Carmichael Water District
Master Plan, Business Plan and Water Rate Study
2015-2065

June 2015

Kennedy/Jenks Consultants

Prepared in association with

The Reed Group, Inc.

Tully & Young
Comprehensive Water Planning

Kennedy/Jenks Consultants

10850 Gold Center Drive, Suite 350
Rancho Cordova, California 95670
916-858-2700
FAX: 916-858-2754

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7837 Fair Oaks Boulevard
Carmichael, CA 95608

K/J Project No. 1370020*00

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List of Abbreviations and Acronyms

Abbreviation	Description
2003 Master Plan	*2003 Carmichael Water District Master Plan*
2010 UWMP	*2010 Carmichael Water District Urban Water Management Plan*
AC	asbestos cement
ACWA	Association of California Water Agencies
ADD	Average Day Demand
AF	acre-feet
AFY	acre-feet per year
AWWA	American Water Works Association
Bil	Billion
BMP	Best Management Practices
BO	Biological Opinion
Central Basin	Central Sacramento Groundwater Basin
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COCs	Contaminants of Concern
CT chamber	chlorine contact chamber
CWC	California Water Code
DFW	Department of Fish and Wildlife
DI	ductile iron
District	Carmichael Water District
DMM	Demand Management Measure
DPMWD	Del Paso Manor Water District
DSC	Delta Stewardship Council
DUs	Dwelling Units
EDCWA	El Dorado County Water Agency
fps	feet per second
FMS	Lower American River Flow Management Standard
Framework	Water Accounting Framework
GAC	granular activated carbon
GET	Groundwater Extraction and Treatment
GET LA	Ancil Hoffman Park GET Facility

Abbreviation	Description
GET LB	Bajamont Water Treatment Plant GET Facility
GIS	Geographic Information System
GMP	Groundwater Management Plan
gpcd	gallons per capita day
gpd	gallons per day
gpm	gallons per minute
GSWC	Golden State Water Company
HCP	habitat conservation compliance plan
IT	Information Technology
IRWMP	Integrated Regional Water Management Plan
LAR	Lower American River
Layne	Layne/Christensen Corporation
MCL	maximum contaminant level
MCWRA	Mountain Counties Water Resources Association
MDD	Maximum Day Demand
Mil	million
MG	million gallons
MGD	million gallons per day
MRR	minimum release requirement
NCWA	Northern California Water Association
NDMA	N-Nitrosodimethylamine
NSWA	North State Water Alliance
Park	Ancil Hoffman Park
PCE	perchloroethylene
PCWA	Placer County Water Agency
PHD	Peak Hour Demand Condition
Plan	2015 Master Plan
Project	American River Flow Management Standard Project
PSA	Purveyor Specific Agreements
psi	pounds per square inch
PSM	Planned System Maintenance
PPE	polypropylene
PVDF	polyvinylidene difluoride

Abbreviation	Description
Reclamation	United States Bureau of Reclamation
RWA	Regional Water Authority
SACOG's	Sacramento Area Council of Government's
Sac Metro	Sacramento Metro Chamber of Commerce
SCADA	Supervisory Control and Data Acquisition
SCGA	Sacramento Central Groundwater Authority
SBX7-7	Senate Bill X7-7
SGA	Sacramento Groundwater Authority
SMUD	Sacramento Municipal Utility District
SRWA	Sacramento Region Water Alliance
SWRCB	State Water Resources Control Board
SWRCB-DDW	State Water Resources Control Board, Division of Drinking Water
the X2 line	salt water line
UWMPA	Urban Water Management Planning Act
UWMP	Urban Water Management Plan
VOC	volatile organic compound
WQCP	Water Quality Control Plan
WMP	Water Master Plan
WTP	Water Treatment Plant

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Executive Summary

Introduction

This 2015 Master Plan Update was undertaken to update the Carmichael Water District's (District) 2003 Master Plan as part of the District's ongoing management of the water infrastructure assets and commitment to efficient operations. The 2003 Master Plan was a landmark 100 year planning effort; this 2015 Plan update continues this effort and covers a 50 year planning period from 2015 through 2065.

The 2015 Plan includes a Financial Business Plan and Rate Study supporting the District's needs for financial investments over the next ten (10) years. This Executive Summary provides a brief overview of the Master Plan, and includes summary tables of many of the recommendations addressing key findings in the work. Background, analysis and details remain in the body of the report for further review.

District Office

Setting and Background

The District was formed in early 1916, but the origins of water use dates back to the 19th Century. Since its formation, the District has used several water supply diversions off the American River, which have since been modified and improved to become the current infiltration diversions feeding the Bajamont Water Treatment Plant, which is the main source of water supply for District customers. Groundwater was also developed by the District prior to World War II as part of a balanced conjunctive use portfolio management strategy, and today the District maintains eight (8) groundwater wells. As an active member in the community, the District regularly engages in local and regional water resources management activities, organizations, associations and Joint Powers Authorities. This includes working with the Regional Water Authority, the Sacramento Groundwater Authority, Association of California Water Agencies, the Water Forum group, Sacramento Area Water Works Association, and the Carmichael Chamber of Commerce.

The need to update infrastructure replacement and financial planning efforts in the District in part stems from urban development and water use pattern changes over the past several years. The District serves water within the unincorporated and well-established community of Carmichael, which is essentially built-out with less than 10% of land available for new

development and a projected infill growth rate at 0.2% annually. The District has been proactive in infrastructure replacement efforts by replacing aging pipelines and failing water service lines while also completing an accelerated meter retrofit program. The meter retrofit program was completed in 2014 and resulted in the complete metering of all District services for the first time in its history. Recent water use reductions are in part a benefit of metering, which has resulted in a greater awareness of water use by District customers, effective customer response to changing water use practices, and regional and District-led implementation of water conservation demand management measures. Although reduced water use is an important part of a modern and responsibly managed utility, it also can present challenges in managing the cost of service and maintaining sufficient revenue.

District access to high quality groundwater, a critical asset and resource, was discovered to be compromised in 2004. This startling event, which took place just one year after the 2003 Master Plan, began with the disclosure that the extensive Aerojet groundwater contaminant plume, which was once thought to be restricted to the Rancho Cordova area, had crossed under the American River and encroached into the District service area boundary. The District embarked on a multi-year collaborative partnership with Aerojet/GenCorp, now Aerojet/Rocketdyne (Aerojet), and many community stakeholders to accelerate construction of groundwater extraction and treatment (GET) facilities within the District under the belief that the faster containment of the plume could be achieved, the smaller the risk of the spread of contamination throughout the aquifer to the District's critical groundwater wells. The District continues to maintain a cooperative working relationship with Aerojet in monitoring containment effectiveness, reporting, and working to establish a replacement water supply for the District and Golden State Water Company. In March 2015, contamination was detected near the center of the District with an undefined plume extent at the time of this Master Plan. Ultimately, the cleanup of the entire contaminant plume has been projected as a 200-plus-year effort, and groundwater contamination will remain an ongoing challenge for the District for the foreseeable future.

Master Plan, Business Plan, and Water Rate Study Overview

In order to ensure clear integration of master planning objectives, investment prioritization, and funding requirements for program/project implementation, the District combined a Master Plan, Business Plan and Rate Study into a single project. Master Plan goals will be achieved by using the Business Plan, and the Rate Study provides a reliable revenue strategy to fund the ongoing District operation and maintenance costs over the next ten years. Both the Business Plan and the Rate Study were developed from the Master Plan capital improvement program recommendations. The three elements of the project were prepared under a single contract with Kennedy/Jenks Consultants with each element being as follows:

Master Plan

The Master Plan provides the analysis, findings and recommendations for the ongoing operation and maintenance of the District and its assets, including pipelines, treatment facilities, pumps and tanks, and other key assets, building on the work of the 2003 Master Plan. The Master Plan identifies recommended investments and scheduled implementation through the year 2065. The draft Master Plan formed the foundation of the Business Plan through which investments were prioritized based on the required revenue impacts on rates and the potential risk of declining level of service of facilities due to the delaying of replacement and renewal projects.

The final Capital Improvement Plan (CIP) was resolved through a collaborative effort of the Master Planning team, the Business Planning team and the District. The development of the funding of the final CIP recommendations is presented in the Business Plan.

Business Plan

The Business Plan provides a ten-year financial analysis of the District's operation and maintenance costs, debt service obligations, and capital program needs, and is used to identify the annual water rate revenue requirements for rate-setting purposes. The Business Plan model incorporates the first ten years of the capital improvement program, identified in the Master Plan. The Business Plan was prepared by The Reed Group, Inc. as a subcontractor to Kennedy/Jenks Consultants.

Successful implementation of the Master Plan and recommended capital improvement program is dependent upon the development of a financial strategy to accomplish Master Plan goals, as well as sustain ongoing operations and meeting service obligations. The recommended Business Plan incorporates water rates, other revenues, and reserve policies in a financial strategy that reflects estimated future annual operating costs, debt obligations, and capital program needs, while seeking to minimize water rates over the planning period.

Water Rate Study

The Water Rate Study provides the cost of service analysis and design of water rates intended to meet the District's service and financial obligations FY 15-16 through FY 24-25. The water rate study was conducted with the assistance of a Water Rate Structure Committee (WRSC), comprised of five customers of the District, as well as two Board members. A new rate structure is proposed to better achieve specified rate-setting objectives. With the assistance of the WRSC, proposed water rates are intended to meet the District's financial needs, satisfy legal requirements, improve equity across all customers and customer classes, and achieve other rate-setting objectives.

Section 1 - Historical and Recent District Planning

Section 1 of the Master Plan provides an overview of District formation, leadership, governance and overall geography to provide a setting for the rest of the Master Plan. This section also provides a look back at the 100-year Master Plan completed in 2003 and significant changes in planning drivers and issues that have occurred since that time. The 2003 100-Year Master Plan should be reviewed as a basis for the 2015 Plan as part of understanding the District approach to maintaining and safe and reliable water utility for the benefit of the community in perpetuity.

The following are the key findings of Section 1:

Section 1 – Table of Findings

Subject	Findings
Master Plan Approach	The 2015 Master Plan is coupled with a Business Plan and Rate Study element, which was developed separately from this Master Plan document. The 2015 Master Plan looks ahead 50 years and includes a 15-year capital plan improvement strategy to continue the work described in the 2003 Master Plan. Many of the 2003 Master Plan findings and recommendations remain timely; however events since the 2003 Master Plan have culminated in the need to reanalyze the District's priorities.
Planning Documents	The District's supply-related planning and cooperative efforts are reported in a number of local and regional planning documents, including, but not limited to: • 2003 Master Plan and other historical planning documents • 2010 Carmichael Water District Urban Water Management Plan • American River Basin Integrated Regional Water Management Plan 2013 Update • Sacramento County Groundwater Management Plan

Section 2 - Water Use and Demand Management

Section 2 of the Master Plan provides an evaluation, findings and recommendations with regard to District water use, available supply and demand management measures that resulted in reduced water use by the District over the last several years. In general, the District customers continue to modernize their water use practices through reduced usage and the supply availability is sufficient to meet demand conditions. However, the record-breaking ongoing drought (2015) has resulted in two consecutive years of surface water curtailment, and the District has had to purchase supplemental supplies for treatment at the water treatment plant to meet peak demands. The issues surrounding the surface water supply reliability and competing demand for water are discussed in detail in Section 5 – Strategic Water Issues.

The following is a summary of the findings and recommendations presented in Section 2:

Section 2 – Table of Findings and Recommendation

Subject	Findings	Recommendations
Growth	Near Build-out. Less than 0.2% annual growth, total growth estimated as 10% by Buildout in 2050. (2010 UWMP, Table 2-1)	Continue to focus planning efforts on restoration and renewal of District assets to maintain high level of service, water quality and supply reliability.
Water Demand - Annual	Annual water use down from 12,496 acre-feet in 2008 to 8,360 acre-feet in 2014 according to District records.	Continue water demand management.

Section 2 – Table of Findings and Recommendation

Subject	Findings	Recommendations
Water Demand – Average Day, Maximum Day and Peak Hour	Average Day Demand 2015 9.04 MGD Buildout 9.08 MGD Maximum Day Demand 2015 18.08 MGD Buildout 18.17 MGD Peak Hour Demand 2015 20,083 GPM Buildout 20,187 GPM (Demands calculated based on 2010 UWMP, Table 7-2)	Continue water demand management.
Metering	Completed metering of District customers with six remaining services to be metered pending pipe replacement project.	Complete remaining installation and develop standard analysis of meter data to support demand management practices.
Water Use Efficiency	SBX7-7 Targets for 20% conservation by 2020 (2010 UWMP) Baseline 306 gpcd 2015 Interim Goal 275 gpcd 2020 Goal 244 gpcd	Drought pressures have resulted in accelerated conservation and the District is expected to be well below the 2015 Interim Goal.

Section 3 - Facilities Placement Planning

The District assets and facilities range in age and condition and include buried pipelines for transmission and distribution of treated water, above ground water supply treatment and pumping plants, groundwater wells, buildings, and storage. Planned maintenance, rehabilitation and replacement of these assets are essential to the long term sustainability of District operation and are the largest District liability.

The District executed a construction contract for the installation of a 24-inch diameter intertie with Golden State Water Company (GSWC) in June of 2015 to provide 5,000 acre-feet per year of treated water to GSWC. This project is part of a joint project with GSWC, Aerojet and the District to provide replacement water supply to GSWC and an emergency intertie to deliver water from GSWC to the District if needed under a severe emergency. The project includes a payment of capacity buy in and capital facility reimbursement addressing the value of existing District assets used to divert, pump, treat and deliver water to GSWC. In addition, the project will result in a treated water rate to be paid by GSWC/Aerojet. The final terms and conditions of this project were not available at the time of the completion of this Master Plan. The Business Plan and Water Rate Study included consideration of the possible final terms and conditions and impact on the District revenue requirements.

Section 3 provides an evaluation, review and recommendations for the major District assets and the findings and recommendations are summarized in the following table:

Section 3 – Table of Findings and Recommendations

Subject	Findings	Recommendations
Water Supply Capacity	Surface Water 20.7 MGD Groundwater 6.17 MGD Total Production 26.87 MGD	• Maintain existing capacity
Conjunctive Use	District practices conjunctive groundwater and surface water use to meet demands based on supply availability. 2008 – 13% GW; 87% SW 2014 – 70% GW; 30% SW	• Maintain supply balance in both groundwater and surface water.
Groundwater Wells – Potable Supply	There are eight (8) existing wells owned by the District and four (4) are active. Of the four active wells two (2) are over 50 years old. The increasing presence of groundwater contamination within the aquifer accessible to the District may require addition of groundwater treatment. Aerojet's efforts to contain and cleanup contamination will be ongoing for several decades. District access to groundwater within the existing surface area boundary will be limited by the Division of Drinking Water's determination that the groundwater is severely impaired.	• Garfield Well – Replace, pipe to La Vista for central groundwater treatment if needed. • Willow Park Well – Continue operation – replacement after 2040. • La Vista Well – Replace, provide central treatment if needed. • Winding Way Well – Replace and provide groundwater treatment is needed. • Barrett School Well – Maintain on standby – if drought continues consider adding iron/manganese treatment. • Barrett Road Well – Maintain as inactive – if drought continues consider piping to Barrett School for central treatment and blending. • Dewey Well – Destroy Well • Ladera Well – Destroy Well • Construct new well
Aerojet Groundwater Extraction and Treatment (GET) Facilities	GET water production is a resource available to the District and should continue to be put to beneficial use.	Continue irrigation of Ancil Hoffman and continue to pursue credit for groundwater discharge to the American River for surface water exchange. Work with Sacramento County Parks department to pursue and implement improvements to their irrigation system and controllers.

Section 3 – Table of Findings and Recommendations

Subject	Findings	Recommendations
Water Storage Facilities and Booster Pump Stations	The District maintains three water storage facilities. There are two within the distribution system equipped with booster pump stations to deliver water from the tanks to the distribution system at pressure. The third reservoir is the water treatment plant clearwell, an integral part of the WTP and addressed in the WTP discussions.	Dewey Tank – Condition is good and meeting service conditions well. La Vista Tank – Condition is poor and needing rehabilitation. • New roof and structural repairs • Painting and coating of tank • Installation of cathodic protection • Replacement of existing booster pump station • Coordination with La Vista Well replacement and integration with Garfield Well
Emergency Power Supply	The District has emergency power generation at the WTP and Dewey Tank. Additional backup power supply is needed under a WTP outage condition.	Replace existing gas engine driven pump at La Vista and include new diesel generator for booster pump station and La Vista Well in rehabilitation project. Equip new Garfield Well with backup power generation.
Bajamont Water Treatment Plant (WTP)	WTP condition is excellent and system continues to perform very well.	Continue current practices of Operation and Maintenance. Conduct WTP upgrade and membrane replacement study at 25 years of WTP operation.
Bajamont WTP Treated Water Pumps	Treated water pumps have exhibited severe wear and require replacement at 10 year cycle or approximately 50% of anticipated service life.	Replace existing pumps and conduct annual performance testing. Monitor operating conditions and continue to investigate wear conditions of replacement pumps.
Distribution System Planned System Maintenance (PSM)	Existing backlog of pipeline replacement projects continues to increase and drive the PSM schedule.	A detailed list of projects prioritized by schedule is provided to direct the continued PSM program.

Section 3 – Table of Findings and Recommendations

Subject	Findings	Recommendations
Other District Assets	The District has developed additional detail for this Master Plan for the following other District Assets: • Distribution – Washrack, warehouse, solar carport, corporation yard facilities, tools and vehicles • Financial Services – .Furniture, office equipment, vehicles • Administrative – District computers, security, Office Facility, HVAC, GPS equipment, vehicles and furniture • Production – WTP and Raw Water Facilities, vehicles, equipment, instrumentation, SCADA	Continue tracking and projecting O&M facility replacement cost, and renewal and replacement of required operation tools, equipment and supplies as part of annual budgeting process.

Section 4 - Capital Improvement Plan

This section provides a detailed listing and summary of costs by category and by year of the planned capital improvement projects to support the District operations. The Capital Improvement Plan (CIP) is based on sustaining District operations and is not based on growth or expanded service. The draft CIP was used in conjunction with the development of the Business Plan and the Rate Study with adjustments made to the draft CIP to support an economically viable combination of investments and rates supporting the required revenue. Consideration of a 50-year Master Plan must be made with the idea that the further into the future a project is planned, its schedule and cost will have contain uncertainty in scope and timing. For this reason, this CIP is structured with three implementation periods as follows:

- 10-year CIP reflecting specific project recommendations and schedules with known locations and quantifiable features.
- 25-year CIP reflecting specific project recommendations and programmatic schedules for alternative project elements and locations.
- 50-year CIP reflecting programmatic impacts of major project elements requiring planned program development and financial positioning. Project elements, locations and schedules are conceptual.

La Vista Well and Tank: Aging Outlet Piping

The greatest level of planning detail is included for the upcoming 10-year period. It is envisioned that future planning will refine specific projects and timing after 2025. The CIP is not restated in detail in this Executive Summary.

Section 5 - Strategic Water Issues

This section of the Master Plan provides an in depth and wide ranging discussion of the water resources, environment, and issues surrounding water supply reliability that could potentially influence District decisions. This section provides specific recommendations for the District's continued participation at a locally, regionally and at the statewide level as continuing competition for the limited water resources of California impacts the District.

Seven broad recommendations are provided addressing the bigger picture strategic water issues as follows:

- Perfect existing American River surface water supply assets.
- Manage groundwater supplies, monitor Aerojet contamination cleanup and remediation and participate in guiding North Area Basin management strategies.
- Engage in groundwater legislative issues. Actively promote the District's groundwater management needs in this engagement.
- Engage in Lower American River Flow Management Standard issues.
- Utilize regional working groups (Regional Water Authority [RWA], Northern California Water Association [NCWA], Association of California Water Agencies [ACWA] and North State Water Alliance [NSWA]) to engage in the Bay Delta Water Quality Control Plan Update and the Water Bond proposition.
- Establish relationships with State Water Resources Control Board and staff, Legislators and Legislative staff, as well as the Governor's Office.
- Participate and hold lead positions in RWA, SGA and the Water Forum. Lead discussions on key issues pertinent to the District and prepare information for participating stakeholders.

In addition to these broad strategic recommendations, Section 5 also addresses the evolving impact of drought on District water supply and operations, especially in light of the actions taken by the State Water Resources Control Board (SWRCB) in 2014 and 2015. The SWRCB's actions include curtailing surface water diversion of post-1914 appropriative water rights holders, and they have brought into focus water use and conservation practices impacting the District.

Section 6 – Aerojet/Rocketdyne Regional Groundwater Contamination Response

This section provides a summary of the 2004 discovery of contamination within the District service area and resulting collaborative effort to fast track completion of Aerojet groundwater extraction and treatment facilities to protect to the extent possible the remaining uncontaminated

groundwater resources accessible to the District. Additional definition of the contamination plume in March 2015 indicates that contamination has reached as far into the District as California Avenue and Fair Oaks Boulevard. The District continues to work with Aerojet to remain proactive in encouraging Aerojet's expedited response and implementation of additional monitoring, clean up and remediation to protect District groundwater resources.

The District should assume that groundwater contamination will remain an issue limiting access to high quality groundwater indefinitely. Working with Aerojet to support cleanup efforts while also pursuing regulatory support for reuse of treated groundwater should be an essential part of the long range District water supply portfolio. This includes continuing to pursue a favorable opinion on a permit from the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) regarding Policy 97-005, Use of Severely Impaired Water Supply which would allow contaminated groundwater treatment and delivery as a safe and reliable water supply for the District customers should drought conditions persist and groundwater conditions degrade.

In addition, the District should continue to secure the use of GET LA and GET LB water production, including any future expanded production, as a water supply available to the District under a long term reuse agreement. It is recommended that the District pursue this agreement with a no cost reimbursement and that the District protect all future contamination and damage resolution options regardless of GET effluent reuse agreements.

