans made by the District or regional management in recent years, such as:

1. The 2018 American River Basic Integrated Regional Water Management Plan (IRWMP), developed in collaboration with the District and a broad range of regional stakeholders and water suppliers, which included discussion on potential adaption responses to climate change, including water efficiency and conservation.
   - This plan identified physical threats to surface and groundwater availability, and stated that reductions to water losses, water supply system improvements, and groundwater banking are their highest priority for addressing these and other threats to the regional water supply. The proposed project is a direct follow-up on this and other regional planning efforts to increase system reliability in response to climate change and water availability concerns.
2. The 2008 American River Parkway Plan, developed by the County of Sacramento Municipal Services Agency in close collaboration with regional stakeholders which outlines the preservation, use, development, and administration of the lower American River, including water conservation any all efforts that can ensure adequate volumes of water are able to remain in the river to support the natural, aesthetic, and historical resources of the Parkway.
   - This plan identified that projects which can reduce surface water diversions are critical to the health of the American River Watershed, including the proposed project which tackles water losses.
3. The 2022 American River Basin Study, developed by the Bureau of Reclamation for the California Great Basin region, identified the need for increased water supply reliability, whereby groundwater extraction in the Valley Floor is expected to increase considerably and would negatively impact groundwater sustainability. The Study identified the large-scale regional benefits that are available for projects which include water efficiency, water loss reductions, and groundwater recharge.
   - This study was an examination of water management practices in the Basin, and identified water supply reliability as being extremely challenged by 2070, with the mass balance of available water under-accounting for projected water demand. Projects such as this proposal are designed to reduce system-side water losses and increase flexibility through increased efficiency and support for groundwater banking, which is in direct support of the conclusions of this study.
4. The 2022 North American Subbasin Groundwater Sustainability Plan, prepared by the Sacramento Groundwater Authority and other regional GSAs in compliance with SGMA GSP regulations, itemize sustainability goals for the entire North American Subbasin as well as potential projects and management actions, which includes support for projects that include water efficiency, water loss reductions, and groundwater recharge.

- This plan outlined specific projects and management actions with the highest priority for achieving SGMA sustainability goals, including conjunctive use through groundwater banking, which the proposed project would directly support, and through water efficiency and reductions to water losses.

5. The 2019 Regional Water Reliability Plan (RWRP) and 2017 Regional Drought Contingency Plan (RDCP) with the Regional Water Authority of Northern California, which were partially funded through a Drought Contingency Planning Grant awarded through the Bureau of Reclamation. The RDCP focuses on mitigation actions and near-term responses specifically related to drought conditions. The RWRP goes beyond the scope of the RDCP by evaluating a broader set of vulnerabilities and mitigation actions. These plans identify the importance for regional water management, water efficiency, and groundwater recharge as necessary projects to increase regional water supply reliability and to plan for future drought conditions.
    - These plans outlined their highest priority action as the development of regional water banking and conjunctive use, which this proposed project would directly support through the increased flow capacity following the installation of the new DIP water mains.

Criterion C: Ability to Meet Program Requirements

The proposed project is outlined with 15 tasks across 5 primary phases, including: (1) Environmental Review (CEQA and NEPA); (2) Pipeline Design; (3) Service Pressure Analysis and Data Gathering; (4) Pressure Zone Design and Operation Plan; and (5) Documentation, Reporting, and Project Closeout. Each phase is described briefly below. The work phase descriptions will illustrate the work involved as well as the detailed milestones and task descriptions. The District and any professional consultant support will be identified as “CWD” or “The District”. The District is very experienced with mainline design and replacements, and is very familiar with the regions identified in this proposal due to frequent repairs and maintenance performed on the leaking mainlines. Furthermore, the District anticipates that the design and data gathering for the isolated pressure zones and pressure management is largely an effort of data gathering and operational planning, and will not involve a high degree of on-the-ground construction or infrastructure changes to achieve isolation.