The District executed a construction contract for the installation of a 24-inch diameter intertie with Golden State Water Company (GSWC) in June of 2015 to provide 5,000 acre-feet per year of treated water to GSWC. This project is part of a joint project with GSWC, Aerojet and the District to provide replacement water supply to GSWC and an emergency intertie to deliver water from GSWC to the District if needed under a severe emergency. The project includes a payment of capacity buy in and capital facility reimbursement addressing the value of existing District assets used to divert, pump, treat and deliver water to GSWC. In addition, the project will result in a treated water rate to be paid by GSWC/Aerojet. The final terms and conditions of this project were not available at the time of the completion of this Master Plan. The Business Plan and Water Rate Study included consideration of the possible final terms and conditions and impact on the District revenue requirements.

Section 7 - District Organization, Administration and Data Management

Carmichael Water District was formed as Carmichael Irrigation District under California law in 1916. In the 1980s, it changed its name to Carmichael Water District, though it remains an irrigation district in legal and organizational structure.

The District is a public agency with an elected five member Board of Directors. The Board members are elected by Division and the District conducts periodic review of customer count by Division to assure uniform representation between Divisions. The General Manager serves under contract to the Board of Directors.

District staff includes two lead management positions (General Manager and Assistant General Manager) and four major departments reflecting the four principle activities of the District. The departments include Administrative Services, Financial Services, Production, and Distribution.

The District has had a stable leadership team in place for nearly two decades. However, it is anticipated that the top management positions throughout the organization will experience turnover due to retirements in the coming five years requiring recruitment to fill vacant senior-level positions. A recently completed salary survey of the General Manager and Assistant General Manager positions indicates that District compensation for the management team is at the lowest of the 12 local agencies surveyed.

District work force at the time of this Master Plan was 25 positions as follows:

Management: General Manager, Assistant General Manager	2 positions
Administration Services: Public Information, Human Resources, Information Technology, Water Efficiency/Meter Reading, Engineering, GIS	5 positions
Financial Services: Accounting and Billing, Inventory	5 positions
Production: Plant Superintendent, Treatment Plant/Well	5 positions
Distribution Services: Field Superintendent, Distribution Operators	8 positions

Discussion and recommendations regarding District organization, administration and data management are developed in the Business Plan. Recommendations and considerations for proceeding with succession planning are also provided. The findings and recommendations of the Business Plan include additional staff and replacement of key management positions as current employees retire and leave the District employment over the next few years. The Rate Study includes costs for the additional staff and anticipated salary adjustments necessary to be competitive for qualified leadership replacing current leadership.

Section 8 - Financial Business Plan and Rate Study

This section presents the Financial Business Plan and Rate Study prepared as part of the Master Plan update effort. The Reed Group, Inc. served as a subcontractor to Kennedy/Jenks Consultants for the preparation of the business plan and water rate study. The final Business Plan and Rate Study are inserted into this section with the formatting and appearance identical to the documents used in the Proposition 218 Public Hearing and as presented to the Board for consideration.

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Section 1: Historical and Recent District Planning

1.1 Historical Setting

Prior to European settlements, the area was home to the Maidu Indians, and archaeological sites have been identified in the area, especially close to the American River. With the onset of European settlement, land ownership in the area was vested through Mexican land grants. Two land grants encompassed most of the area of Sacramento County north of the American River and east of the Sacramento River, including the area now known as Carmichael. One was the Rancho del Paso Grant, 44,371 acres located between the old Marysville Road and Manzanita Avenue, and its southerly extension along Fair Oaks Boulevard to the American River. The other was the Rancho San Juan Grant, 19,982 acres extending east from Manzanita Avenue to about Folsom Dam, and extending north well beyond Carmichael's boundaries. With the discovery of gold in the American River watershed by James Marshall in 1848, gold mining drew increasing numbers of prospectors and supporting services to California. Once the gold rush ended, prospectors and their families sought settlements in many of the Central Valley's growing communities.

The San Juan Grant lands began to be broken up in about 1875 and the Rancho del Paso Grant in about 1908. Some of the lands were leased for farming prior to 1900. Jacob Heintz moved to California about 1870 and settled in the northern area of Carmichael, leasing about 4,400 acres within the two land grants on much of what was to become Carmichael. The John and William Barrett family came to the area about 1900, farming approximately 80 acres along Barrett Road. Among other early settlers of Carmichael were Charles W. and Mary A. Deterding, who purchased 425 acres along the north bank of the American River in 1907. A major portion of their Deterding Ranch was eventually sold and is now Ancil Hoffman Park.

In 1909, a real estate developer by the name of Dan Carmichael purchased 2,000 acres of the San Juan Grant lands, lands that became Carmichael Colony No. 1. Two (2) years later, Dan Carmichael purchased 1,000 of the Rancho del Paso Grant, adjoining his prior purchase. The second purchase was Carmichael Colony No. 2. (Cowan 1975).

Dan Carmichael divided the 3,000 acres into 10-acre parcels, and placed ads in mid-western and eastern newspapers: "Lots for sale in Carmichael, California – 10 acre tracts for $1,500 with 10 percent down on terms of $10 a month at 6 percent interest."

Dan Carmichael never lived in his Carmichael Colonies, instead making his home in Sacramento, where he served a term as mayor from 1917-1919, along with many other civic activities. He left the area in 1923 and later settled in San Francisco.

The origin of the District dates to July 3, 1915, when the Carmichael Colonies Improvement Club appointed a committee to investigate the possible formation of an irrigation district, constructing a 10-mile pipeline to bring water directly to Carmichael from an upstream penstock, and pumping water for irrigation purposes from the American River. The committee hired Albert Givan, Civil Engineer, of Sacramento to study the engineering feasibility of the projects.

The committee report was completed October 28, 1915, and printed as a supplement to the Fair Oaks Citizen newspaper on November 1, 1915. The report provides some insight into the impetus for the committee's work: "An inspection of the distributing system of the American

Irrigation Company will readily determine that this system was laid out to supply the Fair Oaks Colonies and was never intended when built to accommodate the various colonies and subdivisions that it is now attempting to supply; the same conditions hold good for the distributing system in Carmichael Colony in regard to Carmichael Colony No. 2." "It is evident to all of you that if the water situation in the Colonies goes on for but a few more seasons more than it has in the past, disaster will quickly overtake us, individually and collectively. We must have relief."

Albert Givan's engineering report was published as part of the committee's report. The report analyzed three main alternatives for Carmichael's water supply: the penstock alternative, requiring a 10-mile pipeline to an upstream penstock where adequate American River supplies could be obtained; a river supply, involving pumping water from the American River at Carmichael; and a combined supply, where the American Irrigation Company (which bought foreclosed assets of the North Fork Ditch Company in 1914) would be relied on for a continuous supply of 4 cubic feet per second (cfs), and the major irrigation supply would be pumped from the American River at Carmichael for 16 hours per day during the six-month irrigation season.

This third (combined supply) alternative, being the most cost-effective, was recommended and adopted; the formation of the irrigation district was initiated; and Albert Givan filed for 15 cfs water rights from the American River on behalf of the District. The Carmichael Irrigation District was formed in early 1916 and held its first official meeting on February 8, 1916.

1.2 Carmichael Water District

The Carmichael Irrigation District was formed in early 1916 to address the growing water needs of the Carmichael Colony. The District changed its name to Carmichael Water District in the 1980s and remains organized under the laws governing irrigation districts. The governance of the District is through a five (5) member elected Board of Directors with each director representing an approximately equal population division within the service area.

The District is substantially built out with anticipated growth through in-fill development of larger parcels and a limited number of vacant parcels. The land use is predominantly residential with commercial along major road corridors and public use lands including parks, schools, and one golf course. The District owns and operates a surface water treatment plant, multiple groundwater wells and two surface storage reservoirs with booster pump stations. The District is located in unincorporated Sacramento County as shown in Figure 1-1 and surrounding water agencies are shown in Figure 1-2. Figure 1-3 provides an overview of the District facilities.

The District's leadership and staff are active participants in the operation and maintenance of the District's water system and in the development of regional water management strategies that guide participation in influencing strategic water issues. This includes preparation of Urban Water Management Plans, participation in the American River Integrated Regional Water Management Planning led by the Regional Water Authority (RWA), participating in the Water Forum Successor Effort and participating in the Sacramento Groundwater Authority (SGA).

Preparation of this 2015 Master Plan is a part of the continued management strategies of the District and was contracted to Kennedy/Jenks Consultants in association with the Reed Group (Water Rate Specialist) and Tully & Young, Inc. (Water Resources Specialist). The contracted work associated with the 2015 Master Plan includes the Master Plan, a Business Plan and a Rate Study.

1.3 2015 Master Plan Approach and Setting

The District completed a comprehensive 100-year Master Plan in 2003 that provided a perspective on the backlog of unfunded infrastructure replacement liabilities and a strategy for resolving the long-term sustainability of the District. The *2003 Carmichael Water District Master Plan* (2003 Master Plan) direction was established by the elected Board of Directors, the District management and the consulting team. The approach to the 2003 Master Plan was to develop firm asset renewal and replacement recommendations for the 15-year period from 2003 to 2018 followed by identifying the broader long-range asset liabilities through 2103. The findings and recommendations of the 2003 Master Plan were then incorporated into a Business Plan presenting various scenarios for scheduling the investments and managing the water service risk with the financial risk. The Business Plan was followed by the Rate Study and ultimately the setting of rates to fund the recommended improvement strategies.

The 2015 Master Plan (Plan) is following the same approach and is coupled with a Business Plan and Rate Study element (developed separately from this Master Plan document). The Plan looks ahead 50 years and includes a 15-year detailed capital improvement strategy to continue the work described in the 2003 Master Plan. Many of the prior findings and recommendations remain timely and continue to guide the activities of the District. However, several events over the past twelve years have culminated in the need to reanalyze the District's priorities and focus on a different strategy for this Plan update including:

- Groundwater Contamination. There was an unforeseen discovery of the existence of groundwater contamination within the District's service area that originated from the Aerojet Rocketdyne (Aerojet) Superfund site in Rancho Cordova, on the southern side of the American River. Groundwater contamination forced the District to shift from its historical balanced conjunctive use (groundwater and surface water supply) water resources strategy to meet demands. The discovery of the groundwater contamination resulted in the shifting to a greater reliance on surface water. The District evaluated the options for protecting the groundwater supply capacity, proceeded with expansion of the surface water treatment plant, and delayed the renewal and replacement of District groundwater wells. In addition, the District embarked on a groundbreaking strategy of remediation without litigation by establishing a cooperative working partnership with the Aerojet Rocketdyne, the Environmental Protection Agency, the California Regional Water Quality Control Board, the Department of Toxic Substance Control, and the County of Sacramento to expedite the construction of two (2) Groundwater Extraction and Treatment (GET) facilities within the District's service area. The two (2) GET facilities currently pump, treat, and discharge about 2.5 million gallons per day and operate nearly 24 hours a day, 365 days a year. The projected clean-up duration is through the year 2250. *Additional discussion of the Aerojet groundwater contamination issues is provided in Section 6.*

- Meter Installation and Revenue Volatility Impacts. The District implemented a District-wide meter installation program in 1999 in accordance with statewide requirements and industry standards. Several deferred pipeline replacement projects necessary for the meter retrofit program were completed. The retrofit program was accelerated by the District and completed approximately 4 years ahead of schedule along with the transition from a flat rate billing structure to a commodity based metered billing structure. The rate structure transition occurred during a period of significant pressure for customers to conserve water, resulting in a significant revenue shortfall. The District cut costs in

response to declining revenues by delaying additional capital projects and other measures in combination with a rate increase to maintain financial stability. The revenue volatility inherent in a commodity-based rate structure will continue to be a challenge as the District customers continue to implement new conservation requirements and the District implements deferred and planned system maintenance projects to protect system reliability. *These are key elements addressed in the Business Plan and Rate Study elements of the Plan.*

- Economic Impact and Reserves. The 2003 Business Plan included recommendations for establishing financial reserve funds for supporting identified capital renewal and replacement projects known as Planned System Maintenance projects, supporting a rate stabilization fund, surface water purchase reserve, and creating an environment where District assets would be replaced with interest earned on investments not interest paid on debt financing. During 2008 to 2012 the economy of California, the United States and the world experienced a major recession that resulted in severe hardship for many District customers including the loss of jobs, investments, foreclosure of homes and bankruptcy. The 2003 Business Plan did not foresee the recession. Recognizing the potential financial hardship of increasing water rates, the District opted to forgo additional recommended rate increases and delayed fully funding the Business Plan reserves, including the surface water purchase reserve. *Changes in reserve methodology and a pay as you go approach versus funding strategies are discussed in the Business Plan recommendations.*

- Golden State Water Company Intertie Project: The District executed a construction contract for the installation of a 24-inch diameter intertie with Golden State Water Company (GSWC) in June of 2015 to provide 5,000 acre-feet per year of treated water to GSWC. The GSWC intertie, point of connection and GSWC transmission main is shown in Figure 1-3. This project is part of a joint project with GSWC, Aerojet and the District to provide replacement water supply to GSWC and an emergency intertie to deliver water from GSWC to the District if needed under a severe emergency. The project includes a payment of capacity buy in and capital facility reimbursement addressing the value of existing District assets used to divert, pump, treat and deliver water to GSWC. In addition, the project will result in a treated water rate to be paid by GSWC/Aerojet. The final terms and conditions of this project were not available at the time of the completion of this Master Plan. The Business Plan and Water Rate Study included consideration of the possible final terms and conditions and impact on the District revenue requirements.

- Local and Regional Organizational Changes. The District expanded its presence within the water community and continued to work towards regional water supply strategies that benefited the ratepayers of Carmichael and provide a greater benefit to the surrounding community. Regionalization and water agency consolidation are continuing to be explored for neighboring agencies. Looking forward for succession planning, this Plan will be one of the legacy documents to provide a road map for future leadership transition. *Refer to Section 7, District Organization, Administration, and Data Management for additional information.*

- Regulatory Challenges. Regulatory requirements are evolving and have increased water use efficiency requirements, which have placed the District's water supply assets at greater risk. *Refer to Section 5, Strategic Water Issues for additional discussion.*

The 2015 Master Plan (Plan) updates the 2003 planning cycle, addresses changed conditions, and expands into additional detail to further assist the management of the District assets. This Plan stands on its own and is a comprehensive update of the prior work. It is recommended, however, that anyone wishing to further understand the District planning strategies and approach obtain and review the 2003 Master Plan.

1.4 Acknowledgments

The following persons provided leadership, effort and insight into the preparation of this Plan and their participation is greatly appreciated and hereby acknowledged.

- Carmichael Water District Board of Directors:
  - Roy Leidy – Division 1
  - Mark R. Emmerson – Division 2
  - John A. Wallace – Division 3
  - Ron Greenwood – Division 4
  - Paul Selsky – Division 5
- Carmichael Water District Staff:
  - Management
    - Steven M. Nugent, General Manager
    - Lynette S. Moreno, Assistant General Manager
  - Staff
    - Chris Nelson, Public Information Officer
    - Laura McManigal, Financial Services Supervisor
    - Mark McClintock, Production Superintendent
    - Scott Bair, Field Superintendent
- Consultants:
  - Kennedy/Jenks Consultants, Engineers and Scientists:
    - Alex Peterson, PE, Principal in Charge, Project Manager
    - Sean Maguire, PE, Water Resources
  - Tully & Young, Strategic Water Issues:
    - Gwyn-Mohr Tully
  - The Reed Group, Inc., Business Plan Update and Water Rate Study:
    - Robert Reed

1.5 Planning Documents

The District's supply-related planning and cooperative efforts are reported in a number of local and regional planning documents. This section is not exhaustive of all the District's planning documents, but the ones presented here summarize much of the foundation and setting for the 2015 Master Plan.

1.5.1 Historical Planning Documents

The 2003 Master Plan was adopted in principle by the District on May 19, 2003 and served as the foundation for implementing a five-year rate resolution (Resolution Number 052192003-2) reflecting a modified capital improvement schedule in the initial years of the Capital Improvement Plan current at the time. The 2003 Master Plan is the source document for the District planning strategies and approach and is essential to understand and fully comprehend the 2015 Master Plan Update. The 2003 Master Plan was undertaken by the District to

document planning objectives addressing the long-term sustainability of District infrastructure, obtain rate stability, and define the conditions and liability associated with District infrastructure over the life of the facilities and assets.

The recommendations from the 2003 Master Plan range from specific to general and were based on the apparent conditions at the time the plan was adopted. As the 2003 Master Plan is a 100-year planning effort, and considered a living document, its recommendations were reviewed in the development of this 2015 Master Plan Update based on how conditions had changed. The 2003 Master Plan recommendations were either maintained in the 2015 Master Plan Update as written in 2003, revised, reprioritized, and incorporated into the 2015 Master Plan Update, or excluded from the 2015 Master Plan Update because they had been completed or were no longer appropriate to current conditions.

Other historical planning documents leading up to the 2003 Master Plan include the 20-Year Master Water Plan (November 1990), 1996 Bajamont Way Membrane Filtration Plant – Preliminary Design Report, and the 1998 Production Facilities and Distribution System Evaluation. These documents are summarized in the 2003 Master Plan.

1.5.2 Water Supply Planning Documents

1.5.2.1 2010 Urban Water Management Plan

The District adopted the *2010 Carmichael Water District Urban Water Management Plan* (2010 UWMP) on June 20, 2011 (Resolution 06202011-4). The 2010 UWMP serves as a water supply planning tool, and is consistent with the California Urban Water Management Planning Act (UWMP Act). The 2010 UWMP documents and evaluates the reliability of its water supplies, customer water use, demand management measures, and its long-term plan for efficient water use to ensure adequate water supply over the next 25 years.

The California Water Code, Division 6, Part 2.6, Section 10610 et. seq. (UWMP Act) requires any municipal water supplier serving over 3,000 connections or 3,000 acre-feet of water per year to prepare an Urban Water Management Plan and to update the Plan on a five (5) year cycle. Each supplier is required to submit its plan to the State Department of Water Resources. Serving over 11,000 customer accounts, the District has chosen to complete the 2010 UWMP in compliance with the UWMP Act.

The 2010 UWMP specifically assesses the availability of supplies to meet future demands during normal, single-dry and multiple dry years. The UWMP also presents baseline per-capita water use data and target conservation values as required by CWC §10608 et seq. The analysis, supply-demand projections, data, and target conservation values are all used in the development of this Master Plan.

1.5.2.2 Regional Plans

The District is an active participant in water management in the Region, working with local organizations such as the Regional Water Authority and the Sacramento Groundwater Authority. These organizations work with local stakeholders to manage the region's water resources and ensure its sustainability. Additional regional cooperation is described more fully in Section 5.

American River Basin IRWMP

The Regional Water Authority Board adopted the American River Basin Integrated Regional Water Management Plan 2013 Update (2013 IRWMP) in July 2013. The 2013 IRWMP addresses complex water resources challenges faced by the region and is the result of regional cooperation among its 11 members (Cooperating Agencies) and the support of nine "collaborating" agencies. The 2013 IRWMP identifies major water resource management issues, proposes solutions, and attempts to maximize economic, societal, and environmental benefits throughout the region.

Groundwater Management Plan

The Sacramento Groundwater Authority (SGA) adopted its Groundwater Management Plan (GMP) in December 2008 and revised it in February 2009. The SGA is a joint powers authority with four signatories (City of Citrus Heights, City of Folsom, City of Sacramento, and Sacramento County) and cooperates with 14 local water purveyors to manage the Sacramento Region's North Area Groundwater Basin. The GMP provides a framework for actions to meet its commitment to not exceed the average annual sustainable yield of the groundwater basin, as well as for providing safe, reliable water supply. The GMP is discussed in further detail in Section 5 of this Master Plan.