Phase 1. Environmental Review (CEQA and NEPA)

The primary construction efforts will involve the direct replacement of existing infrastructure with alternative, new DIP materials and - in the case of the Gunn Road site - larger diameter mainlines. As such, the District anticipates that extensive environmental document preparation will likely not be unnecessary to achieve approval. It is expected that the work will fall under Categorical Exemptions for both CEQA and NEPA. To accomplish Phase 1, the District will perform the following sub-tasks with related milestones:

- Task 1.1. Develop and Submit CEQA Categorical Exemption
- Task 1.2. Develop and Submit NEPA Categorical Exemption
    - Milestone 1. Receive Approved CEQA and NEPA Exemptions

Phase 2. Pipeline Design

Pipeline alignment has already been established and will not change. Design documents will include

development of Plan and Profile sheets as well as crossing and connection details based on field explorations completed as part of the design process. Additional documents to be developed include construction contract terms, conditions and technical specifications which are based on the District's Construction Standards: https://www.carmichaelwd.org/163/Construction-Improvement-Standards. To accomplish Phase 2, the District will perform the following sub-tasks with related milestones:

- Task 2.1. Retain Design Consultant
- Task 2.2. Develop Plans and Specifications (30% Design)
  - Milestone 2. 30% Pipeline Design Plans and Specifications
- Task 2.3. Utility Coordination & Potholing
- Task 2.4. Develop Plans and Specifications (60% Design)
- Task 2.5. Develop Plans and Specifications (90% Design)
  - Milestone 3. 90% Pipeline Design Plans and Specifications
- Task 2.6. Submit for Encroachment and Other Necessary Permits

Phase 3. Service Pressure Analysis and Data Gathering

The District will perform a hydraulic analysis and data gathering of service pressures in Zone 3 to identify the critical service connections that will constrain the lower pressure setpoints for the El Camino PRS and California PRS. The District will install four pressure loggers at strategically fire hydrants and collect up to 24 chlorine residual samples within Zone 3 with known or suspected lower service pressures to identify the current operating pressures and chlorine residuals. These test results will be used to calibrate the District's computer distribution system water model to ensure the service pressures at critical service connections, including high-elevation or distant customers and hydrants, exceed 40 psi at all times and that water quality will be maintained following the new zone isolations. To accomplish Phase 3, the District will perform the following sub-tasks with related milestones:

- Task 3.1. Pressure Logging and Water Quality Testing: Site Selection and Testing
- Task 3.2. Hydraulic Model Calibration for Zone 3
- Task 3.3. Service Pressure Analysis and Pressure Setpoint Recommendations for Zone 3
  - Milestone 4. Service Pressure Analysis Results Report

Phase 4. Pressure Zone Design and Operation Plan

The District will collaboratively develop an implementation and operation plan for the isolation of Zones 3A and 3B, and the interconnection of the Willow Park groundwater well to Zone 2 through the Gunn Road pipeline. In part, this will include an internal workshop with the Distribution and Operation teams at the District to discuss constraints, requirements, and obligations with regard to the isolation and operation of Zones 3A and 3B. For example, the District anticipates it will need to site a new sampling station inside of Zone 3B, and will utilize the existing sample station at Shelfield Park for Zone 3A. To accomplish this, leveraging the data gathered from Phase 3, the District will perform the following sub-tasks with related milestones:

- Task 4.1. Zones 3A and 3B Operation, Distribution, and Engineering Workshop
- Task 4.2. Develop Water Quality Management and Operation Plan for Zones 3A and 3B

- Task 4.3. Develop Implementation Plan for Rollout of Zones 3A and 3B
  - Milestone 5. Zones 3A and 3B Implementation and Operation Plan

Phase 5. Documentation, Reporting, and Project Closeout

The District will complete all final project noticing all project closeout tasks to include completion of all required financial and project reporting.

- Task 5.1. Final Report Development
  - Milestone 6. Final Report

Preliminary Project Schedule

Phase, Subtask, and Milestone	Start	Due	Working Days
Phase 1. Environmental Review (CEQA and NEPA):	04/01/2025	05/02/2025	24
Task 1.1. Develop and Submit CEQA Categorical Exemption	04/01/2025	05/02/2025	24
Task 1.2. Develop and Submit NEPA Categorical Exemption	04/01/2025	05/02/2025	24
Milestone 1. Receive Approved CEQA and NEPA Exemptions	05/01/2025	05/01/2025	1
Phase 2. Pipeline Design:	04/01/2025	12/26/2025	194
Task 2.1. Retain Design Consultant	04/01/2025	06/27/2025	64
Task 2.2. Develop Plans and Specifications (30% Design)	06/30/2025	08/29/2025	45
Milestone 2. 30% Pipeline Design Plans and Specifications	09/01/2025	09/01/2025	1
Task 2.3. Utility Coordination & Potholing	09/01/2025	09/26/2025	20
Task 2.4. Develop Plans and Specifications (60% Design)	09/01/2025	10/31/2025	45
Task 2.5. Develop Plans and Specifications (90% Design)	11/03/2025	11/28/2025	20
Milestone 3. 90% Pipeline Design Plans and Specifications	12/01/2025	12/01/2025	1
Task 2.6. Submit for Encroachment and Other Necessary Permits	12/01/2025	12/26/2025	20
Phase 3. Service Pressure Analysis and Data Gathering:	04/01/2025	08/18/2025	100
Task 3.1. Fire Flow and Water Quality Testing: Site Selection and Testing	04/01/2025	05/23/2025	39
Task 3.2. Hydraulic Model Calibration for Zone 3	05/26/2025	07/18/2025	40
Task 3.3. Service Pressure Analysis and Pressure Setpoint Recommendati	07/21/2025	08/15/2025	20
Milestone 4. Service Pressure Analysis Results Report	08/18/2025	08/18/2025	1
Phase 4. Pressure Zone Design and Operation Plan:	09/29/2025	12/01/2025	46
Task 4.1. Zones 3A and 3B Operation, Distribution, and Engineering Work	09/29/2025	10/03/2025	5
Task 4.2. Develop Water Quality Management and Operation Plan for Zor	10/06/2025	10/31/2025	20
Task 4.3. Develop Implementation Plan for Rollout of Zones 3A and 3B	11/03/2025	11/28/2025	20
Milestone 5. Zones 3A and 3B Implementation and Operation Plan	12/01/2025	12/01/2025	1
Phase 5. Documentation, Reporting, and Project Closeout:	12/01/2025	01/12/2026	31
Task 5.1. Final Report Development	12/01/2025	01/09/2026	30
Milestone 6. Final Report	01/12/2026	01/12/2026	1

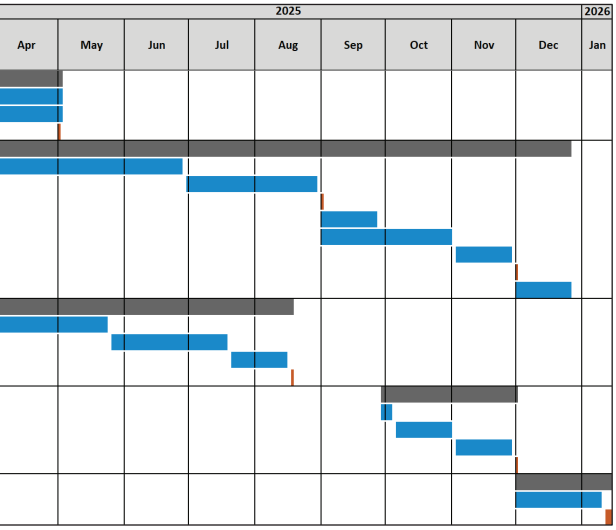

Figure 6: Preliminary Project Schedule

Criterion D: Presidential and Department of the Interior Priorities

Please see the section "**Supporting Disadvantaged Communities, Tribes, and Insular Areas" in Criterion A, which discusses the disadvantaged communities served by the District and by the proposed project.** The proposed project will have a positive impact on these Disadvantaged or Underserved Communities, as well as others outside of the District.