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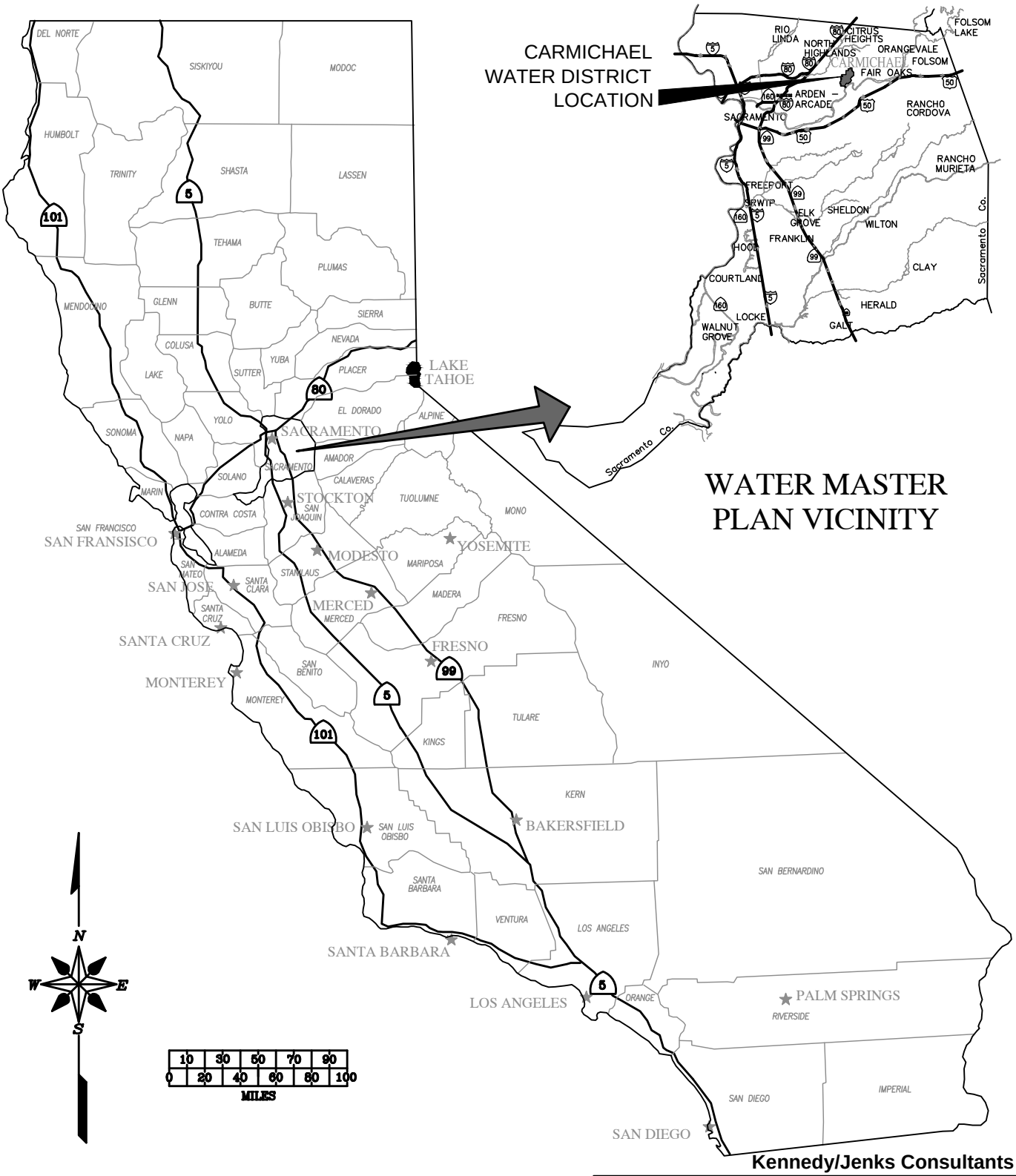

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Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

Vicinity Map

June 2015
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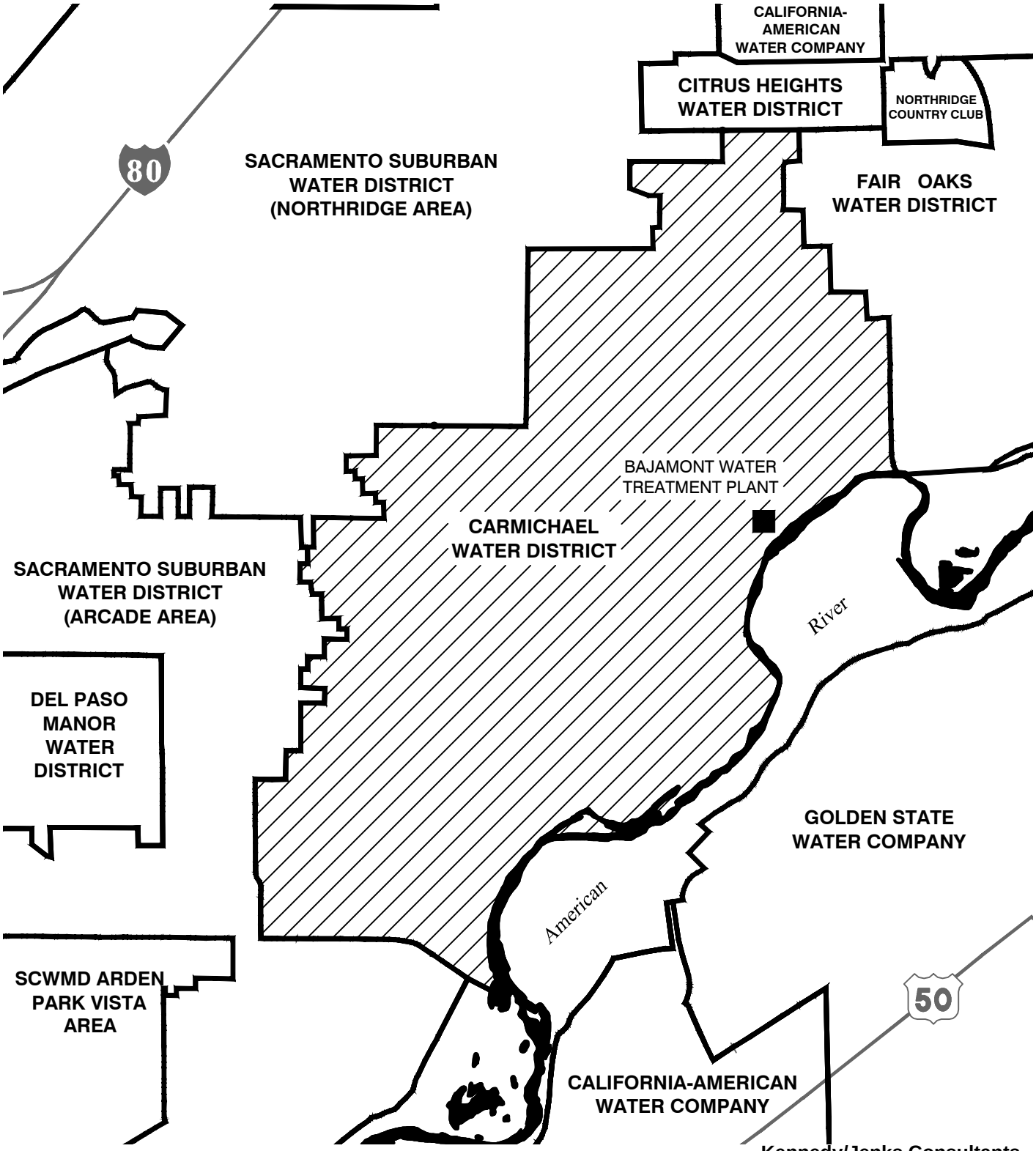
Figure 1-1



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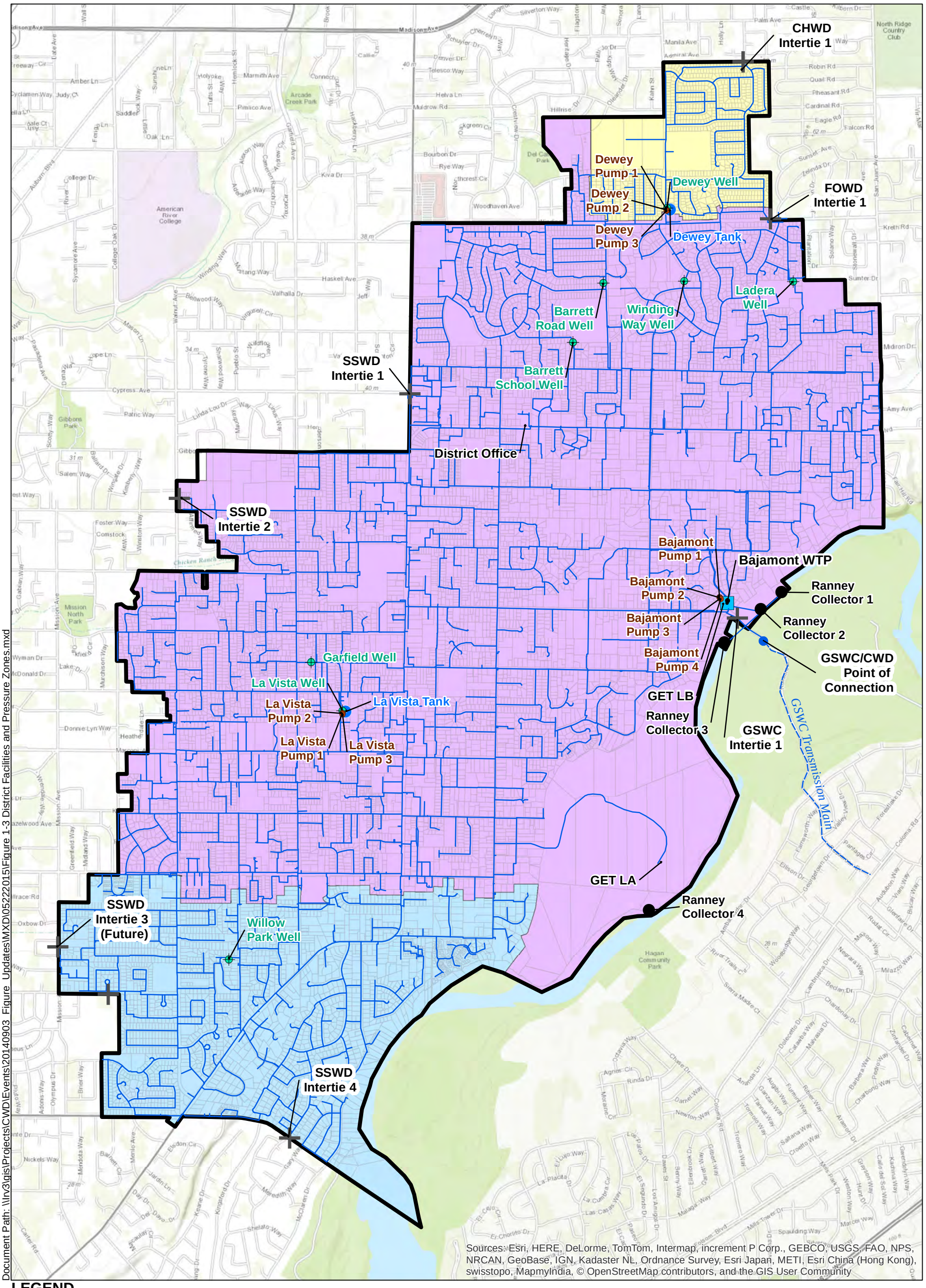
Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

Adjacent Water Districts

June 2015
K/J 1370020.00
Figure 1-2



Document Path: \\rv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 1-3 District Facilities and Pressure Zones.mxd

LEGEND

- Interties
- Booster
- Diversions
- Pipeline_to_GSWC
- Reservoirs
- Wells
- WTP
- Service Area
- Pipelines
- Parcels

Pressure_Zones

- Lower Zone (Zone 3)
- Middle Zone (Zone 2)
- Upper Zone (Zone 1)

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

District Facilities and Pressure Zones

K/J 1370020*00
June 2015

Figure 1-3

Section 2: Water Use and Demand Management

2.1 Introduction

This section presents the evaluation of the District's current and projected water use, describes current water use efficiency practices, and summarizes the District's existing water supply sources.

This section discusses how the District's water use and environment affecting water use has changed over the last 10-years and outlines recommendations for future actions by the District such as measures to harden current water demands to continue to meet Senate Bill X7-7 (SBX7-7) per capita water use reduction requirements. Finally, an introduction to the District's water supply sources provides a foundation for understanding the facilities replacement planning and strategic water issues described later in this document.

2.2 Water Use Overview

There are two ways that the term water use is defined: either the total amount of potable water that enters the distribution system, or the amount of metered (measured) consumption at each account. The total amount of water that enters the system is described here and includes all water lost due to leaks, unmetered connections, illegal connections, and other sources. The District's annual water use peaked in 2006 at approximately 12,500 acre-feet per year (AFY). During the period 2009 to 2013, the overall water use decreased to approximately 10,000 AFY. The 2014 water use under curtailment and mandatory conservation was 8,267 AFY, which has contributed to the need to reconsider revenue sources and use of available water assets (see the Section 8, Business Plan).

2.3 Water Use Types

Water use types within the District are grouped into the following sectors:

- Residential
  - High Density
  - Medium/Low Density
- Non-Residential
  - Commercial/Industrial
  - Institutional/Government (including schools)
  - Landscape/Recreational (including parks and dedicated irrigation)
  - Sacramento County-Ancil Hoffman Golf Course

The breakdown of the District's service area profile by sector, as shown in Table 2-1 reflects approximately 11,038 residential (single family and multi-family) connections and 500 non-residential connections as of December 2014 (as reflected in the business plan). All services, with the exception of six (6) remaining residential services are metered and billed on a metered rate.

Table 2-1: Past, Current, and Projected Water Use by Sector

Water Use By Sector	2005	2010	2015	2020	2025	2030	2035
Residential	11,181	7,942	7,687	7,630	7,645	7,660	7,770
Commercial/Industrial	940	824	634	626	618	610	610
Institutional/Government	0	0	180	178	176	173	173
Landscape	603	192	344	342	340	337	337
Total	12,724	8,958	8,845	8,776	8,779	8,780	8,890

Units of Measurement: Acre-feet/year
Source: *2010 Carmichael Water District Urban Water Management Plan*, Tables 3-7

The District's water use type is important in understanding how the District's water use may vary in the future.

2.3.1 Residential

Residential connections can be further categorized into the following subcategories:

1. High Density: Apartments, duplexes, tri-plexes, or condominiums.
2. Medium/Low Density: Single-family homes.

Single and Multi-family residence are by far the highest water use type in the District, and account for approximately 88% of total water use. The population served within the District was estimated at 37,899 in 2010 based on the U.S. Census data[1]. As of December 2014, there are about 9,800 single family residential and 1,250 condominium and multi-family residential connections.

2.3.2 Non-Residential

All non-residential water demand users are grouped as follows:

- Commercial/Industrial
- Institutional/Government
- Landscape/Recreational
- Sacramento County Parks - Ancil Hoffman Golf Course

2.3.2.1 Commercial/Industrial

The District has a complex mix of commercial and industrial customers, ranging from antique stores, medical/dental and office buildings, hair salons, gas stations, shopping centers, restaurants, industrial, churches and other facilities serving the community of Carmichael. The current number of commercial accounts is expected to remain stable through the year 2035, although some areas such as Fair Oaks Boulevard are undergoing areas of redevelopment and could see the commercial business types evolve. In 2010, there were 378 commercial accounts with a water use of 642 AFY (2010 UWMP, Table 4-4). Projected water use is expected to decrease to 610 AFY through the implementation of water use efficiency measures. All commercial and industrial services are metered and billed on a metered rate.

[1] According to the 2010 U.S. census data, Carmichael's population is 61,762 of which the District serves 10,832 residential customers.

2.3.2.2 Institutional/Government

The District has a stable institutional/governmental sector, comprised primarily of special districts and governmental facilities, schools and parks.

Special District/Government: Special Districts and governmental facilities within the District are the American River Fire District, postal facilities, libraries and county facilities.

Schools: The District supplies water service to twelve (12) schools (i.e., San Juan Unified School District and private institutions). Since the land within the District's service area is nearly built out, it is unlikely that a new school will be added to the system. San Juan Unified School District has consolidated schools and closed underutilized campuses in recent years, which could cause re-purposing of these properties. No schools within the District's service area are currently known to be targeted for closure.

Parks: The park districts within the District service area are Carmichael Recreation and Park District and Mission Oaks Park District. The District supplies water service to thirteen (13) parks. Since the 2003 Master Plan, the Carmichael Recreation and Park District has developed the O'Donnell Heritage Park and Jan Park with full landscaping and irrigation. These parks have a mix of developed park area, walking trails and native oak woodlands. The Schweitzer Grove Nature Area is located in the northeastern part of the District and is also a naturalized area with limited irrigated water use. The largest undeveloped parkland in the District is the 10.8 acre Sutter Avenue Park Site that currently supports the community garden with water supply. Development of the Sutter Avenue Park Site is assumed to follow the recent trend for Carmichael Recreation and Park District improvements with low water use and relatively small turf areas. The Carmichael Recreation and Park District is also considering a master planning update to Carmichael Park, which could include the addition of an aquatic center.

Despite these changes, no significant increase in water use for this sector is expected in the future. Water demand to support limited development of additional parkland is assumed to be offset by improved efficiency at existing sites. This includes the addition and use of the California Irrigation Management Information System (CIMIS) data based irrigation controllers by the Carmichael Recreation and Park District. All institutional/government services are metered and billed on a metered rate. Annual water use at parks and schools within the District is approximately 120 and 183 AFY, respectively (2010 UWMP, Table 4-4).

2.3.2.3 Landscape/Recreational

Landscape and recreational customer demand is generally considered open space areas with dedicated meters and does not include developed areas such as parks. Demands are expected to remain stable in the future due to the almost fully developed character of the District. All landscape/recreational services are metered and billed on a metered rate. The District's existing landscape/recreational use is 72 AFY; and future use is not expected to increase (2010 UWMP, Table 4-4).

2.3.2.4 Sacramento County - Ancil Hoffman Park and Golf Course

The Ancil Hoffman Park (Park) is maintained by the County of Sacramento. The Ancil Hoffman Golf Course is the only golf course within the District. In 2010, the Park began receiving water from a groundwater extraction and treatment (GET) facility located within the Park. The Park's potable water use is provided by the District and there is a dedicated pump station to

supplement the GET water supply as needed to meet irrigation demands. Annual irrigation demand for the golf course and Park is approximately 155 AFY (2010 UWMP, Table 4-4).

The District met with the Park maintenance leadership following the 2014 American River surface water curtailment notification to coordinate an overall reduction in irrigation, and when possible, a reduction of potable water irrigation use at the Park. This may result in extended irrigation schedules to better utilize the GET maximum flow of 900 gallons per minute (gpm) while still maintaining turf areas. Optimizing the GET water supply could result in significant reduction in the potable water used at the Park in the future, however this may require significant irrigation system and controller improvements.

2.4 Population and Growth

Growth within the District is expected to be slow into the future, as the District is close to build out. Growth is limited by available land, resulting in a population growth rate of less than 0.2 percent over the last 10 years. The population projections presented in Table 2-2 reflect growth through build out based on the Sacramento Area Council of Government's (SACOG) blueprint plans. The projections include 60 acres of conversion of commercial space to mixed use (residential and commercial dual land use such as condominiums, townhomes and apartments on top of stores and offices). A total of approximately 1,800 new Dwelling Units (DUs) are expected by the 2050 build out with no reduction in commercial space. These additional dwelling units would result in approximately 10 percent population growth by build out.

Table 2-2: Population Projections

Year	Population
2000	37,200
2005	38,042
2010	37,899
2015	38,061
2020	38,223
2025	39,285
2030	40,347
2035	41,409
2040	41,707
Build out[(a)]	42,309

(a) Build out is projected to occur in 2050.
Source: *2010 Carmichael Water District Urban Water Management Plan*, Table 2-1 (based on 2010 Census Data). 2040 population was calculated using an assumed linear growth rate between the period of 2035 and 2050.

2.5 Water Demand Projections

Projected water demands were reviewed and included consideration of historical demands, recent demand patterns, as well as published projections in the 2003 Water Master Plan and 2010 UWMP planning documents. The 2010 UWMP's projections are the most recently updated projections and reflect changes in the District through 2010 and projected through build out, therefore these projections were used for the updated 2015 Plan. The 2015 UWMP Update process will start soon and will include preparation of revised demand projections. The projections provided do not include consideration of 2015's 36% water conservation mandates ordered by the State Water Resources Control Board (SWRCB).

The projections presented in Table 2-3 indicate that despite some projected growth, average year demands will remain flat at approximately 9,700 AFY through 2035 and eventual build out. The 2010 UWMP found this to be possible due to trending reductions in overall water use as well as water savings achieved from conservation, water metering, and compliance with SBX7-7 (the Water Conservation Act of 2009). Single dry year demands are increased to represent the additional outdoor irrigation that would be anticipated in a drought year with reduced precipitation.

Table 2-3: Projected Water Demands

Water Demand	2015	2020	2025	2030	2035	Build out
Average Year	9,642	9,566	9,569	9,571	9,691	9,770
Single Dry Year	10,124	10,044	10,047	10,050	10,176	N/A

Source: *2010 Carmichael Water District Urban Water Management Plan*, Table 4-7 and Table 7-2.

The GSWC intertie project will result in treatment and delivery of up to 4.5 million gallons per day of water constituting a new demand on the system. This new demand is being met with new supply provided by Aerojet through the groundwater extraction and treatment processes upstream of the District Ranney Collector diversions from the American River. The GSWC intertie project has no impact on District supplies.

2.6 Metering

Over the past fifteen years, the District has completed an extensive meter retrofit program of all service connections. The program was completed in four (4) phases as follows:

- Phase 1 – 2000 commercial connections
- Phase 2 – 2001 apartment, school and park connections
- Phase 3 – 2004 duplex, triplex, fourplex, mobile home and condominium connections
- Phase 4 – residential connections

With changing water conservation requirements, new water meter installation regulations, and available grant funding, the District chose to accelerate meter installation and through leveraging the support of available grant funding, successfully completed nearly all meter installations by 2013. There are six (6) unmetered services remaining, which will be metered once the District completes two scheduled water main projects required for the meter installation.

Meters are read by the District on a bimonthly schedule with half the meters read on odd months (January, March, May, July, September, November) and the other half read on even months (February, April, June, August, October, December). The odd/even meter reading program provides a basis for billing but does not provide for uniform comparison of water use patterns due to the 2-month variation of the aggregate use.

Example: January billing (odd month) = November and December usage

February billing (even month) = December and January usage

Figure 2-1 includes the produced water versus the metered water use between 2007 and 2014 showing greater agreement between the two data sets. The difference between the customer

meters and the total water produced largely reflects the accounts on flat rate versus metered rates prior to transition. That difference also includes unaccounted-for water (i.e., mainline leaks, flushing program, permit water, cleanup/projects), meter errors and any difference in water use verses production that occurs due to meter reading cycles. The 2014 data reflects the data with the majority of customer meters installed and has 10 percent unaccounted-for water. The 2014 data does not include remaining unmetered services receiving water at that time on a flat rate prior to transition to metered rates.

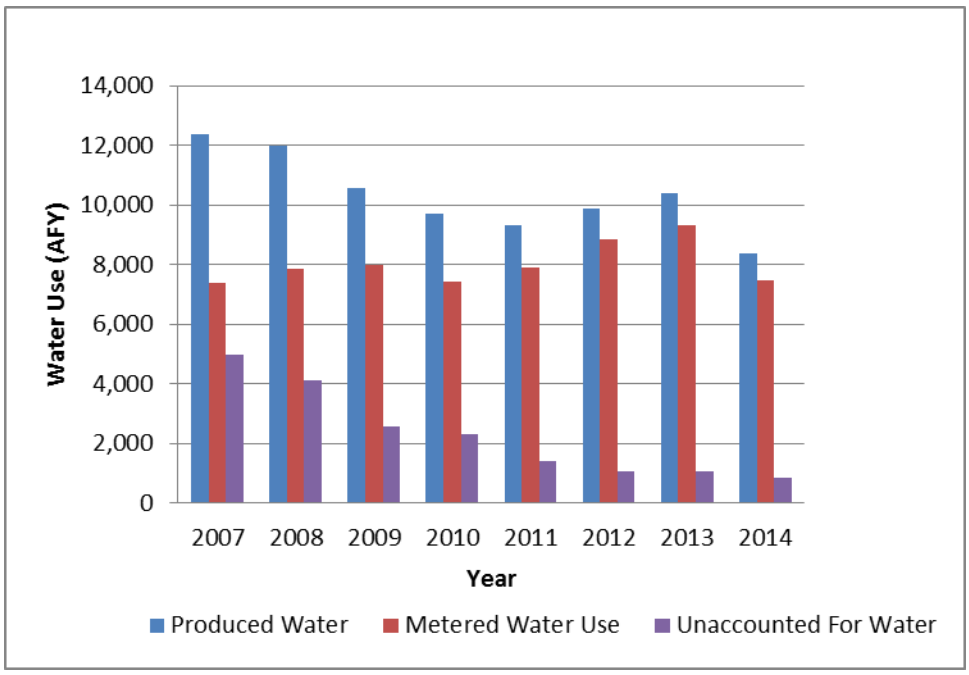


Figure 2-1: Produced Water vs. Metered Water Use

The water use data between 2007 and 2014 was compiled to provide a resource for the District to analyze historic annual and bimonthly water use used in the Business Plan and Rate Study. The water use data was extracted from the District's billing database and provides water use by customer type and connection size over each 1-year period.

Recommendation: The continued development of a tool to provide for an annual review of water use is recommended to support the District's ongoing conservation outreach program. In addition, the evaluation of meter data in combination with production data should be used to enhance the existing unaccounted-for water management and leak detection programs.

2.7 Water Use Efficiency

The District maintains an active water efficiency program. The District is a member of the Regional Water Authority's Water Efficiency Program and the California Urban Water Conservation Council, as well as a signatory with the Sacramento Water Forum (Water Forum). Since joining these organizations, staff has served on several committees.

The District has made great strides in water efficiency through adding staff to offer indoor and outdoor water audits; customer assistance; customer education; and fostering relationships with local park's departments and schools. The District maintains an active public outreach program

participating in various outreach events and frequently presents/speaks at local schools and associations. This has been key in building positive relationships and partnerships within the community and spreading the water conservation message. Other District conservation efforts include:

- Meter Program: The District is 100% metered and bills customers based on a consumptive charge as well as a fixed service charge.

- Leak Detection: The District measures unaccounted-for water, surveys main and service lines and implements an aggressive repair program. Currently, the District's audit, leak detection and repair program keep unaccounted-for water under 10%.

- Best Management Practices: The District implemented and maintains a Best Management Practices program to ensure efficient water use throughout its service area. The District has been a Sacramento Water Forum signatory since 2000 and has been operating its water conservation program consistent with its purveyor-specific agreement under the Water Forum.

- Beneficial Use: Since July 2005, the District, Aerojet, and Sacramento County Regional Parks Department have collaborated in groundwater remediation projects to help prevent contaminant plumes from reaching the District groundwater supplies, resulting in the installation of two Groundwater Extraction and Treatment facilities. One facility, located at Ancil Hoffman Park in Carmichael, utilizes treated water for irrigation of the golf course. The volume of water treated is sufficient to meet about half of the golf course's non-potable irrigation water needs from May through September, and all of the non-potable irrigation water needs from October through April. This innovative approach has reduced the District's largest water user's consumption by 50%. Any water not used for irrigation is discharged to the American River for beneficial use.

The District's collective approach to water conservation, system improvements, and resource management has reduced water production from a 1997 level of 13,646 acre feet per year (AFY) to a 2014 low of 8,359 AFY. The result is a 39% reduction in use since the District began aggressive implementation of water reduction measures. The District continues to seek opportunities for additional conservation measures and water efficiency programs.

2.7.1 SBX7-7 Water Conservation

In 2009, SBX7-7, the Water Conservation Act of 2009 was signed, which requires each urban water supplier to select one of four methods for determining water conservation targets for 2020. The bill has a goal of an overall reduction of statewide per capita urban water use of 20 percent by 2020. The reduction in water use measured under SBX7-7 is in gallons per capita day (gpcd).

The 2010 UWMP outlines the methodology used to determine the District's 2010 gpcd and 2020 gpcd goal per SBX7-7. The District chose to use Method 1, which sets the District's 2020 gpcd target as 80 percent of the District's baseline daily per capita water use. Table 2-4 shows the baseline and 2020 gpcd targets and Table 2-5 shows the 2007-2012 historical gpcd data. The District has met the 2015 interim target since 2009 and the 2020 compliance target since 2010. Through continued conservation efforts, including fully metering the District and other BMP

implementation, the District plans to maintain a gpcd at or below its goal of 244 gpcd through the year 2020.

Table 2-4: SBX7-7 Targets

SBX7-7 Goals	Gallons Per Capita Day
Baseline	306
2015 Interim Goal	275
2020 Goal	244

Table 2-5: Historical (gpcd)

Year	Gallons Per Capita Day
2007	291
2008	281
2009	246
2010	227
2011	219
2012	233
2013	243
2014	192

2.7.2 Residential Water Use Efficiency

The District's 2010 UWMP outlines Future Residential Unit Demand Factors by Dwelling Unit Type as shown in Table 2-6. 2012 water use data was compared with these dwelling unit goals to determine how many connections within the medium density and low density residential units currently meet these goals (these make up the majority of the District connections). It was found that approximately 22 percent of the Medium Density and 9 percent of the Low Density are not currently meeting this goal. Targeting high water users in the low density residential customer type for exterior water audits and incentive programs is expected to result in the highest water savings for the District. There are also some outliers within the Medium Density group that may be a source of savings. High water use at these locations may be due to a leak that when fixed could significantly decrease water use at that connection.

Table 2-6: Future Residential Unit Demand Factors

Dwelling Unit Type	Dwelling Unit (gpd)	Demand Factor (AF)
High Density RD-40	143	0.16
High Density RD-20	143	0.16
High Density RD-10	281	0.32
Medium Density RD-5	495	0.55
Low Density RD-2	1340	1.50

Source: *2010 Carmichael Water District Urban Water Management Plan*, Table 4-3.

2.7.3 Water Demand Trends

Since 2009, District water demands have been on the decline. While it is difficult to fully quantify individual factors to explain the considerable decline in District demands in recent years, a number of changes to the operation and management of the water system have occurred that support the recent trends. Changes are shown on the graphical timeline presented in Figure 2-2 depicting the approximate occurrence of the events. Programs such as water use efficiency (i.e., water audits, public education and outreach), leak detection and repair to reduce water losses, service line replacement, as well as the use of reclaimed water at Ancil Hoffman Park from the GET remediated water supply have reduced the potable water use. Softer changes such as customer response to voluntary conservation, public outreach, implementation of commodity based water rates, and the economic downturn caused by of the 2008 recession also contributed to lower water use. In addition, a series of multiple mild summers with average or above average rainfall may have contributed to the lower water use period 2008-2011, followed by a record-breaking drought beginning in 2012 and continuing through 2015.

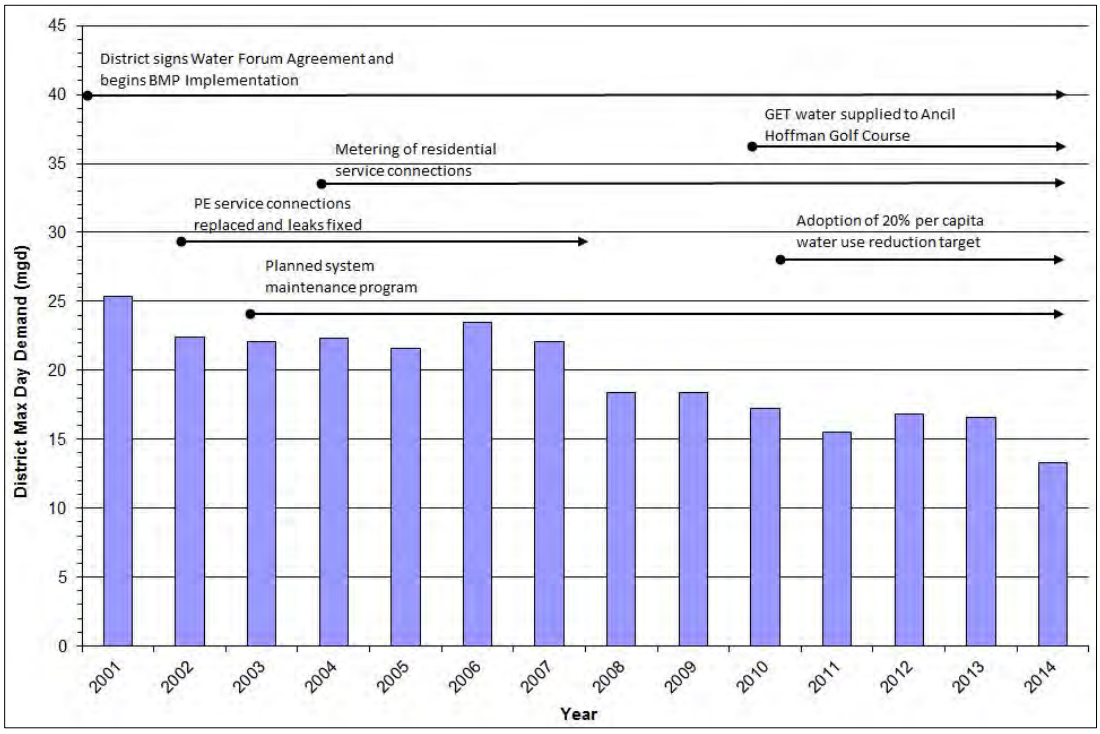


Figure 2-2: Water Demand Trending Timeline

The changes to the operation and management of the water system are described below:

- Signing of the Water Forum Agreement in 2000 and subsequent implementation of water conservation Best Management Practices (BMP).
- Installation of commercial, industrial and residential water meters and conversion to volumetric billing. The District implemented a commodity rate billing system as

meters were installed. As indicated in the District's 2010 UWMP, metering and volumetric billing alone can account for up to a 20 percent water savings, according to the California Urban Water Conservation Council.

- Aggressive leak repairs to reduce water losses – including replacement of failing polyethylene service lines and repair of leaking pipelines along distribution and transmission mains.

- Implementation of the Planned System Maintenance (PSM) program following adoption of the *2003 Water Master Plan* that included a programmatic replacement of a backlog of failing and leaky water distribution mains. Much of the backlog included steel water pipelines 70 plus years old.

- Conversion of Ancil Hoffman Golf Course and Park from a fully-potable water supply to a partially potable/partially remediated supply provided by the Aerojet GET LA facility. It is estimated that approximately 180 acre-feet is provided by GET LA over the irrigation season (2012 and 2013 data), which is approximately 40 percent of the overall irrigation demand and close to a 2% savings in total District water use. The supply provided by the treated GET water during irrigation periods is approximately 800 gpm.

GET LA Booster Pump Station

Even though there are a number of discreet factors to explain the reduced water demands, it is important to consider that declining water demands appears to be a widespread occurrence within the region. Many water agencies throughout California have experienced demand declines in recent years of similar magnitude. It is widely thought that the multi-year drought, economic downturn, climate change, and a renewed focus on water conservation efforts have all contributed to changing water use to various degrees.

Recommendation: The District should carefully monitor water demands, particularly after the drought is over to evaluate potential demand rebounds and adjustments necessary to remain in compliance with water use efficiency targets.

Section 3: Facilities Replacement Planning

3.1 Introduction

The District maintains a diverse water supply system drawing water from the American River and groundwater aquifer underlying the District service area. These supply sources are treated, stored, and distributed to District customers via a complex array of water facilities including over 160 miles of pipelines, two ground level water storage tanks, several groundwater wells, and a surface water treatment plant. This section summarizes the District's water sources, supply and distribution facilities, discusses existing equipment condition, and current operating conditions necessary to ensure safe and reliable water supply for District customers into the future.

This section provides a description of the District's existing condition assessment and includes replacement recommendations for existing infrastructure and project identification as part of the Capital Improvement Plan; and provides recommendations for continued recordkeeping and data collection as part of the ongoing operation and maintenance efforts. This work includes Scheduled Planned System Maintenance activities such as meter replacement and pipe replacement as well as scheduled capital improvement projects required over the 50-year master planning period.

3.2 Water Supply Sources

The District has two water supplies: groundwater from District wells and surface water diverted from the lower American River through subsurface infiltration diversion facilities known as Ranney collectors. Figure 3-4 shows the District water production facilities.

The District also has potential for obtaining emergency water supplies through connections to adjacent water purveyors, with existing emergency interties between the District and Fair Oaks Water District, Citrus Heights Water District, and Sacramento Suburban Water District. Refer to Section 3.13 for additional discussion on these opportunities.

The District began construction in June of 2015 of an intertie with GSWC to provide 4.5 million gallons per day of remediated groundwater provided by Aerojet through the American River to the District's Bajamont Water Treatment Plant (WTP). This source of treated groundwater for reuse through the District's WTP provides new supplies to meet the GSWC agreement for water deliveries, and is anticipated to be completed in late 2015. The treated groundwater produced by Aerojet has also been an alternative water source allowing continued operation of the WTP following the State Water Resources Control Board curtailment of allowable District water diversion off the American River in 2014 and 2015.

3.2.1 Surface Water Supply Facilities

The District has been diverting flows from the American River since it was first formed in 1915, continuing earlier diversions serving the Carmichael Colony dating back to the nineteenth century. Initial diversions consisted of direct river intakes which allowed surface water to be pumped to the Carmichael Colony using an early distribution system which consisted of a 2-inch water connection for each 10-acre parcel.

In the late 1950s, after the construction of Folsom Dam had begun, the District initiated a program to install four Ranney collectors to improve water quality of the surface water diversions. Ranney collectors are comprised of horizontal infiltration pipelines installed in the gravel formations of the American River riverbed. The Ranney collectors use the natural filtering capability of the riverbed to provide a high quality water supply. Initial surface water treatment consisted of chlorination and lime softening.

The Ranney collectors continued to serve the District throughout the 1980s and 1990s, until changes in federal/state surface water treatment regulations required additional treatment for drinking water supplies. In addition, flood flows in the lower American River in 1986 and again in 1997 caused enough damage to the collectors to impact their filtration performance. The District completed construction in 2001 of the Bajamont Water Treatment Plant using membrane micro-filtration water treatment technologies. The plant was expanded with additional capacity added in 2008. The surface water treatment plant and surface water infiltration system have been operating and have a nominal capacity rated at 22 MGD, with actual capacity estimated at 20.7 MGD due to backwash requirements of the filters.

Drought conditions in 2014 and 2015 resulted in a curtailment notification from the State Water Resources Control Board directing the District to stop all surface water diversions off the American River under post-1914 appropriative water rights. The District complied with this order and transitioned the water treatment plant to operate with purchased Aerojet remediated groundwater.

3.2.2 Groundwater Supply Facilities

The District operates several wells and relies on groundwater for approximately 15-30 percent of its total typical annual water supply. Depending on well locations and pumping levels, the groundwater quality conditions vary and can be high in iron, manganese and hydrogen sulfide. All operating District wells provide water that complies with applicable drinking water standards, including maintaining a chlorine residual and no additional treatment.

In 2004, rocket manufacturer Aerojet detected N-Nitrosodimethylamine (NDMA) in a groundwater monitoring well located in Carmichael. In response, Aerojet and the District collaborated on a fast track installation of two Groundwater Extraction and Treatment (GET) facilities expanding the Superfund Western Groundwater Operable Unit groundwater remediation program. This collaboration was very successful in expediting the start-up of the first GET facility, GET LB, and negotiation and construction of the second GET LA, located in Ancil Hoffman Park. This expedited response assisted in reducing the likelihood of the groundwater contaminant plume from reaching the District's existing groundwater production wells. The aquifer under the District remains at risk from contamination, and the District continues a proactive and positive working relationship with Aerojet, the Sacramento Groundwater Authority Contamination Task Force, the EPA, Regional Water Quality Control Board, and the California Department of Toxic Substance Control.

Additional discussion regarding the groundwater basin and contamination is included in the Aerojet/Rocketdyne Regional Groundwater Contamination Response and Strategic Water Planning sections of this Master Plan.

3.2.3 Groundwater/Aquifer Overview

The regional geologic and hydrogeologic conditions of the groundwater basin underlying the District are documented in the Department of Water Resources (DWR) Bulletin 118 (2003), Evaluation of Ground Water Resources: Sacramento County. The underlying aquifer is named the North American Subbasin and is bounded on the south by the American River, the north by the Bear River and west by the Feather and Sacramento Rivers. The subbasin aquifer terminates at the Sierra Nevada foothills as the water bearing formations thin on the eastern limits of the subbasin. The North American Subbasin includes the jurisdictional areas of approximately 24 public and private water providers with most parties collaborating on groundwater management strategies.

3.2.3.1 Geology

DWR Bulletin 118-3 identifies and describes the various geologic formations that constitute the water-bearing deposits underlying Sacramento County and therefor the District. These formations include an upper, unconfined aquifer system consisting of the Victor, Fair Oaks, and Laguna Formations, and a lower, semi-confined aquifer system consisting primarily of the Mehrten Formation. These formations are shown on Figure 3-1 and are typically composed of lenses of inter-bedded sand, silt, and clay, interlaced with coarse-grained stream channel deposits. Figure 3-1 illustrates that these deposits form a wedge that generally thickens from east to west to a maximum thickness of about 2,000 feet under the Sacramento River.

In addition, Figure 3-1 shows three broad zones where the subbasin may be influenced by groundwater contamination relative to the Aerojet source; zone 1 is most at risk decreasing to zone 3 being least at risk.

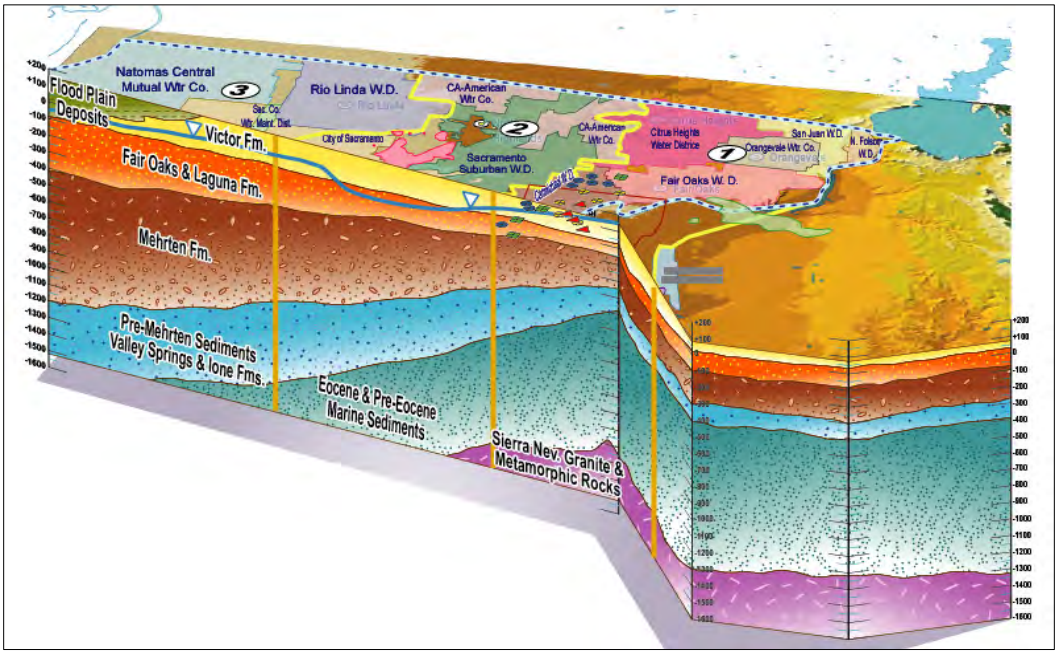


Figure 3-1: Regional Geology and Aquifers

Aerojet's groundwater investigations and aquifer modeling has identified six hydrostratigraphic layers (Layers A through F) beneath the region as shown in Figure 3-2. The hydrostratigraphic layers were defined in relation to the geologic formations. These include:

- Layer A – Quaternary sediments of the Modesto, Riverbank, Fair Oaks, and Arroyo Seco Formations.
- Layer B – Quaternary Laguna Formation.
- Layer C – Miocene Mehrten Formation or the informally defined Laguna-Mehrten transition zone.
- Layer D – Miocene Mehrten Formation.
- Layer E – Oligocene Valley Springs Formation, although locally it may include a portion of the lower Mehrten Formation.
- Layer F – Eocene and pre-Eocene marine sediments.