Criterion E: Nexus to Reclamation

The District participated in the North American Basin Regional Drought Contingency Plan (RDCP), completed in fall 2017, as it was a collaborative planning effort supported by a grant through the U.S. Department of the Interior, Bureau of Reclamation's (Reclamation) WaterSMART Drought Response Program that provides a proactive approach to building long-term resiliency to drought. The RDCP began the process of identifying vulnerabilities and mitigation actions for many RWA member agencies, which served as the foundation of the planning process for the RWRP.

Does the applicant have a water service, repayment, or O&M contract with Reclamation?

- The applicant does not have a direct water service, repayment, or O&M contract with Reclamation.

If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?

- The District contracted with San Juan Water District (SJWD) to provide supplemental surface water supply during the 2021 curtailment of the District's post-1914 water rights to American River water. SJWD has a contract for up to 24,200 AF of CVP water, pursuant to a long-term water service contract that expires in 2045, which is subject to renewal. The District and SJWD have contracted to provide the District temporarysupplemental surface water supplies to mitigate the severe drought implications from the curtailment order.

Will the proposed work benefit a Reclamation project area or activity?

- This project is linked to Reclamation Mid-Pacific Region facilities and activities at Folsom Reservoir as the District has water rights to the American River which is downstream of Folsom Dam. The reduction of surface water usage by utilization of the groundwater source has the potentialto provide benefit to these facilities during drought conditions. All surface water diversions of the District and its collaborative regional partners are taken primarily from the American River with additional diversions from the Sacramento River. Conjunctive Use in the region has a beneficial impact to Reclamation facilities and Folsom Lake water supply and storage by minimizing necessary water releases from the reservoir.

Is the applicant a tribe?

- The Carmichael Water District is a Special District, and is not a tribe.

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WaterSMART Planning and Project Design Grants for FY 2024

Funding Opportunity Number: R23AS00109

PROJECT BUDGET
Increasing Water Resiliency through Mainline Upgrade and Improved Pressure Management
May 2024

Carmichael Water District
7837 Fair Oaks Blvd
Carmichael, CA 95608

Project Manager:
Greg Norris
gregn@carmichaelwd.org
(916) 483-2452 ext. 13

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Project Budget

Funding Plan

The proposed project will be funded by the District's Capital Improvement Plan Fund. The budget for this fund for Fiscal Year 2023-2024 is $8.63 million dollars. The District has enough funding in this year's budget for the proposed project and will make the funding available as part of the cost-share contribution. There will be no in-kind contribution by other parties.

Budget Proposal

The project budget has been designed to include contractual services for mainline design, District field work for data gathering, District internal engineering and design services for the design and operation planning of the new pressure zones, and final reporting and project management (see Table 5). The total cost of the project is estimated to be $670,000.00 (see Table 3). The project funding sources are $335,000.00 from the District and $335,000.00 from the USBR, amounting to a 50% cost-share with the USBR (see Table 4).

Table 1: Budget for Proposed Project

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal Funding	$335,000.00
Costs to be paid by the applicant	$335,000.00
Value of third-party contributions	$0.00
Total Project Cost	**$670,000.00**

Table 2. Non-Federal and Federal Funding Sources Summary

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1. Carmichael Water District	$335,000.00
Non-Federal Subtotal	$335,000.00
REQUESTED RECLAMATION FUNDING	**$335,000.00**

Table 3: Budget for Proposed Project

Contractual	Quantity	Unit	Unit Cost ($)	Cost[3] (Thousand$)	CWD Share[4] (Thousand$)	USBR Share[4] (Thousand$)
Task 3.2 Hydraulic Model Calibration	1	Ea.	43,000	43	21.5	21.5
Task 3.3 Service Pressure Analysis	1	Ea.	20,000	20	10	10
Task 4.2 Water Quality and Operation Plan	1	Ea.	40,000	40	20	20
Task 4.3 Zone 3A and 3B Implementation Plan	1	Ea.	40,000	40	20	20
Task 2 Design Engineering Fee	8,577	LF[1]	41.86[2]	359	179.5	179.5
Task 1. Environmental & Permitting Fees	1	Ea.	50,000	50	25.0	25.0
10% Contingency[5]	1	Ea.	55,000	55	27.5	27.5
Contractual Subtotal				607	303.5	303.5