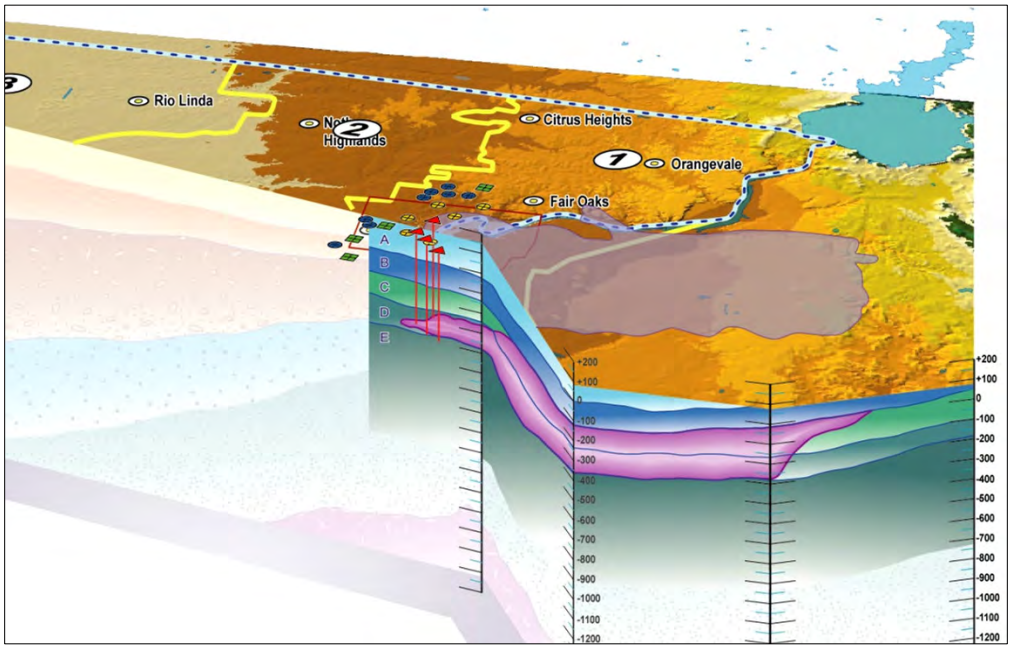


Figure 3-2: Aerojet Aquifer Layer Naming

The apparent contamination plume is predominantly in Layer C and D within the District vicinity. District wells are constructed in Layers B, C, D, and based on SGA pumping data 58% of the regional extraction is Layers C and D. The hydrogeology underlying the District area is a complex with unknown variations both vertically and horizontally that makes it difficult to understand and predict the potential contaminant flowpaths from existing contamination to the existing District wells. Prior Aerojet modeling indicated that District wells have no impact on the contamination plume migration under the following three scenarios: (1) full-time pumping condition, (2) seasonal operating condition similar to the actual operation, and (3) a non-operating condition.

The District continues to work with Aerojet using their modeling resources to review and investigate contaminant capture and movement of contaminants of concern. This work has identified concerns of movement of the contamination past the GET LA and GET LB capture area and recent (March 2015) sampling indicates contamination has migrated substantially across the District. The District is actively working with technical, legal, regulatory experts and Aerojet representatives to support proactive resolution of improved contamination capture while also protecting the District's interest in long-term safe and reliable groundwater resources within the District area.

3.3 Operational Conditions Criteria

Title 22 of the California Water Code requires municipal water providers to monitor average day demand, maximum day demand and peak hour demand to determine the required firm water production capacity to support the water system. The following critical service conditions must be met by a water provider:

A. Average Day Demand (ADD) – The average day demand is a theoretical number calculated based on the total estimated water used in a year, divided by 365 days. This number is used to develop water resource plans, projections of groundwater extraction use versus yield, and other strategic planning considerations.

B. Maximum Day Demand (MDD) Condition – Typically occurring during extended hot periods of the summer and around summer holidays. Maximum day refers to the highest 24-hour average flow reported in gallons per minute (gpm). California Title 22 Water Works Standards requires that a water purveyor be capable of sustaining the maximum day flow indefinitely. The MDD is defined as the highest value over the past 10 consecutive years.

C. Peak Hour Demand (PHD) Condition– Typically occurring during an extended hot period of the summer. Peak hour refers to the highest 60-minute water use of the District and is reported in gallons per minute (gpm). Peak demand is typically met from storage. The District has three types of storage available as follows:

    1. Above ground steel storage reservoirs with booster pumping. Current capacity is a nominal 4 million gallons (MG) comprised of emergency storage, fire flow storage, and operational storage. This includes the Dewey Tank (1 MG) and the La Vista Tank (3 MG).

    2. Below grade concrete clearwell storage at the Bajamont Water Treatment Plant (1.8 MG).

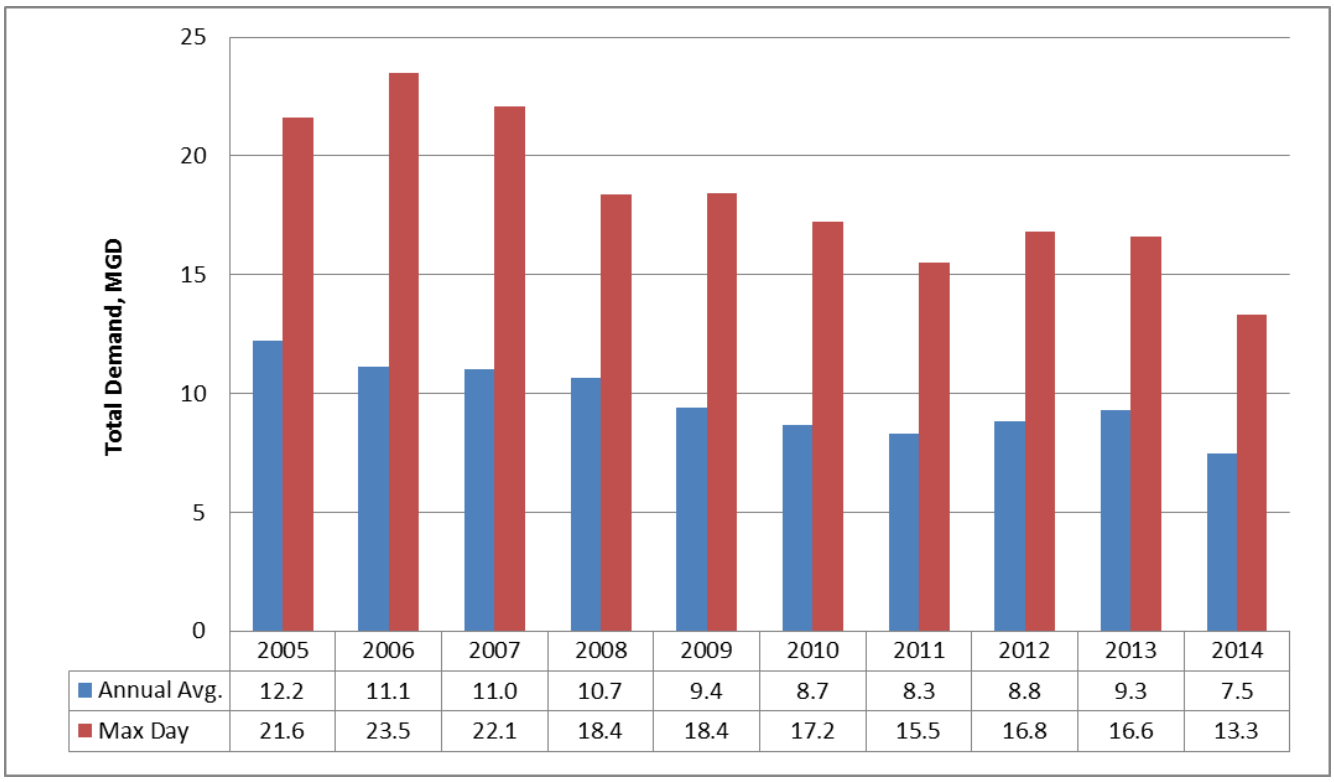
    3. Groundwater aquifer storage accessible by water production wells.

3.3.1 Peaking Factor Updates

The MDD and PHD peaking factors were reviewed and reconfirmed. The future demands based on the 2010 UWMP were used in conjunction with historical peaking factors to determine future supply requirements to meet the MDD and PHD conditions. The peaking factors have been revised from the 2003 Master Plan and are presented in Table 3-1.

District average annual water demands have decreased in the last 10 years. The highest water use in the last 10 years was 11.1 MGD in 2006. Average and maximum day water use has decreased since 2006 as seen in Figure 3-3. The average day demand and maximum day demand during the 2014 drought was 7.5 MGD and 13.3 MGD, respectively, which represents a significant decline from pre-drought peak water use.

The District has implemented several permanent improvements in the last 10 years resulting in a decreased MDD. The current 10-year highest use MDD is 23.4 million gallons per day (MGD) which occurred in 2006. The 2008 MDD was 18.4 MGD. The MDD reached a new low of 13.3 MGD in 2014. Since it is likely that MDD will increase once the drought has ended, a revised MDD of 18.2 MGD is recommended to be used for planning the projected future water use through 2035. The continued benefits of leak reduction, water reuses, and metered conservation efforts should be documented annually to retire the historic 2006 MDD value. The District may benefit from requesting a reduction in the MDD criteria through the State Water Resources Control Board, Division of Drinking Water (SWRCB-DDW) (formerly California Department of Public Health).



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual Avg.	12.2	11.1	11.0	10.7	9.4	8.7	8.3	8.8	9.3	7.5
Max Day	21.6	23.5	22.1	18.4	18.4	17.2	15.5	16.8	16.6	13.3

Figure 3-3: Average Day and Maximum Day Demands – 2005 to 2014

The peaking factors have also been reviewed are recommended to be reduced and as shown in Table 3-1 due to recent changes in District water use patterns. Historical MDD are shown in Figure 3-3; peaking ratios (MDD divided by ADD) ranged from 1.7 to 2.1 from 2006-2014. All peaking ratios after 2007 were below 2.0. The recommended multiplier is 2.0, since MDD has been consistently below this for the past eight years. The peak hour demand factor (PHD divided by MDD) has similarly also trended downward over recent years and has ranged from 1.4 to 1.6; the recommended PHD has been reduced to 1.6.

The decrease in water use was due to a combination of factors over the last several years including a number of changes to the operation and management of the water system have occurred such as water use efficiency program investments, meter installation and metered billing, and providing GET reuse water for irrigation at the Ancil Hoffman Park and Golf Course.

Table 3-1: Recommended Demand Peaking Factors

Peaking Factor Multiplier	2003 Master Plan	2015 Master Plan Update
Average Day Demand	1.0	1.0
Maximum Day Demand	2.0	2.0
Peak Hour Demand	1.7	1.6

3.3.2 Water Demand Projections

A summary of the key water system demands (total demand, average day, maximum day, and peak hour) for select historical periods and projected 2015, 2020, and 2035 conditions are provided in Table 3-2. The projected future demand requirements are lower than historical highs and are projected to continue into the future through continued conservation efforts. The 2014 and 2015 drought curtailments, District drought declaration, and statewide regulation for 36% conservation will require that District customers save significant amounts of additional water during drought conditions. The District should carefully monitor for any rebound effect in the form of increased water demands after the drought has ended. The projections included in the following table will be updated through the 2015 Urban Water Management Plan Update process, which will occur following completion of this Master Plan.

Table 3-2: Historical and Projected District Demand Factors

	Historical Demands			Projected Demands		
Demand Factor	High in Last 9 Years[(a)]	5-Year Average[(b)]	2010	2015	2020	2035
Total Annual (AFY)	12,496	9,541	9,732	10,124	10,044	10,176
Average Day (MGD)	11.11	8.7	8.66	9.04	8.97	9.08
Maximum Day (MGD) [(c)]	23.47	17.4	17.21	18.08	17.93	18.17
Peak Hour (gpm)[(d)]	26,081	19,333	18,456	20,083	19,925	20,187

(a) High occurred in 2006. Total annual demand based on available data for 2006-2014 time periods.
(b) 5-year average 2010-2014.
(c) Projected MDD estimated using 2.0 ADD:MDD peaking factor.
(d) PHD estimated using 1.6 MDD:PHD peaking factor.
(e) Water demand projections from 2010 UWMP, Table 7-2, Single Dry Year.

3.3.3 System Reliability and Redundancy

The District has set the objective of maintaining a prudent redundancy capacity to account for unscheduled mechanical failures or service disruptions. Table 3-3 summarizes the District's current water supply redundancy policy which was considered in assessing the production replacement schedule.

Table 3-3: System Redundancy

Production Facility	Redundancy
Bajamont Water Treatment Plant	One Standby Treated Water Pump Backup electrical generation for partial capacity
Booster Pump Stations (storage)	One Standby Booster Pump Backup drive equipment (natural gas) or electrical generation capacity
Groundwater Production Wells	One Standby Well at approximately 1,300 gpm

The 2003 Master Plan presented anticipated system redundancy improvements, including the installation of one standby raw water pump at the Water Treatment Plant (WTP), a standby booster pump at the La Vista Booster Pump Station, and an additional standby groundwater production well at approximately 1,200 gpm to 1,400 gpm. The District has installed the raw water pump and maintains standby groundwater production capacity. Additional District facility details, as well as recommended improvements, are presented in following sections.

3.3.4 Supply Evaluation

A supply evaluation was conducted to determine the available reliable capacity under maximum day and peak hour demand conditions. Table 3-4 provides a summary of the existing District firm supply sources under full surface water supply availability and the District's groundwater and surface water facilities with the status and estimated available supply capacity.

Total source capacity is determined through compliance with the CA Waterworks Standards (Title 22) and recommended District practices for minimum supply reliability and redundancy. Title 22 definition of minimum "source capacity" for systems with both groundwater and surface water requires that the system meet MDD with primary sources but does not provide specific reliability/redundancy parameters. Title 22 does require that groundwater only systems maintain a minimum of two sources, and that surface water supply be determined based upon the lowest anticipated daily yield of the source. It is recommended that the District demonstrate MDD source capacity for overall system reliability assuming the largest active well – Garfield – is offline.

The 2014 American River surface water diversion curtailment notice reduced the District's firm surface water available. Purchased Aerojet remediated groundwater provided relief and allowed for reduced operation of the surface water treatment plant concurrent with statewide mandatory conservation measures. The instantaneous diversion capacity of the surface WTP is not affected by the curtailments, however the total annual extraction volume may be limited, causing the District to rely more heavily upon groundwater, demand reduction, or other sources under these conditions. The reliable annual surface water yield under drought conditions will be documented in the 2015 UWMP.

Table 3-4: Groundwater and Surface Water Production Capacity

Supply Source	Pressure Zone	Status	Design Capacity (gpm)	Available Active Capacity (gpm)	Available Active Capacity (MGD)
Surface Water					
Bajamont WTP[(a)]	2	Active	14,400	14,400	20.7
Groundwater					
Garfield Well	2	Active	1,500	1,500	2.16
Willow Park Well	3	Active		1,440	2.07
La Vista Well	2	Active	1,500	1,500	2.16
Winding Way Well	2	Active	1,350	1,350	1.94
Barrett School Well[(b)]	2	Standby	1,300	0	0.00
Barrett Road Well	2	Inactive	---	0	0.00
Dewey Well	1	Inactive	1,500	0	0.00
Ladera Well	2	Inactive	1,350	0	0.00
Total Available Capacity			***---***	***20,190***	***29.03***
Redundancy (Garfield Well offline)				***<1,500>***	***<2.16>***
Total "Firm" Source Capacity[(c)]			***---***	***18,690***	***26.87***

(a) The nominal 22 MGD capacity was reduced to 20.7 MGD due to membrane backwash requirements.
(b) Barrett School Well was not counted as base supply due to age and water quality. However, this well is operational and available as a standby source.
(c) Firm capacity for the District assumes 1 pump from Bajamont WTP is out of service and the Garfield Well is offline. Barrett School and Winding Way wells are available as supply sources.

Table 3-5 provides a summary of the District's existing peak booster pumping capacity from the La Vista and Dewey ground level water storage tanks.

Table 3-5: Peak Supply Capacity

Supply Source	Pressure Zone	Status	Design Capacity (gpm)	Available Capacity (gpm)
La Vista Tank				
La Vista Booster 1	2	Active	1,400	800
La Vista Booster 2	2	Active	1,400	1,450
Dewey Tank				
Dewey Booster 1	1	Active	1,000	1,000
Dewey Booster 2[(a)]	1	Standby	1,000	0
Dewey Booster 3	1	Standby	1,000	0
Total Peak Supply Capacity				***3,250***

(a) Dewey peak capacity limited by actual demand in Pressure Zone 1 – pump station and tank has surplus capacity and could support expansion of the upper zone to optimize existing capacity.

The available production capacities of the District's existing supply sources were compared with the projected maximum day and peak hour demands, as show in Table 3-6 and Table 3-7. The analysis revealed that the District has sufficient maximum day and peak hour capacity to meet current and 2035 projected MDD and PHD under the requested MDD and PHD. The District has approximately 1,750 gpm excess peak hour capacity available and additional peak hour booster pumping or supply sources would provide greater reliability in the event of an unplanned source outage.

Table 3-6: Maximum Day Capacity Analysis

Category	(gpm)	(MGD)
Firm Source Capacity	18,690	26.87
2035 Projected MDD	12,618	18.17
Available Excess Source Capacity	**6,072**	**8.7**

The GSWC Intertie project is designed to provide 4.5 million gallons per day under a daily delivery schedule to increase flows during off peak hours and decrease flows during peak hour so as to utilize the available maximum day capacity and not impact the ability of the District to meet peak hour demands.

Table 3-7: Peak Hour Capacity Analysis

Category	(gpm)
Pumping Capacity	
Existing Source Capacity[(a)(b)]	18,690
Storage Booster Pumping Capacity	3,250
Total Peak Hour Supply	*21,940*
2035 PHD	20,187
Available Excess Peak Capacity	**1,753**

(a) No credit for La Vista Well - dedicated tank supply well only. Assumes Garfield well available during PHD. Supply based from booster pump station/storage capacity.
(b) Assumed no storage supply capacity from Bajamont WTP 2 MG clearwell.

3.3.5 Conjunctive Use Balance

The District conjunctively uses both groundwater and surface supplies with the goal of maintaining a sustainable groundwater supply. The District's use of both groundwater wells and surface water allows the District to provide high quality reliable water to its customers. The District's conjunctive use practices have resulted in groundwater banking credit and in-lieu recharge of the groundwater within the vicinity of the District. This practice of conjunctive use and active participation in the Sacramento Groundwater Authority's Water Accounting Framework (refer to Section 5.4 for additional discussion) has provided for increased groundwater pumping during the American River surface water supply curtailments without exceeding the District's banked groundwater supply.

The ratio of surface water to groundwater use increased after upgrade of the WTP in 2008 (see Table 3-8). Traditional operations shows groundwater use over the past decade has ranged from 13-28 percent of total supply, with surface water ranging from 72-87 percent. In 2014, with a portion of the year under SWRCB surface water curtailment, the District used approximately 70 percent groundwater and 30 percent surface water.

Table 3-8: Historical Groundwater and Surface Water Balance

Year	Groundwater Supply (AFY)	Surface Water Supply (AFY)	Total Water Supply (AFY)	% Groundwater	% Surface Water
2003	3,265	9,358	12,623	26	74
2004	3,836	9,843	13,679	28	72
2005	2,347	9,722	12,069	19	81
2006	3,521	8,975	12,496	28	72
2007	2,868	9,509	12,377	23	77
2008	1,580	10,418	11,998	13	87
2009	1,609	8,966	10,575	15	85
2010	1,518	8,214	9,732	16	84
2011	1,469	7,850	9,319	16	84
2012	1,580	8,315	9,894	16	84
2013	2,031	8,369	10,400	20	80
2014	5,826	2,441	8,267	70	30

Source Data: *2008 Sacramento Groundwater Authority Groundwater Management Plan,* Table 4, 2003-2005. *2010 Carmichael Water District Urban Water Management Plan,* Table 4-1, Years 2006-2010. Production data provided by the District 2011-2014.

3.4 District Production Facilities Replacement Considerations

This section provides a description of the District's existing production facility assets and evaluates the current condition and replacement recommendations for the existing District infrastructure, including project identification for incorporation into the Capital Improvement Plan provided in Section 4. This section also provides recommendations for continued recordkeeping and data collection as part of the ongoing operation and maintenance efforts.

3.5 Groundwater Production Wells

There are currently eight (8) existing groundwater production wells in the District (four active, one standby and three inactive) as shown on Figure 3-4. The existing groundwater facilities' capacity, status and age are shown in Table 3-9.

Table 3-9: Groundwater Production Facilities Existing Condition

Well Name	Design Capacity (gpm)	Status	Year Constructed	2015 Age	Water Quality
Garfield Well	1,500	Active	1946	69	Good
Willow Park Well	1,440	Active	1993	22	Good
La Vista Well	1,500	Active (pumps directly to La Vista tank)	1980	35	Good, periodic positive low level PCE detection
Winding Way Well	1,350	Active	1959	56	Detectable levels of Perchlorate below MCL
Barrett School Well	1,300	Standby	1992	26	Elevated Iron and Manganese; Sand Production

Well Name	Design Capacity (gpm)	Status	Year Constructed	2015 Age	Water Quality
Barrett Road Well	---	Inactive (Disconnected, Operational)	1989	26	Elevated Iron and Manganese; Detected perchlorate, detected PCE near maximum contaminant level; Disconnected in 2005 due to perchlorate levels of 4 parts per billion (ppb)
Dewey Well	1,500	Inactive (Connected, Non-operational)	1980	35	Detectable levels of Perchlorate, well fouling with biological contamination
Ladera Well	---	Inactive (Connected, Operational)	1989	26	Hydrogen sulfide odor and taste problems, manganese present also. Removed from service in 2001.

Current capacity of active wells in the District is 5,790 gpm (8.4 MGD). The existing groundwater capacity is just below the projected 2015 average day demand (ADD) of 9.0 MGD (see Table 3-2).

The useful service life of wells varies based on water quality, methods of construction, maintenance and service conditions. The EPA identifies a typical well life as 30 years. With the exception of the Garfield Well, all District wells are reasonably young when compared to a regional inventory of well age completed by the Sacramento Groundwater Authority in 2011 (*SGA, 2012*). This reflects the District prior capital improvements to both construct wells and abandon the inactive wells such as the Jan Well, Paddock Well, Engle Well, Cottage Well and Susan Well. Wells in the SGA member agencies demonstrate that significantly longer service life are not uncommon in the Sacramento area. Although a typical well life is 30 years, wells in the District could be expected to have a 40 to 50 year service life making both Garfield and the Winding Way Wells approaching or exceeding the projected end of their expected useful life. Replacement planning of the District's remaining wells should also be considered within the planning horizon of this 50 year Master Plan.

The 2003 Master Plan included recommendations for maintenance of a robust groundwater supply capacity including the construction of several new and replacement wells. However, the discovery of the Aerojet groundwater contaminant plume in 2004 changed the District's focus to rely primarily on its surface water supply source and the District delayed the construction of the three (3) wells recommended to be constructed by 2014. Groundwater contamination continues to threaten District water supplies.

Existing and future wells in the District may require treatment for single or multiple contaminants if drinking water regulations change or the groundwater contaminant plumes continue to migrate. For example, the Aerojet plume constituents may require advanced oxidation using hydrogen peroxide, ultraviolet light for NDMA destruction, granular activated carbon and ion exchange with the possible addition of air stripping for volatile organic compounds (VOCs) removal. It is unknown whether SWRCB-DDW would approve this level of treatment for a direct potable use of remediated groundwater under the current regulatory environment. DDW Policy 97-005 for Guidance for Direct Domestic Reuse of Extremely Impaired Water Sources discourages the use of sources with contamination when higher quality alternatives exist.

Reduced reliability of surface water supplies in the future may now require the District to pursue advanced treatment of groundwater. As these conditions evolve, the short term likely scenario is that groundwater treatment and delivery as a potable source will be limited to naturally occurring minerals (manganese, arsenic, chromium, iron) and one or two processes for contaminants caused or produced by humans such as perchloroethylene (PCE), perchlorate or VOCs.

The 2014 drought has highlighted the District's need to maintain a diverse portfolio of both surface and groundwater as the American River surface water curtailment order effectively eliminated the availability of surface water under existing water rights. Replacement of the existing well capacity as the wells reach the end of their useful life is discussed in this section with the goal of maintaining a minimum groundwater production capacity to support the District's customers under possible future surface water curtailment orders.

Recommendation: Replacement and/or treatment of existing wells (six [6] new wells by 2037 with an installed capacity of 13 MGD or approximately 1,500 gpm for each well). This recommendation will allow for the District to meet normal average day demand with groundwater only.

Continue monitoring groundwater quality in partnership with Aerojet and regulatory agencies. Apply knowledge to considerations limiting construction of new wells, production capacity, and implementation of wellhead treatment systems for supply reliability.

3.5.1 Garfield Well

The Garfield Well was constructed in 1946 and is an active well for the District. This well was equipped with a new submersible pump and motor in 2008. The well site is large enough to support construction of a new well at this site with minimal disruption of the existing well operation.

The Garfield Well is the oldest well in the District and remains a reliable source of groundwater

The Garfield Well is performing reliably and has good water quality. The latest video inspection was less than 5 years ago and showed the casing interior condition to be good. This well will be 69 years old in 2015 and is statistically at or beyond the useful life for a reliable water supply well. It is recommended that this well be replaced and equipped with a minimum pump capacity of 1,500 gpm. Additional capacity may be achievable but increased pumping should be reviewed with Aerojet modeling.

Recommendation: It is recommended that the District:

- drill and equip a new well with a low pressure pump at the Garfield Well site;
- pipe the new well to discharge directly into the tank at the La Vista site for blending with La Vista Well water in the La Vista Tank; and,
- consider central groundwater treatment at the La Vista site should future contamination require treatment.

Pumping directly to the La Vista site and into the tank will reduce the energy losses currently incurred through filling the tank from the water system and then re-pumping the water to return it to the distribution system.

3.5.2 Willow Park Well

The Willow Park Well is the newest well in the District and produces high-quality water

The Willow Park Well was constructed in 1993 and is an active well for the District. This well is equipped with a submersible pump and motor and Variable Frequency Drive (VFD) capability. The well is located on a very small lot and has no room for treatment or reconstruction.

The Willow Park Well is performing well and has excellent water quality. This is the newest well in the District and can be expected to continue performing well over the next 25 years. The well equipment has not been pulled and inspected in the last 10 years and although not a serious concern it is recommended that the well be video surveyed at the next opportunity.

Recommendation: This well should be video surveyed within the next three (3) years to determine its current condition.

3.5.3 La Vista Well

The La Vista Well was constructed in 1980 and is an active well for the District. This well is equipped with a 125 horsepower electric motor and pump. The well is located close to the existing La Vista tank and pumps directly to the tank. The existing La Vista site is large enough to support construction of a new well with minimal disruption of the existing well operation.

The La Vista Well is performing well, but is showing some reduction in production. This well has good water quality, however low levels of PCE contaminants have been detected at this site. The La Vista Well is 35 years old and it is recommended that this well be replaced and equipped with a minimum pump capacity of 1,500 gpm at the same time that the tank and booster pump station are upgraded in the near future (see La Vista Tank section). Additional capacity may be achievable but increased pumping should be reviewed with Aerojet modeling.

Recommendation: This well should be replaced and equipped with a minimum pump capacity of 1,500 gpm at the same time that the tank and booster pump station are upgraded in the near future (see La Vista Tank section for further details).

3.5.4 Winding Way Well

The Winding Way Well was constructed in 1959 and is an active well for the District. This well is equipped with a vertical turbine motor. The well is located on a very small lot between two houses and has no room for treatment or reconstruction.

The Winding Way Well has shown signs of declining pumping and some water quality issues. It meets all current drinking water standards; however, the well has had very low level detections of perchlorate. During the 2014 surface water curtailment period, the pump bowls were lowered

to reduce an occurrence of air entrainment and allow for additional drawdown while maintaining pumping capacity at a reduced flow.

The Winding Way Well is the second oldest operating well in the District. The declining pumping water level may be due to a dropping water table and/or it may be due to decreased well screen and formation efficiency due to age. Rehabilitation may provide for improved well performance but this is an invasive process and would result in significant disruption of the immediate residents near the well. In addition, rehabilitation of a 56 year old well should be considered a short-term measure and improvements temporary.

Recommendation: It is recommended that the Winding Way Well be replaced with a new well located at a new site, such as at the nearby O'Donnell Heritage Park. The District has a small site within the park that may not be suitable for a District well, but could be considered for a test hole to explore groundwater quality. The presence of perchlorate at the Winding Way Well, PCE at the Barrett Road Well, and naturally occurring manganese, iron and hydrogen sulfide at the Ladera Well in the northern portion of the District make the drilling and zone sampling an important step in locating a suitable well site with reduced risk of needing wellhead treatment.

The recommended schedule for the test hole is to complete it by 2022. Completion of the test well as a multi-zone monitoring well may be of interest to Aerojet. The District should discuss the site location, cost and schedule of such a well with Aerojet prior to proceeding.

A replacement well for Winding Way is recommended by 2025 and is assumed to not require treatment during initial operation. Suitable well site size should be acquired to support future treatment. A minimum well site size would be a 1/3 acre parcel which would accommodate the following:

- Well discharge piping
- Electrical transformer
- Chemical feed and electrical control building
- Future iron and manganese treatment – one pressure vessel
- Future granular activated carbon (GAC) or ion exchange treatment – two vessels; 12 foot diameter
- Future backwash tank – 14,000 gallons minimum

Until other options are considered, it is recommended that Winding Way Well remain as an active well.

3.5.5 Barrett School Well

The Barrett School Well was constructed in 1989 and is a standby-well. This well is equipped with a submersible pump and motor. The well site is within the site of the San Juan Unified School District's Barrett Middle School.

The Barrett School Well is in standby status mainly due to its water quality. This well has elevated iron and manganese below the secondary drinking water maximum contaminant level (MCL).

Recommendation: It is recommended that the Barrett School Well be inspected for production and pump performance. If the well is still viable, treatment for iron and manganese reduction should be installed. Installation of treatment at this site could include expanding the treatment to provide centralized treatment and piping of the Barrett Road Well water to this location for treatment as well.

Treatment is assumed to be initially for iron and manganese reduction in combination with blending to reduce PCE to below 80 percent of the MCL. Future addition of GAC for PCE reduction should be including in the siting negotiations with the school district. A 1/3 to 1/2 acre parcel total, including the existing well site would provide space for the following:

- Existing well and well discharge piping
- Future well and well discharge piping
- Electrical transformer
- Chemical feed and electrical control building
- Future iron and manganese treatment – two pressure vessels
- Future GAC or ion exchange treatment– two pressure vessels; 12 foot diameter
- Future backwash tank – 24,000 gallons minimum

Until other options are considered, it is recommended that Barrett School Well remain as a standby well unless needed to provide groundwater during a severe supply shortage.

3.5.6 Barrett Road Well

The Barrett Road Well was constructed in 1989 and is an inactive well for the District. This well is equipped with a submersible pump. The well is located on a very small lot and has no room for treatment or reconstruction.

The Barrett Road Well is disconnected from the distribution system but is still operational with a treatment source. Water quality has declined over recent years with detectable perchlorate and PCE approaching the drinking water MCL. In addition, this well has iron and manganese at levels below the MCL.

Recommendation: It is recommended that the District consider coupling the Barrett Road Well with the Barrett School Well using centralized treatment at the Barrett School Site and restore the well to active status. Blending of the two well supplies or partial perchlorate treatment may be required.

3.5.7 Dewey Well

The Dewey Well was constructed in 1980 and is an inactive well for the District. This well is equipped with a pump and motor. The well is located on a large lot with the Dewey Tank and booster pumps.

The Dewey Well is connected to the Dewey Tank but is non-operational. This well has declining performance and poor water quality due to severe and recurring biological fouling of the well.

Recommendation: It is recommended that the Dewey Well be destroyed.

3.5.8 Ladera Well

The Ladera Well was constructed in 1989 and is an inactive well for the District. This well is equipped with a submersible pump. The Ladera Well is located on the San Juan Unified School District Albert Schweitzer Elementary School property in the far north easterly corner.

This well has had poor water quality due to hydrogen sulfide and elevated manganese. A review of the Ladera well construction log indicates a unique formation of blue and green clays at depths where it is more common to see brown clays. The Ladera Well logs were compared with the logs from the Winding Way Well nearby and it was noted that the two wells encountered different aquifer materials, suggesting a sudden change in formation.

Recommendation: It is recommended that the Ladera Well be destroyed. Additionally, the District should consider constructing a test well in the westerly portion of the school property or within Schweitzer Grove adjacent to the school property. Construction of this test well would investigate the limits of the formation believed to contribute to the hydrogen sulfide and provide a second alternative site for construction of a replacement well for the Winding Way Well.

The recommended schedule for this second test hole is to complete it by 2022 following the O'Donnell Park test well. Completion of the test well as a multi-zone monitoring well may be of interest to Aerojet. The District should discuss the site location, cost and schedule of such a well with Aerojet prior to proceeding.

3.5.9 Well Recommendations

The recommended 15-year Capital Improvement Plan for groundwater is included in Table 3-10.

Table 3-10: 15-Year Capital Improvements Groundwater Production Facilities 2015-2030

Well Name	Demolition Date	Replacement/ Construction Date	Assumed Treatment
Garfield Well	2028	2028	PCE
Willow Park Well	2037	2037	None
La Vista Well	2023	2023	PCE
Winding Way Well	2026	2024	None
O'Donnell Park Test Hole	N/A	2022	N/A
Barrett School Well	2032	2031	Iron & Manganese
Barrett Road Well	2032	2031	Iron & Manganese
Dewey Well	2020	Not Recommended	N/A
Ladera Well	2020	Not Recommended	N/A
Schweitzer Grove Test Hole	N/A	2022	N/A

Additional Improvements:

1. Centralized Iron and Manganese Treatment for Barrett Road and Barrett School Wells (Treatment at this location may be implemented prior to 2025 depending on supply conditions). PCE treatment and Perchlorate may be required for the Barrett Road well and may result in abandonment of the well at that site.
2. Centralized PCE treatment at La Vista for both Garfield and La Vista assumed.
3, Willow Park Well may require arsenic treatment in the future.

Note: Assumed replacement wells have a minimum of 1,500 gpm capacity.

3.5.10 Ancil Hoffman Irrigation Booster Pump Station, Aerojet GET LA and GET LB

The extraction wells serving the groundwater extraction and treatment (GET) facilities at Ancil Hoffman Park (GET LA) and at the Bajamont Treatment Plant (GET LB) are owned, monitored and operated by Aerojet. These wells include treatment to meet stringent water quality criteria and meet all drinking water quality standards. The GET effluent is currently either discharged to the American River for reuse at other locations or is used at the Ancil Hoffman site to offset irrigation demands.

GET LB Designed to Appear as Residential Structure

Aerojet modeling and ongoing evaluation of effectiveness of the plume containment indicate that additional wells for extraction remain a possibility in the next several years. The overall clean up horizon remains over 200 years and it can be expected that high quality remediated groundwater will remain an element of the groundwater resource management in the District service area for the foreseeable future.

The Ancil Hoffman booster pump station supplies irrigation water from the GET LA facility directly to the Ancil Hoffman Park and Golf Course. The pump station also boosts District potable water as needed to meet irrigation demands that cannot be met with remediated groundwater. The booster pump station was completed in 2010 to replace an existing aging facility and is operating as designed.

The Sacramento County Park's department controls the irrigation pump station and has undertaken an effort to optimize use of the GET LA remediated water supply maximum flow of 900-960 gpm by lengthening the irrigation cycle and limiting circuit demands to be within the limitations of the GET well. This effort was in response to the District's 2014 and 2015 surface water curtailments and water conservation activities. Additional modifications to maximize use of the GET water may be possible in the future through a collaborative effort with Sacramento County Parks and modernization of the irrigation system and controllers.

Recommendation: Work with Sacramento County Parks department to pursue and implement improvements to their irrigation system and controllers.

3.6 Water Storage Facilities

The existing District water storage, as discussed earlier, consists of three components: two surface steel reservoirs, a buried concrete clearwell, and the groundwater aquifer. The District storage facilities are used for equalization, fire flows, and to meet peak hour water demands. In addition, the aquifer storage provides significant storage for groundwater banking and critical dry year water supply. Table 3-11 includes the two aboveground storage tanks, their capacity, construction year and last rehabilitation.

Table 3-11: Aboveground Storage Tanks

	Capacity (gallons)	Year Constructed	Last Rehabilitation
La Vista Tank	3,000,000	1971	N/A
Dewey Tank	1,000,000	1967	1997

3.6.1 Dewey Tank and Booster Pump Station

The one (1) million gallon (MG) Dewey Tank and Booster Pump Station were constructed in 1967 and last rehabilitated in 1997. During rehabilitation the tank was structurally repaired, recoated and equipped with a cathodic protection system to extend the remaining life of the tank.

The Dewey Tank 2-year coating warranty inspection indicated a coating system failure and resulted in a significant recoating effort that produced an excellent final interior system. Inspection video records from October of 2005 and May of 2007 show the inside of the tank to be in excellent condition. This tank should provide multiple decades of reliable service with periodic recoating and continued maintenance of the cathodic protection system.

The Dewey Booster Pump Station Serves Upper Pressure Zone

The booster pump station was completely reconstructed and consists of three split-case horizontal booster pumps equipped with vertical turbine pumps. The pumps include two duty pumps and one backup. The pump station is equipped with diesel engine backup power generation. The booster pumps draw from the tank and there is limited bypass capacity should the tank be taken out of service.

Capacity exists to increase the upper pressure zone service area to maximize the tank capacity and reduce the peak hour pumping demands on the Bajamont Water Treatment Plant. Improvements to the distribution system include several check valves and limited piping improvements to extend the upper pressure zone to include the north eastern part of the District between Winding Way and San Juan Avenue. These improvements are not recommended at this time as they are not necessary and would increase energy costs by increasing the total water pumped in the system.

3.6.2 La Vista Tank and Booster Pump Station

The existing three (3) million gallon (MG) La Vista tank and booster pump station were constructed in 1971. The District purchased additional land next to the site for future expansion of the tank, the booster pump station and/or groundwater treatment. The tank receives water directly from the La Vista Well and from the distribution system using an inlet control valve to limit flow into the tank.

The La Vista Tank and Booster Pump Station are in poor condition. The rehabilitation of the tank and booster pump station was deferred with a lower priority than the water treatment plant expansion, GET LA water reuse, and completion of meter installation. The existing pumping capacity is not sufficient to fully utilize the nominal 3 MG capacity of the tank in combination with

the use of the La Vista Well pumping directly to the tank. The pump station is equipped with two electrical driven pumps and one natural gas engine driven pump that is not functioning at this time. The District has been unable to find parts for the existing gas engine drive therefore this third pump is currently inoperable. The remaining booster pumps provide approximately 2,600 gpm of peaking with both pumps running and 1,300 gpm available assuming one pump is standby. The recommended pumping capacity to optimize the existing tank size and to meet the peak hour demand using storage is 7,500 gpm using three duty pumps and one additional 2,500 gpm pump as standby.

The tank coating is well beyond its useful life. The tank conditions are summarized in Table 3-12. The interior coatings include a coal tar enamel and coal tar epoxy that makes full tank inspections using SCUBA equipment difficult. Access to the tank and the ability to drain the tank are poor and an actual interior inspection difficult. In addition, inspection of the steel below the coating is impractical and a comprehensive inspection will require significant effort to remove and expose the steel.

Several alternatives were considered for upgrade of the La Vista booster pump station and either rebuilding or rehabilitation of the La Vista Tank. The alternatives are described below and were considered based on the estimated lifetime cost benefit.

Table 3-12: Summary of Existing La Vista Tank Conditions

Item	La Vista Tank
Construction	Steel
Year Built	1971
Tank Diameter	120 feet
Sidewall Height	36 feet-2 inches
Center Height	39 feet-11 inches
Volume, Gallons	3,000,000
Interior Coating:	
Sidewalls:	Coal Tar Enamel
Ceiling:	Bitumastic
Floor:	Coal Tar Enamel
Exterior Coating:	Red lead Primer with Alkyd paint.

3.6.2.1 La Vista Tank Alternatives Analysis

The alternatives considered for the La Vista Tank are included below:

Alternative 1: Do Nothing: Existing Tank and Booster Pump Station to Remain

This alternative assumes the tank is left as is. This is not recommended due to the corrosion observed on the inner and outer portions of the tank. The tank is over 40 years old, which is beyond the life expectancy for a steel tank without rehabilitation and with no corrosion protection system in place. The standby booster pump is no longer functional due to its age. The booster pump station is also undersized for the 3 MG tank.

Figure 3-5 provides a conceptual site layout for the tank rehabilitation, new booster pump station, backup power generation and future well. Figure 3-5 provides a conceptual booster pump layout with a new well bypass to allow the tank to be taken offline and maintain full well bypass operation. Figure 3-6 provides a layout for future centralized treatment

assuming a suite of contaminants and treatment with bag filters, GAC, ion exchange, and ultraviolet light. However, as stated earlier, multiple contaminants are assumed to result in a Policy 97-005 requirement and the potential for the treatment to be disallowed by SWRCB-DDW. So although Figure 3-7 shows that full treatment of the Aerojet plume could be accommodated at this site we anticipate treatment to only require bag filters and GAC for VOC reduction.

Alternative 2: Rehabilitation of Existing Tank (Recoating and Roof Replacement)

This alternative was developed based on the findings of severe structural decay in the Dewey Tank roof when it was rehabilitated. The Dewey Tank was in worse condition than the La Vista Tank at that time and the work at La Vista was deferred pending completion of supply improvements. This alternative assumes deterioration similar to that observed at the Dewey Tank will be discovered once the interior coating is removed. This alternative replaces the entire roof including the knuckle transition and the center column. In addition to replacing the roof, the inner and outer coatings should be removed and replaced with a new D102 compliant American Water Works Association (AWWA) coating system. It is recommended that the tank also be equipped with a Cathodic Protection System.

The existing tank has what is assumed to be a lead-based outer paint system. This system will have to be removed using approved methodology for lead paint removal and disposal. As well, the inner bitumastic coating should be removed and a new coating placed on the bare steel tank. The inner coating is coal tar enamel on the floor and walls to the normal high water mark and coal tar epoxy (bitumastic) up the rest of the wall and roof. It is expected that the coal tar enamel will require a labor intensive chipping process for removal and this effort has been included in the estimated cost. This is similar to the coating encountered at the Dewey Tank. Coating systems such as this are known to be vulnerable to pitting. It was assumed that some pitting has occurred and will require repair.

The available freeboard for the existing tank does not meet current seismic standards and preliminary calculations were conducted based on the location and size of the tank to determine a freeboard recommendation using current standards. It was found that there should be approximately 3.5 feet of freeboard, which will downsize the existing tank from 3 MG to approximately 2.9 MG. The additional freeboard could be implemented by installing a new overflow at the lower elevation. The existing overflow appears to be undersized and should be replaced regardless. A new overflow should include an exterior drop pipe and duck-bill check valve to reduce access to the tank and reduce damage to the surrounding area during an overflow event.

The minimum water storage recommended for this location was reviewed based on both typical surface water supply availability year and the assumption that a groundwater only condition was to occur. Under both conditions the minimum nominal tank size is about 1.8 MG. If the GSWC project proceeds, the nominal storage requirement would increase to about 2.9 MG. Based on these estimates, the existing tank can continue to provide a reliable service under a District only and District plus GSWC scenario.

It is recommended that prior to rehabilitation the District drain the tank, cut a drive in access hole in the wall, install a 36-inch man way opposite the vehicle entry and proceed to chip and blast remove the coating off the inner walls to allow a thorough inspection of the inside of the tank. This inspection should be used to confirm the cost benefit for rehabilitation of the

tank versus rebuilding the tank. It is assumed that there will be moderate welding repair of surface pitting and replacement of the roof, knuckle and center column. The current inspections are not sufficient to confirm the extent of surface corrosion on the inner wall of the tank.

Booster Pump Station Replacement

Because the current booster pump station is undersized it is recommended that the booster pump station be replaced. The total capacity of this booster pump station will be increased to include three duty pumps for a firm pumping capacity of 7,500 gpm. A backup pump is recommended to provide for the firm capacity of 7,500 gpm. An initial pump selection using a Peerless Horizontal Split Case pump indicates that a robust high efficiency pump with a steep curve and adequate shut off head exists to support the target flows using a variable frequency drive at all pumps.