Field Work	Quantity	Unit	Unit Cost ($)	Cost[3] (Thousand$)	CWD Share[4] (Thousand$)	USBR Share[4] (Thousand$)
Pressure Logging (Equipment and Materials)	4	Ea.	2,834[6]	11	5.5	5.5
Pressure Logging (Installation)	16[7]	Hr.	139	2	1.0	1.0
Chlorine Residual Testing	48[8]	Hr.	139	6	3.0	3.0
Field Work Subtotal				19	9.5	9.5

District Engineering Services	Quantity	Unit	Unit Cost ($)	Cost[3] (Thousand$)	CWD Share[4] (Thousand$)	USBR Share[4] (Thousand$)
Task 3.3 Service Pressure Analysis	80	Hr.	139	11	5.5	5.5
Task 4.1 District Workshop	32	Hr.	139	4	2	2
Task 4.2 Water Quality and Operation Plan	24	Hr.	139	3	1.5	1.5
Task 4.3 Zone 3A and 3B Implementation Plan	40	Hr.	139	5	2.5	2.5
Project Management and Final Reporting	152	Hr.	139	21	10.5	10.5
District Engineering Services Subtotal				44	22	22

Project Total	Cost ($)	CWD Share[4] ($)	USBR Share[4] ($)
	670,000	335,000	335,000

[1]Linear feet of mainline to be replaced. [2]Estimated from 2023 design services contracted by the District for the design of DIP mainlines, where the total fee for design services of 3,200 feet of mainline (including surveying, utility coordination, design plans, technical specifications, contract documents, and engineering estimates) was $41.86 per linear foot. [3]Rounded down to the nearest thousand dollars. [4]The requested cost-share with the United States Bureau of Reclamation (USBR) will be 50% of the project costs. [5]A contingency of 10% is included for all contractual services. [6]Includes $1,416.92 per gauge based on a quote provided for Omega digital pressure gauge model DPG280 on May 17th 2024, and assumes an additional $1,416.92 worth of materials will be necessary to install the gauge, including the data logger, security equipment, District vehicles, conduit, and other supplies. [7]Assumes that a team of two personnel will require two hours to install each pressure gauge. [8]Assumes that a single personnel will require two hours for each of the sample sites to collect and perform the chlorine residual test across a maximum of 24 sites.

Budget Narrative

Salaries and Wages

- The District has an approved Fee Schedule for Fiscal Year 2023-2024 for all engineering services which includes the time of engineering staff, management, and administration to accomplish the typical engineering design, data gathering, and project management activities. The currently approved rate is approximately $139 per hour per employee during normal work hours. No overtime or holiday time is included in the proposed project budget. The project budget allocates approximately 328 hours of support from District engineering or management staff to perform or administrate the work described. These hours are approximately allocated to the following staff and purposes:
    - 80 hours is requested for the project manager of the proposed project and Engineering Manager of the District, Greg Norris, to provide strategic oversight and direction on all project activities; mentor staff; review technical work and project reports and provide quality control on all project deliverables; participate in project meetings; and write reports.
    - 40 hours is requested for the Distribution Superintendent, Scott Bair, to review technical work and project reports; and participate in project meetings.
    - 40 hours is requested for the Production Superintendent, David Biagi, to review technical work and project reports; and participate in project meetings.
    - 168 hours is requested for an assistant engineer to perform data analysis; data gathering; report writing; perform the engineering design of the new pressure zones; provide engineering and management support on the project; coordinate with all consultants; lead and perform water system hydraulic model calibration and analysis; develop all project reporting deliverables; lead all project deliverable work; participate in data/info requests; and general assistance of all tasks.
    - 16 hours is requested for a Distribution Operator of the District's Distribution Department to install the pressure logging equipment at 4 hydrants in Zone 3.
    - 48 hours is requested for a Treatment Plant Operator of the District's Production Department to collect and test 24 chlorine residual samples from 24 sites in Zone 3.