The additional pumping capacity will allow for increased use of the tank for peak demand and will improve tank turnover. The additional capacity will also support the installation of a centralized groundwater treatment plant at this site for a reconstructed Garfield and La Vista wells with a new installed capacity of 3,000 gpm. The direct pumping from the groundwater table through a treatment plant to the tank will reduce energy costs over the current practice of filling the tank from the surface water supply and burning the system pressure head as the tank is filled. The current practice results in the repumping of all surface water used to fill that tank.

This alternative requires the installation of a single diesel powered generator that will be set to automatically turn on during a power outage. The standby pump should be sized to operate one booster pump and the La Vista Well.

A larger booster pump station will require installation of local transmission mains to provide sufficient pipe capacity to distribute the additional flows. Modeling confirmed that installation of an 18-inch main paralleling the existing distribution system along Robertson Avenue from La Vista Avenue to Walnut Avenue and La Vista Avenue to Fair Oaks Boulevard, 18-inch piping paralleling the existing distribution system along Fair Oaks Boulevard and Garfield Avenue and then 18-inch replacing the existing 14-inch along Stanley Avenue to California Avenue would provide sufficient capacity.

The estimated transmission main pipelines are as follows:

- 18-inch Robertson Avenue to Garfield Avenue
- 14-inch Robertson Avenue and Garfield Avenue to Hanna Court
- 12-inch Robertson Avenue and Hanna Court to Walnut Avenue
- 18-inch Robertson Avenue to Fair Oaks Boulevard
- 18-inch Garfield Avenue from Robertson Avenue to Kenneth Avenue
- 24-inch La Vista Pump Station to Robertson Avenue

The proposed transmission main and pump station were modeled using the existing hydraulic water system to confirm the recommendations and further test the following conditions:

Case 1: Base Case – 16 MGD from Surface Water Treatment Plant, Garfield Well and Willow Park Well plus 7,500 gpm from La Vista Booster Pump Station. Demand was peak hour using 18 MGD maximum day with a 1.7 peaking factor for a 31 MGD peak hour demand. The upper pressure zone with the Dewey Tank and Booster Pump Station modeled normal. Assumed La Vista Well fills the La Vista Tank with supplemental fill from the distribution system off peak. All pipe velocities are below 5 foot per second and the system pressures exceed the 45 pounds per square inch (psi) minimum peak hour system pressure criteria.

Case 2: Curtailment Case – 5.5 MGD (one pump running) from Surface Water Treatment Plant (purchased groundwater), Garfield, Willow Park, Barrett School and Winding Way wells pumping to system. This option relies on the Barrett School Well that is recommended for treatment for iron and manganese currently below the MCL. La Vista Well pumps to tank and La Vista Booster Pump providing 7,500 gpm. Dewey modeled under normal conditions. Demand was reduced from 18 MGD by 20 percent and peaked using the 1.7 peaking factor for a reduced peak hour demand of 25 MGD. All pipe velocities are below 5 foot per second and the system pressures exceed the 45 psi minimum peak hour system pressure criteria.

Case 3: Groundwater Only Case – Surface Water Plant offline, Garfield, Willow Park, Barrett School and Winding Way wells pumping to system. This option relies on the Barrett School Well that is recommended for treatment for iron and manganese currently below the MCL. La Vista pumping to tank and La Vista Booster Pump providing 5,700 gpm (2 pumps running). La Vista pumps reduced to 2 due to limitation of daily refilling capacity under the no-surface water condition. Dewey modeled under normal conditions. Demand was reduced from 18 MGD to 10.5 MGD to match groundwater supply capacity and peaked using the 1.7 peaking factor for a reduced peak hour demand of 18 MGD. All pipe velocities are below 5 foot per second and the system pressures drop below the 45 psi minimum peak hour system pressure criteria in the vicinity of Lincoln Avenue and Hollister Avenue and Albert Schweitzer School. Pressure remained above 20 psi under all cases.

Following modeling, it was found that the 7,500 gpm is sufficient for a Base Case full surface water supply condition and under a groundwater only condition with reduced system pressure.

Schedule: The Alternative 2: Rehabilitation of Existing Tank (Recoating and Roof Replacement) should be able to be completed in approximately 3-4 months. The recommended recoating and reconstructing of the La Vista Tank/Booster Pump Station will require the well to be taken out of service for one to two summer peak seasons and could negatively impact the District's water system level of service. The scheduling of the La Vista Tank/Booster Pump Station will need to be coordinated with improved multi-season surface water reliability such as following two (2) above average rainfall years.

Alternative 3: New Tank

The new tank alternative hydraulics are the same as described for Alternative 2.

Alternative 3a: 3 MG Tank with Sufficient Peaking for GSWC Supply

This alternative includes removal of the existing tank and replacement with a new 3 MG tank. The new tank was sized to provide sufficient peaking capacity for the District with provision for the future delivery of water to GSWC. This alternative assumes the existing booster pump station will get replaced as described in Alternative 2. This alternative provides sufficient additional peaking capacity to support the GSWC 4,500 gpm use of the WTP without affecting the District's deliveries. The same pipe upgrades as were included in Alternative 2 will be necessary for Alternative 3a.

Alternative 3b: 1.5 MG Tank with Peaking for District Only

Alternatively, a smaller, 1.5 MG tank could be installed to supply 450,000 gallons equalization storage, assuming 1,500 gpm peaking capacity over a 5-hour period. Additional capacity includes 675,000 gallons of fire storage and a 25 percent safety factor (the safety factor takes into account the fact that not all of the tank capacity is usable). This alternative will not supply sufficient equalization storage and booster pump capacity to provide 4,500 gpm water to GSWC during peak hour conditions without reduction of water pressure throughout portions of the District. This alternative also relies on the WTP for supply of the majority of PHD supply and would not meet system demands under a Curtailment Case or the Groundwater Only Case. This option is not recommended.

Schedule**:** The Alternative 3: New Tank should take approximately 6-8 months for demolition and reconstruction of the La Vista Tank.

Recommendation: A cost analyses for each of the Alternatives was conducted and are presented in Appendix B.5. Alternative 2, recoating and rehabilitation of the existing tank and installation of a new, larger booster pump station is recommended as the most cost effective option. This alternative has the least initial cost, provides 20 plus years of reliable service and will provide for full use of the 3 MG tank capacity for peaking. The District should be prepared for full tank replacement if the detailed condition inspection after coatings are removed reveal that there is insufficient steel material remaining to warrant rehabilitation.

Conceptual Construction Phasing Plan

The recommended schedule is to complete construction entirely between the October 1 and May 1 window (7 months) when the District does not need to rely on the tank for peaking or need the supply from the La Vista Well. The following phasing plan is recommended:

Year 1: Install Piping and new Booster Pump Station
Year 2: Repair or Install Tank

- Bid inspection and repair/rebuild as single project
- Cut in access manway and conduct inspection (~6 weeks)
- Rehabilitate tank (~3 to 4 months)

3.7 Upper Pressure Zone Realignment Study

The realignment of the upper pressure zone would relieve peak hour pumping from the middle pressure zone and improve operating efficiency in the north easterly area of the middle zone

near Lincoln Avenue and Hollister Avenue and Albert Schweitzer School. The reconfiguring would increase District electrical demand by requiring the repumping of the water currently being serviced directly from the middle zone as the water would instead break head to atmosphere in the Dewey Tank and then be repumped to increase the system pressure of the upper zone.

The area evaluated for the pressure zone realignment is also the area of the District that drops below 45 psi under the groundwater only scenario associated with the continued severe drought including full surface water curtailments; expiration of the contract with Aerojet for a purchased groundwater supply; and indirect reuse through the Bajamont Water Treatment Plant. Under this condition the realignment would improve service to the group of upper zone 2 customers.

A second alternative to addressing a protracted or recurring drought and curtailment water supply challenge is included in the recommendation to install groundwater treatment at Barrett School Well and pipe Barrett Road Well to the same site for PCE treatment. This centralized treatment site would include conventional oxidation, adsorption and filtration for iron and manganese for the Barrett Road Well and GAC from the Barrett Road Well. A third well to replace Winding Way is also recommended to strengthen the groundwater source capacity in the north eastern part of the District's central zone.

Recommendation: Realignment of the upper pressure zone to expand the service area is not recommended at this time because it will not offset the construction costs or energy reduction benefit. However, it may be a viable action in the future to shed peak pump capacity requirements under supply cutbacks.

3.8 Emergency Conditions Preparation Planning

The District has a *2010 Emergency Response Plan* that includes details on how to react in the event of an emergency condition. This document should be used in the event of an emergency and it is recommended that this is updated every five (5) years to maintain an accurate and up to date description of emergency procedures.

The Master Plan considers a high-level assessment of existing assets that are in place for two scenarios as well as discusses some high-level assessment of potential outcomes for the following three (3) emergency situations:

1. Flood: It is possible that a large enough flow in the river could damage one of the Ranney collectors causing short- or long-term effects to the Bajamont WTP capacity. This situation could require the District to rely only on groundwater for a period of time. Large flows in the American River do not generally occur during the summer months when demands are the greatest. This would give the District time to repair the damage, locate a different supply source, or activate its Water Shortage Contingency Drought Plan. No additional scenario is included for this emergency condition.

2. Power Outage: The Bajamont WTP is on two separate grids and the wells are located throughout the District. It is unlikely that a localized power outage would largely affect the District; however, a widespread power outage was considered in Scenario 1 that follows.

3. No Surface Water: The 2014-2015 drought has further highlighted the necessity of maintaining a diverse water supply portfolio. On 27 May 2014 and again on 1 May 2015,

the State Water Resources Control Board (SWRCB) issued a Notice of Curtailment to stop diverting post-1914 water rights from the American River. A no surface water scenario is discussed in Scenario 2 that follows.

Scenario 1: Power Outage

During a power outage, Table 3-13 presents the emergency supply based on the following available emergency generators:

A. Dewey Tank: The District has an emergency supply generator at the Dewey Tank. This generator provides for 1,000 gpm peaking supply (1 pump).

B. Bajamont Water Treatment Plant: The District has a 1,000 kW standby emergency engine generator driven by a diesel engine. The generator control system is equipped with an automatic transfer switch to start and transfer power to the generator immediately in the event of a power failure. The generator can run approximately 50 percent of the plant capacity or 11 MGD. It is recommended that every 5 years the District conduct a mock power outage true operation simulation to confirm the functionality of this system during an emergency power outage as part of updating their Emergency Response Plan. The generators at the two wells should be included in this analysis.

C. La Vista Tank: Currently there is no emergency supply source at La Vista. The recommended Alternative 2, will provide an emergency supply source at La Vista of 1,500 gpm peaking and 1,500 gpm supply (La Vista Well).

Table 3-13: Emergency Supply

	Total Supply (MGD)	**Peak Hour (gpm)**
Goal	9.08 (2035 ADD)	12,620 (2035 MDD)
Current Emergency Supplies	11	8,650
With La Vista Alternative 2 Implemented	13	12,500

Scenario 2: No Surface Water Supply

This scenario would require significant mandatory conservation and use of water provided by neighboring water agencies to meet severe conservation criteria and not have recurring low system pressures. The reconstruction of the La Vista Booster Pump station as recommended would provide sufficient capacity to meet an 18 MGD peak hour demand under a 10.5 MGD maximum day condition corresponding to a 43 percent mandatory conservation. The emergency installation of centralized groundwater treatment at the Barrett School site to treat both Barrett School and the Barrett Road wells would increase the capacity under a no surface water condition to about 13 MGD and would reflect a required 30 percent reduction is water use.

Recommendation: Conduct an analysis of the functionality of the emergency supply generators as part of update of the *Emergency Response Plan* every 5 years.

3.9 Bajamont Water Treatment Plant

This section discusses the passage of water through the Bajamont Water Treatment Plant. Water is diverted to the Bajamont Treatment Plant via Ranney collectors, pumped and treated using membrane filtration, and sent to a clearwell and chlorine contact chamber prior to distribution through booster pumps.

3.9.1 Ranney Collectors

The diversion facilities include three active radial infiltration collectors (collector) constructed using the Ranney Method. The estimated capacity of the diversion at the time of the WTP construction was 22.4 MGD at an American River flow at Fair Oaks Bridge of 1,000 cubic feet per second (cfs). The reported collector capacities shown in the WTP Record Drawings are 6.3 MGD at Collector 1, 4.1 MGD at Collector 2, and 12 MGD at Collector 3.

The Ranney collectors provide for infiltration from the river bed gravels. The collectors feed into a centralized caisson and a 48-inch pipeline river crossing to the raw water pumping caisson at the WTP. The collectors consist of 13-foot diameter concrete caissons with horizontal perforated inlet laterals extending in the gravels approximately 20 feet below the current river bed. The collectors were constructed by the Ranney Corporation in the late 1950s and provided reliable high quality water supply through the late 1980s when surface water treatment regulations required additional treatment to provide multi-barrier processes for surface water treatment. The District proceeded with the planning, design, and construction of the WTP including inspection and rehabilitation of the Ranney collectors in 2000-2001. The original collector infrastructure included dedicated pumps at each collector. The pumping facilities were removed following completion of the WTP and all flow from the collectors is by gravity with a gradient created by the WTP raw water pump station.

The 2003 Master Plan identified the collectors as critical to the reliability of the WTP and identified the capacity as between 15 and 22 MGD based on preliminary findings of the Layne/Christensen Corporation (Layne). The Layne estimated production capacity did not include discussion of recent testing or evaluation of the condition of the collectors. The 2003 Master Plan included a recommendation to conduct inspections and plan for proceeding with rehabilitation targeted for 2014 and 2024 with major reconstruction in 2034. The 2003 Master Plan recommendations included estimated costs to provide a basis for determining the long-term financial renewal and replacement liability of the District.

Deterding Collector (Collector 4) near Ancil Hoffman is inactive but remains an authorized American River surface water point of diversion

The Deterding Collector (Ranney Collector 4) is currently not equipped to deliver water to the system and is no longer connected to the distribution system. The collector laterals are in poor condition and rehabilitation of the structure and replacement of the laterals would be required to place the Deterding Collector back into service. The Deterding Collector is a permitted point of diversion on the American River and should be

maintained to protect the existing point of diversion.

Recommendation: It is recommended that a *Ranney Collector Study* be conducted in 2017 to determine the current condition and capacity of the active Ranney collectors. This study should indicate whether rehabilitation or improvements to the collectors are necessary. The following three analyses should be included in the study:

1. Compare Raw Water Caisson Level, River Flows, and Water Treatment Plant Flows over the last 10 years for changes in production due to low flows in the river and Ranney collector capacity;

2. Conduct a pump test at full capacity (22 MGD) to confirm current capacity of the collectors; and

3. Video each Ranney collector, all laterals and connection pipelines and the junction structure to determine existing physical condition.

4. Monitor stability of the Deterding Collector and maintain it as an optional diversion location for future District use.

3.9.2 Raw Water Pumps

There are four vertical turbine raw water pumps installed in the central raw water caisson at the WTP site. The pumps are used to move water through the entire membrane treatment process. Three pumps were initially installed, and a fourth pump was installed with the WTP expansion in 2008. The pumps are performing at the design capacity.

The District has implemented a new program to test the treated water pumps in even years and the raw water pumps in odd years. Pumps testing below a minimum efficiency will be pulled and reconditioned. It is possible that replacement, modification, or reconditioning of the pumps or motors will be required to achieve the desired capacity.

Recommendation: It is recommended that the District continue its current schedule to test the raw water pumps.

3.9.3 Membranes

The Bajamont WTP has primary, secondary, and tertiary membrane filter treatment blocks. The membranes are manufactured by Evoqua (previously Siemens). The primary treatment membrane process includes two (2) independent trains of polypropylene (PPE) skid mounted membrane treatment units with eight (8) skids per train and 90 modules per skid. The effluent of the primary membrane treatment process is dosed with chlorine and discharged to the chlorine contact chamber prior to pumping into the distribution system.

The backwash from the primary membrane filters are piped to the backwash holding tank to the secondary membrane filters. These membranes are polyvinylidene difluoride (PVDF) and consist of two (2) skids equipped with 48 modules each. The effluent of the secondary treatment is discharged to the raw water caisson as per the Filter Backwash Rule (FBR) to be treated by the primary filters.

Bajamount Plant Expansion with New Membrane Skid 2007 (In progress)

The backwash from the secondary membrane filters are sent to the tertiary membrane filters. These membranes are PVDF and consist of two (2) skids with six (6) modules per skid. The effluent of the tertiary filters is discharged to the raw water caisson, to be treated by the primary filters. The backwash from these filters is discharged to the sewer under a restrictive permit.

A pressure decay test is performed automatically every 24 hours. Depending on results, on operator may perform sonic testing to identify any broken or damaged fibers. Pinning is conducted if an issue in one of the filters is identified.

Recommendation: It is recommended that the District conduct a *Facilities Replacement Planning Study* in 2021 to identify the physical condition of the major assets within the WTP. The analysis will include life-cycle curves for the major assets within the treatment plant including recommendations for modification to a new membrane system versus continuing use of the existing system. A high-level analysis of current technologies is included as Appendix A to this document. The estimated cost of this analysis is $150,000.

3.9.4 Bajamont Water Treatment Plant Clearwell and CT Chamber

The treated water from the membranes is sent to the chlorine contact chamber (CT chamber) which is a 219,000 gallon serpentine channel which provides the required contact time for chlorination. Treated water effluent from the primary membrane is dosed with sodium hypochlorite prior to entering the channel. After passage through the serpentine channel, the water passes over a weir and into a dual chamber clearwell for pumping to the distribution system. Sodium hydroxide is added for pH control near the effluent weir.

The District inspects the CT chamber and clearwell every 5 years or when necessary. The clearwell was inspected by a diver in 2003, 2004, 2005, and 2007 and have shown the clearwell to be in good condition.

Recommendation: It is recommended that the District continue its current schedule of inspection.

3.9.5 Treated Water Pumps

The four (4) treated water pumps (3 duty and 1 standby) boost treated water from the clearwell for delivery to the distribution system and District customers. The pumps should perform at the design capacity under a full clearwell condition. However, this has not been the case and the total production capacity is reduced rapidly as the clearwell level drops. Observed pump capacities range between 3,500 gpm to 3,700 gpm each, whereas the design capacity is 5,100 gpm each. Prior evaluations indicated that the pump selections are reasonably efficient and that there is little to no available surplus motor horsepower capacity to provide additional performance without exceeding the rated motor horsepower name plate values.

The evaluation of the treated water pumps as part of the GSWC pipeline conveyance project review indicated that some drop in system pressure may be required to deliver the desired flow during the peak hour conditions. However, this occurrence will not be necessary under the reconstructed La Vista Tank and Booster Pump Alternative 2 option for all normal years and under curtailment years when at least 5.5 MGD of purchased groundwater or alternative supply allows for continued operation of the WTP at a reduced flow.

Expanded Bajamont WTP to 22 MGD

An analysis of the treated water pumps existing capacity and performance are critical. The District has implemented a new program to test the treated water pumps in even years and the raw water pumps in odd years. Pumps testing below a minimum efficiency will be pulled and reconditioned. It is possible that replacement, modification, or reconditioning of the pumps or motors will be required to achieve the desired capacity. The first treated water pump was pulled and reconditioned in November 2014. This pump was found to be in critically poor condition with severe impeller erosion due to apparent cavitation resulting from low water levels in the clearwell.

Recommendation: It is recommended that the District continue its current schedule to test and recondition if necessary the treated water pumps.

3.10 Distribution System

The existing District piped water system consists of several types of pipe materials ranging from steel pipe installed in the pre-1950s to the ductile iron pipe installed as a District standard today. The intended service condition of the pipe system also varies depending on the pipe size. The District's largest pipelines are dual 24-inch transmission mains connected to the Bajamont WTP. Smaller lines are distribution mains providing service laterals consisting of small diameter lines from the mainline to the service valve.

The pipeline replacement methodology focuses on the distribution and transmission pipeline elements. The service laterals are included in the Planned System Maintenance (PSM) program; however, a detailed evaluation of a replacement strategy is discussed later with the meter retrofit planning approach.

3.10.1 Operational Conditions and Criteria

Pipeline facilities are required to meet the following critical service conditions:

A. Water Transmission – Water transmission mains consist of larger pipelines intended to transfer large volumes of water from a central source of supply to various parts of the District. These pipelines typically are installed without service connections to limit the possibility of a pipeline shutdown to repair a service. Transmission mains typically are installed with a parallel smaller distribution main available for local water service.

The District water supply consists of both a distributed supply and a central supply as follows:

1. Distributed Supply: The groundwater production wells and storage reservoirs are located throughout the District. Transmission pipelines in the vicinity of these sources of supply are not necessary. Twelve-inch and larger pipes may be needed to limit peak flow velocity; however, limiting service connections to these pipelines is not necessary. Transmission mains are not needed to connect and distribute supply from the distribution sources. However, it may be beneficial to reconsider a transmission backbone network that would allow the District to deliver or receive water from neighboring agencies.

2. Centralized Supply: The Bajamont WTP is a centralized supply providing up to 22 million gallons per day of capacity. Transmission pipelines delivering this water supply are recommended and to a large degree exist within the District. The existing transmission mains include 20- to 30-inch steel pipelines and 20- to 24-inch ductile iron pipelines.

B. Water Distribution Mains – The bulk of the buried infrastructure consists of water distribution mains ranging in size from 4-inch to 18-inch pipe. The following is an overview of the existing distribution pipeline system components.

   1. The 4-inch and smaller pipes are the oldest components in the system. The 4-inch and smaller pipelines are both steel and asbestos cement material. Replacement of small diameter backlot water mains is a high priority for the pipe replacement program.

   2. The 4-inch to 18-inch pipelines vary in materials from different types of steel pipe to asbestos cement, PVC and ductile iron. Installation trends show that the steel material is the oldest followed by asbestos cement pipe, PVC, and most recently ductile iron pipe.

C. Minimum Service Conditions – The pipeline network needs to provide a reliable water supply with adequate hydraulic capacity to meet the following criteria:

   1. Maximum Day Demand: Minimum Pressure, 40 psi.
   2. Maximum Day Demand plus Fire Flow: Minimum Pressure, 20 psi.
   3. Peak Hour Demand: Minimum Pressure, 30 psi.