Fringe Benefits

- Fringe benefits are embedded into the approved District Fee Schedule, and are not included in the proposed project budget as a separate line item.

Travel

- No travel expenses are included in the project budget.

Equipment

- $11,000 is included as the estimated cost for the acquisition and installation four (4) pressure loggers and digital pressure gauges at hydrants in Zone 3 of the District, in support of data gathering and pressure analysis. Each individual gauge is estimated to cost $2,834 to install, including the hardware, materials necessary for installation, and personnel time for installation.

Materials and Supplies

- No materials or supply expenses are included in the project budget.

Contractual

- There are three (3) anticipated contracts proposed in the project budget. All contracts will be selected based on competitive, lowest-cost bidding. These include:
    - *Environmental Review, Permitting and Design for the Water Mainlines ($359,000)*
      The Project Design contract work estimate is based on typical design services costs and recent bid prices from other area pipeline projects. The Pipeline Design contract estimate includes typical bid items and costs for a linear pipeline project. The work under this contract ($359,000) has been included as reimbursable with federal funds as this work will include Environmental Review, Permitting Support, and Pipeline Design. Environmental Review and compliance is not expected to be a major cost item for two reasons: The project is replacing existing infrastructure with improved materials, and in the case of Gunn Road site with larger diameters, and the work takes place in existing urban streets and roadways. The project is expected to be eligible for Categorical Exemptions to satisfy CEQA and NEPA reviews.
    - *Hydraulic Model Calibration ($43,000) and Service Pressure Analysis ($20,000)*
      Utilizing the collected pressure and chlorine residual data (results of Task 3.1), a contractor will calibrate Zone 3 within the District's hydraulic computer model of its distribution system such that the simulation results align with measured pressures within 2 psi, and chlorine residuals within 10% of the measured coefficients. The calibrated hydraulic model will then be leveraged to evaluate the anticipated customer service pressures and chlorine residuals in Zones 3A and 3B following their isolations, and to identify the minimum operating pressures or setpoints for the pressure reducing stations that achieve a minimum customer service pressure of 40 psi while maximizing chlorine residuals. The cost of this contract work is estimated based on typical design services costs at the hourly basis, for an assumed quantity of approximately 450 hours.
    - *Water Quality & Operation Plan ($40,000) and Zone 3A & 3B Implementation Plan ($40,000)*
      Utilizing the results of Task 3, a contractor will develop an implementation plan and operation plan for the District that will address the steps required to safely isolate Zones 3A and 3B while maintaining water service, and to provide the necessary operating information that will be used to operate Zones 3A and 3B on normal, maintenance, and emergency conditions. The cost of this contract work is estimated based on typical design services costs at the hourly basis, for an assumed quantity of approximately 570 hours.

Third-Party In-Kind Contributions

- No Third-Party In-Kind Contributions are included in the project budget.

Environmental and Regulatory Compliance Costs

- The Environmental and Regulatory Compliances costs are included in the project budget as Permitting, Application and Miscellaneous Fees for a total of $50,000.00. There are four (4) permits and/or approvals identified in the Required Permits and Approvals section of the application. The list includes: CEQA & NEPA review, Storm Water Pollution Prevention, and

County Right of Way Encroachment permits. Permits and compliance activities are assumed to cost $10,000.00 each. An additional $10,000.00 is reserved for follow-up compliance inspections by the permitting entity as well as any miscellaneous reporting required by permits.

Others Expenses

- No other expenses (Land Acquisition, etc.) are expected for this project.

Indirect Costs

- Indirect costs are not included in the project budget.