   In addition, the pipeline sizing should result in internal flow velocities under the maximum day flow conditions of not greater than 5 feet per second (fps). Possible exceptions are for fire flow where velocities may exceed 10 fps if the minimum pressure is maintained.

3.11 Existing Pipeline Condition Summary

This section includes recommendations for pipeline planned system maintenance. A pipeline replacement decision matrix addressing the following conditions is recommended for tracking and projecting pipe replacement using existing and future data. The key parameters to be monitored are as follows:

Type of Pipe	Steel, asbestos cement, PVC, ductile iron indicates susceptibility to corrosion and failure.
Age of Pipe	Combined with expected useful life indicates replacement schedule.
Maintenance History	Pipe with known problems are given a higher priority. (These pipes are included in the 10-Year PSM.)
Inspection and Monitoring Findings	Based on findings from inspection and testing of selected pipeline reaches and supplemental reports.
Multiple Service	Two projects remain to complete the upgrade of all multiple services on small diameter pipelines to larger diameter distribution mains. The projects are the Johnson Lane and Whitewood Way pipelines.
County Projects	Prioritized replacement based on County road projects that will either impact pipes by construction loads or limit access due to new pavement cutting moratorium.
Developer Project	Prioritized replacement based on developer projects that would impact pipes by construction loads, increase demand (fire flow) or limit access due to new pavement cutting moratorium.
Other Conditions	Overriding considerations, such as adding a marginal pipe to a project for an economy of scale project, or to increase capacity.

Monitoring and tracking of the condition and progress of pipeline replacements throughout the District will likely require additional staffing to support.

The initial 5- and 10-year Planned System Maintenance (PSM) program address old pipelines, high leak occurrence, and undersized pipelines. The pipelines predominantly are steel pipe originally installed pre-1950s. Seventy-nine (79) projects have been identified for replacement and are shown on Figure 3-11, Figure 3-12, and Figure 3-13 and on a disk for use with the District GIS. The individual PSM projects have been bundled into groups to allow for annual scheduling and bidding of improvements. The remaining portion of the 50-year replacement plan is based on expected remaining useful life and a scheduled capital replacement under a PSM program.

Figure 3-8 shows the diameter of the distribution system. Figure 3-9 shows the pipe materials in the distribution system. A summary is included in Table 3-14 showing asbestos cement and steel are the two most common materials in the District system.

Table 3-14: Estimated Pipeline Length Breakdown by Material and Diameter, Linear Feet (LF)

	Material						
Diameter	**Other**	**Asbestos Cement**	**Polyvinyl Chloride**	**Concrete Cylinder**	**Ductile Iron**	**Steel**	**Total**
0-6	323	276,909	5,084	0	3,299	77,989	363,604
8	0	120,159	45,080	0	63,486	16,198	244,923
10	0	44,546	15,638	1,538	4,424	10,645	76,791
12	16	38,710	12,828	0	16,383	4,706	72,644
14	0	4,096	809	0	1,134	17,376	23,415
18	0	0	0	3,066	2,895	433	6,394
20-24	0	35	0	0	14,943	4,272	19,250
30	0	0	0	0	29	3,424	3,453
48	0	0	0	2,411	0	0	2,411
Unknown	18	0	0	0	5	0	24
Total	**357**	**484,454**	**79,439**	**7,015**	**106,600**	**135,043**	**812,908**

Source: Carmichael Water District. "Asset Information Management". Database query, July 24, 2014.

The installation dates for pipelines was not well recorded. The 2003 Master Plan assumed a pipe age based on the type of pipe. In general, the District was developed in phases, and one type of pipe generally was installed during each high growth period.

Since the 2003 Master Plan, the assumed pipe age was updated based on known dates of development. The pipeline ages were updated to match the date of development within that area based on an analysis of proximity or location within the known parcels for a particular development. Thus, the current mapping is more accurate than the previous assumptions made in the 2003 Master Plan. Figure 3-10 shows the pipe by ages within the District. The pipe diameter and installed total footages for the different materials by decade are shown in Table 3-15.

Table 3-15: Estimated Pipeline Length Breakdown by Material and Age, LF

Pipe Age (years)	Pipe Material						
	Other	Asbestos Concrete	Polyvinyl Chloride	Concrete Cylinder	Ductile Iron	Steel	Total
0-10	2	115	0	0	20,042	0	20,158
11-20	17	118	396	2411	49,208	1,641	53,791
21-30	16	4,263	78,077	0	36,006	92	118,454
31-40	323	49,536	836	0	190	38	50,922
41-50	0	125,815	0	0	22	1,372	127,210
51-60	0	242,570	97	0	41	1,848	244,556
61-70	0	57,246	33	4,604	146	26,063	88,093
71-80	0	4,750	0	0	455	103,988	109,193
>80	0	41	0	0	490	0	530
Total	**357**	**484,454**	**79,439**	**7,015**	**106,600**	**135,043**	**812,908**

Source: Carmichael Water District. "Asset Information Management". Database query, July 24, 2014.

Table 3-16 provides an estimate of the expected useful service life of the pipe materials installed in the District. These values are based on a recent nationwide analysis conducted by AWWA. The results were separated by geographical location and expected ground conditions and installation practices. It is recommended that the District begin a monitoring program to determine the actual lifespan of the pipelines within the District based on historical leak data and pipe condition evaluations. This is important for estimating actual pipe replacement lifetimes as well as identifying problem pipes. Continual reactive repair of a problem pipe can become much more costly than replacement of the entire pipe segment. It is therefore important to identify pipelines that have had issues to properly prioritize these pipelines as well as identify any trends that may help prioritize other District pipeline replacement projects.

Table 3-16: Estimated Service Life by Pipe Type

Pipe Type	Steel	Asbestos Cement (LSL)	Asbestos Cement (SSL)	Poly Vinyl Chloride	Ductile Iron (LSL)	Ductile Iron (SSL)
Average Years of Service	95	105	75	70	110	60

(a) LSL indicates a relatively long service life for the material resulting from some combination of benign ground conditions and evolved laying practices etc.
(b) SSL indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices, etc.

3.12 Pipeline Condition Monitoring

The pipeline condition monitoring program recommendations are the same for this Plan as was recommended in the 2003 Master Plan.

Steel Pipe Monitoring Program

The steel pipe monitoring program will consist of coupon sampling and ultrasonic testing. Each year during the 10-Year PSM, the District should:

- Pothole 30 sites per year based on soil conditions, type of pipe coatings, etc. Take care not to damage the pipeline during excavation and backfill. Each exposed location should be tested and a record developed for the following items:

    - Expose the entire circumference of the pipe for inspection and clean the external surface of dirt.

    - Visually inspect the pipe; photographically record the condition; note condition of coating, any cracks, corrosion ovality, or other visual defects.

    - Ultrasonically test the pipe to determine wall thickness, depth of pits, etc.

- At 10 of the locations for the first 5 years and 5 thereafter, remove a coupon sample for visual inspection and laboratory analysis. Coupons will be used to calibrate and validate the results of the ultrasonic monitoring.

- Each pipeline will be monitored at least twice within the 10-year period. Each successive monitoring of the pipeline should be as close to the previous sites as possible, but not include the same zone to minimize the chance the monitoring activity affects subsequent results.

When any steel pipeline is repaired or replaced, sections up to one-foot long shall be removed and brought back to the shop for visual inspection and possible testing. Pipe sections should be labeled as to the following:

- GIS pipe segment number.
- Estimated installation date.
- Trench condition (wet, dry, native backfill, import backfill).
- Sample date.
- Reason for sampling and associated work order number.

Asbestos Cement Monitoring Program

Because the primary component of asbestos cement pipe is portland cement, it can be degraded similarly to other portland cement products. Asbestos cement is degraded by low pH, low alkalinity conditions. Fortunately, the District maintains favorable water quality conditions. The asbestos cement monitoring program will consist of:

- Sampling of 30 sites per year;

- Excavating to uncover and remove sections of ACP;

- Visual inspection of the pipe; photographically record the condition; note condition of pipe for cracks, corrosion, ovality or other visual defects;

- Phenolphthalein staining to determine the remaining usable pipe wall thickness; and

- When an asbestos cement pipeline is removed, a foot-long section of the pipe being replaced should be collected by the District for visual testing and phenolphthalein

staining. Pipe section removal should be labeled as directed above and brought to the shop for inspection.

Any pipeline being replaced, even for sections as short as a section for installation of a valve should be inspected and the condition noted and recorded in a readily accessible electronic format.

Pipeline Leak History and Condition Asset Management Tool

It is recommended that the District develop GIS interface menus and templates for use by the distribution staff in reporting, tracking and displaying leak history, repair records, inspection reports, and monitoring results using the existing District GIS map as the foundation. This element of a GIS program should be considered as one branch or spoke of a broader centralized GIS database providing services to all District departments.

The different pipeline material types (for example: cast iron, asbestos cement, and ductile iron) in the District have and will continue to exhibit varying performance characteristics as they age such as structural failure, susceptibility to leakage, or degradation of water quality. Further investigation may also reveal other recognizable trends related to pipeline degradation, such as installation conditions (such as corrosive soil used as bedding material), service function (such as transmission main versus distribution pipeline), construction standards, and other parameters.

Pipeline Replacement Ancil Hoffman Park 2010

In 2007, the District developed an Access Database system to input leak data. The intent was to use temporary help and perhaps student interns to input historical leak history data and perhaps current occurrence data. This work was delayed due to budget constraints. It is recommended that the District renew the effort to quantify the leak history and maintain current leak records.

3.13 Emergency Connections Planning

The District has emergency connections with three (3) water agencies, but these connections are sized for emergency operations only and are not set-up for regular exchange of water between the Districts (see Figure 3-4). To use these emergency interties, operators have to open the connecting valves between Districts.

- **Fair Oaks Water District (FOWD Intertie 1)**: one (1) 8-inch intertie.
- **Citrus Heights Water District (CHWD Intertie 1)**: one (1) 6-inch intertie.
- **Sacramento Suburban Water District (SSWD Interties 1, 2, and 4)**: two (2) 6-inch (SSWD 2, SSWD 4) and one (1) 12-inch intertie (SSWD 1) to an existing District 18-inch pipeline and one (1) 2-inch connection. The two 6-inch connections have not been used, but if they were to be used, the District would need to provide notice to customers that

they are being served fluoridated water. The 12-inch intertie is in the northern service area of SSWD which is not fluoridated and could be used without a fluoridation notice.

Future opportunities for emergency connections:

- **Sacramento Suburban Water District (SSWD Intertie 3)**: There is a future turnout on a SSWD transmission main (SSWD 3) on Mission Avenue installed for future connection to the District to deliver fluoridated water. This connection could also be designed to deliver high flows.

- **Del Paso Mano Water District (DPMWD)**: In order to utilize the District's existing emergency mutual aid agreement with DPMWD beyond shared resources, the District could explore an intertie with DPMWD. Although DPMWD is not directly connected to the District, it has a non-fluoridated water source and has explored construction of a pipeline and booster pump station to connect the two systems. The DPMWD service area is not shown on Figure 3-4, but it approximately ½ mile west of the nearest district infrastructure.

- **Golden State Water Company (GSWC Intertie 1)**: The District is completing a project with GSWC to install a pipeline underneath the American River at the Bajamont WTP site to connect to the GSWC Cordova system. The intertie is scheduled for completion in late 2016. If this project moves forward, the addition of a booster pump station by GSWC could allow for the delivery of emergency supplies to the District.

Recommendation: It is recommended that the District flow test and improve each turnout structure to be serviceable and provide metering should extended use be necessary under a severe drought condition. In addition, the District should complete the connection to the SSWD 20-inch Mission Avenue transmission main at SSWD Intertie 3.

3.14 Other Facilities Replacement Planning

The District owns and maintains several buildings and an inventory of materials, equipment and tools that require periodic replacement and renewal. The planning for replacement of elements such as a building roof, painting of structures, purchase of trucks, hand tools, and replacement of the Information Technology (IT) systems has been completed with input from the District staff, and a detailed summary used to develop the Capital Improvement Plan projections. Actual annual costs and replacement schedules for these other facilities should be reassessed each budget cycle/rate setting cycle to address the condition, remaining service life and the risk/consequences of failure. Higher risk/consequence assets such as the District office roof should be replaced prior to failure where a deferred replacement on the air conditioning equipment may be an acceptable option based on the available revenue.

The 2003 Master Plan included a line item of $300,000 annually for maintenance of District equipment and non-production related infrastructure such as the District office. The District has since compiled a list of projected costs for maintenance of this equipment and infrastructure, which was incorporated in development of the overall Capital Improvement Program (CIP) including the following. The list includes the following categories:

1. Distribution Maintenance: maintenance required for the distribution warehouse, wash rack, parking garage, solar carport, equipment, corporation yard, as well as tools and vehicles required for use by the distribution system operators.

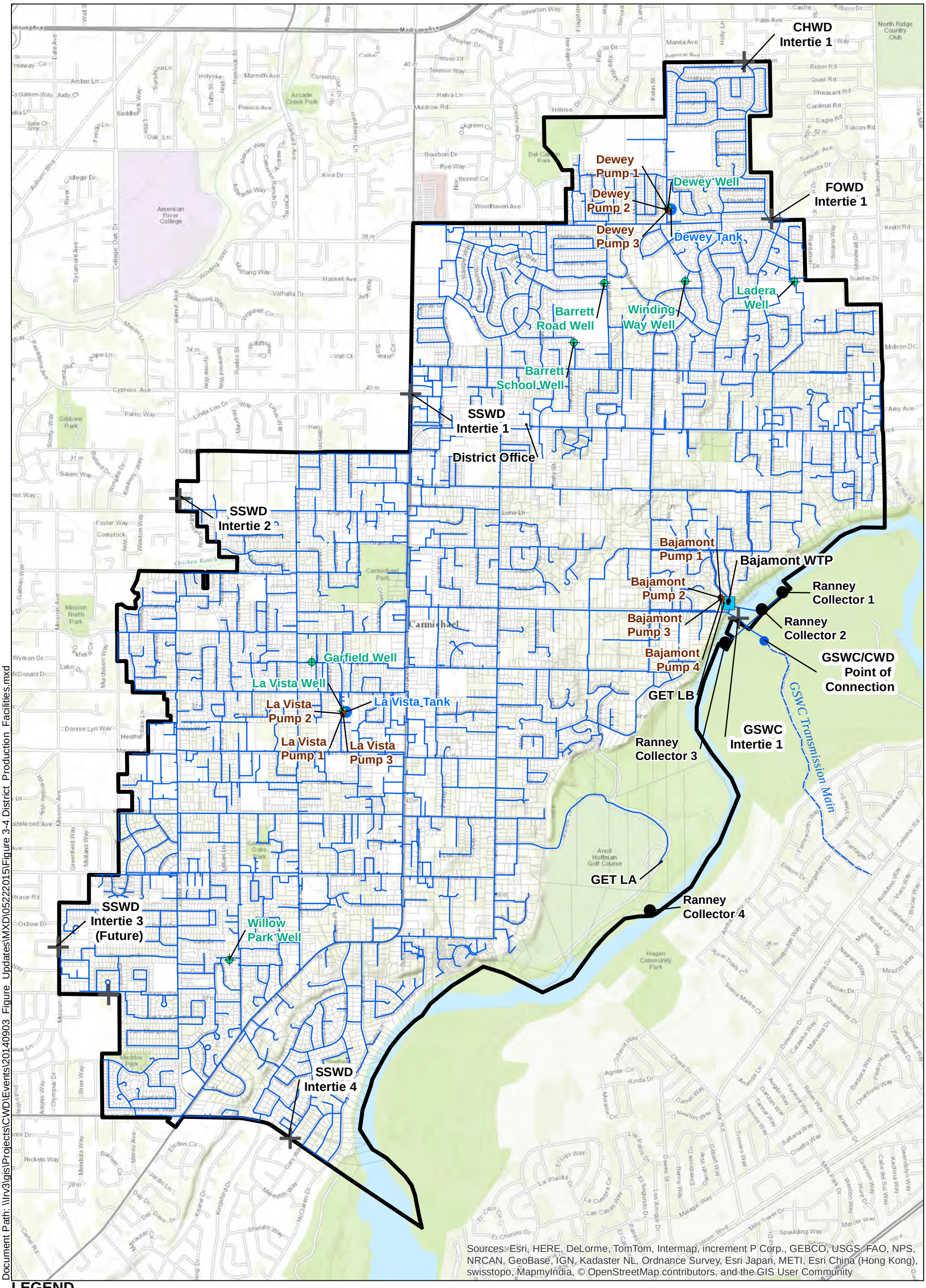
2. Financial Services: furniture, office equipment, and vehicles required by the financial services staff.

3. Administrative: computers, security, maintenance of the District office (i.e., roofing, flooring, HVAC, painting, etc.), meter reading and GPS equipment, vehicles, and furniture used by the administrative staff.

4. Production: vehicles, equipment instrumentation, and tools, as well as furniture and security upgrades, used by the water treatment staff. This segment also includes the upgrade and maintenance of the raw water pump building and water treatment plant building.

The CIP includes cost back-up provided by the District regarding the required equipment and maintenance required for normal District operations (see Appendix B.2).

Recommendation: The District may wish to develop an asset management plan that provides additional detail as to the comprehensive fixed assets with a condition assessment, level of service, and risk/consequence of failure with a prioritized schedule for replacement/renewal.



Document Path: \\rv3\gis\Projects\CWD\Events\20140903 Figure Updates\MXD\05222015\Figure 3-4 District Production Facilities.mxd

LEGEND

- Interties
- Booster
- Diversions
- Pipeline_to_GSWC
- Reservoirs
- Wells
- WTP
- Service Area
- Pipelines
- Parcels

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

District Production Facilities

K/J 1370020*00
June 2015

Figure 3-4

Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

Conceptual Site Plan
Existing La Vista Tank

June 2015
K/J 1370020.00
Figure 3-5

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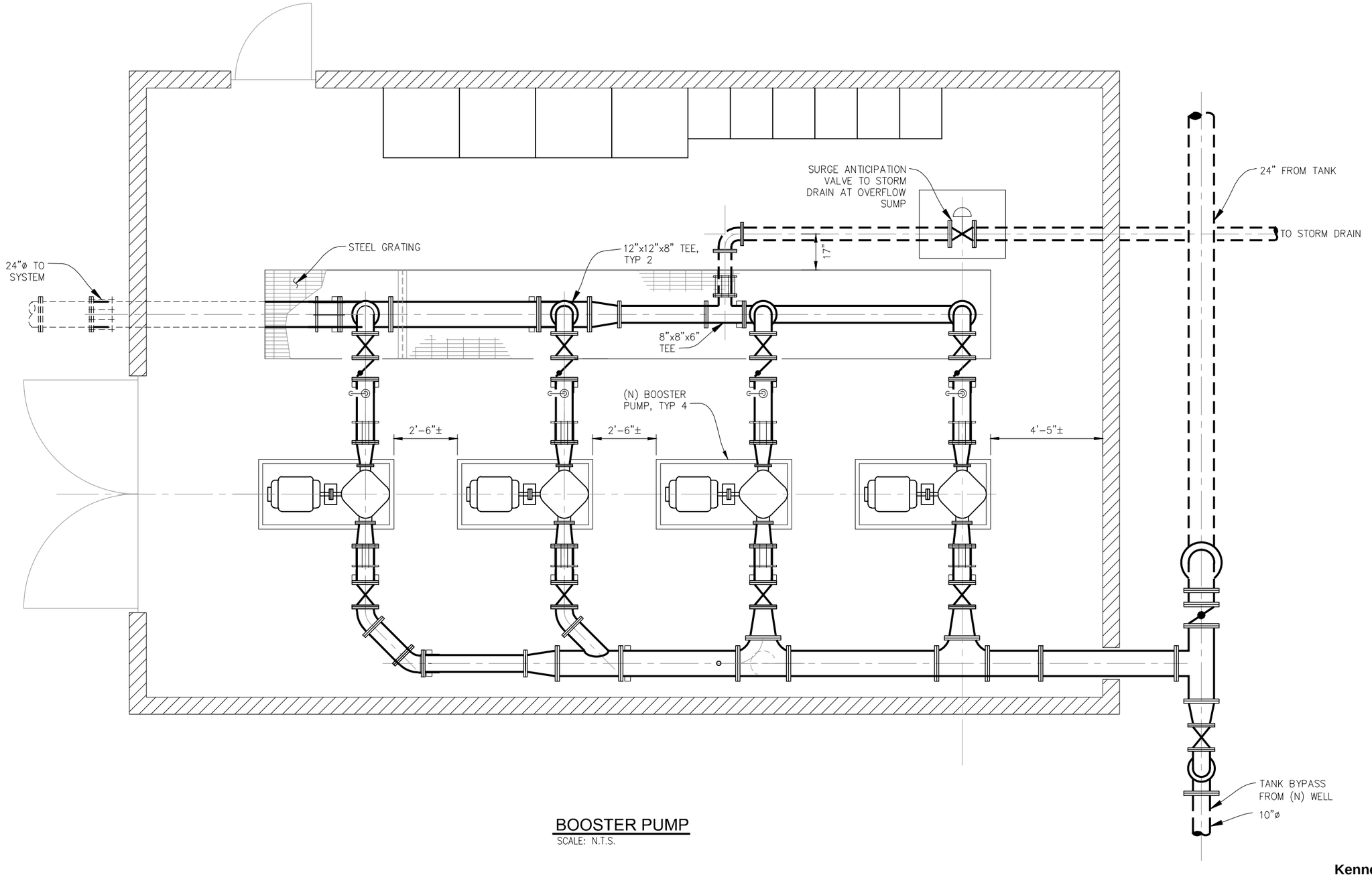

BOOSTER PUMP
SCALE: N.T.S.

Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

La Vista Conceptual
Booster Pump Station Plan

June 2015
K/J 1370020.00
Figure 3-6

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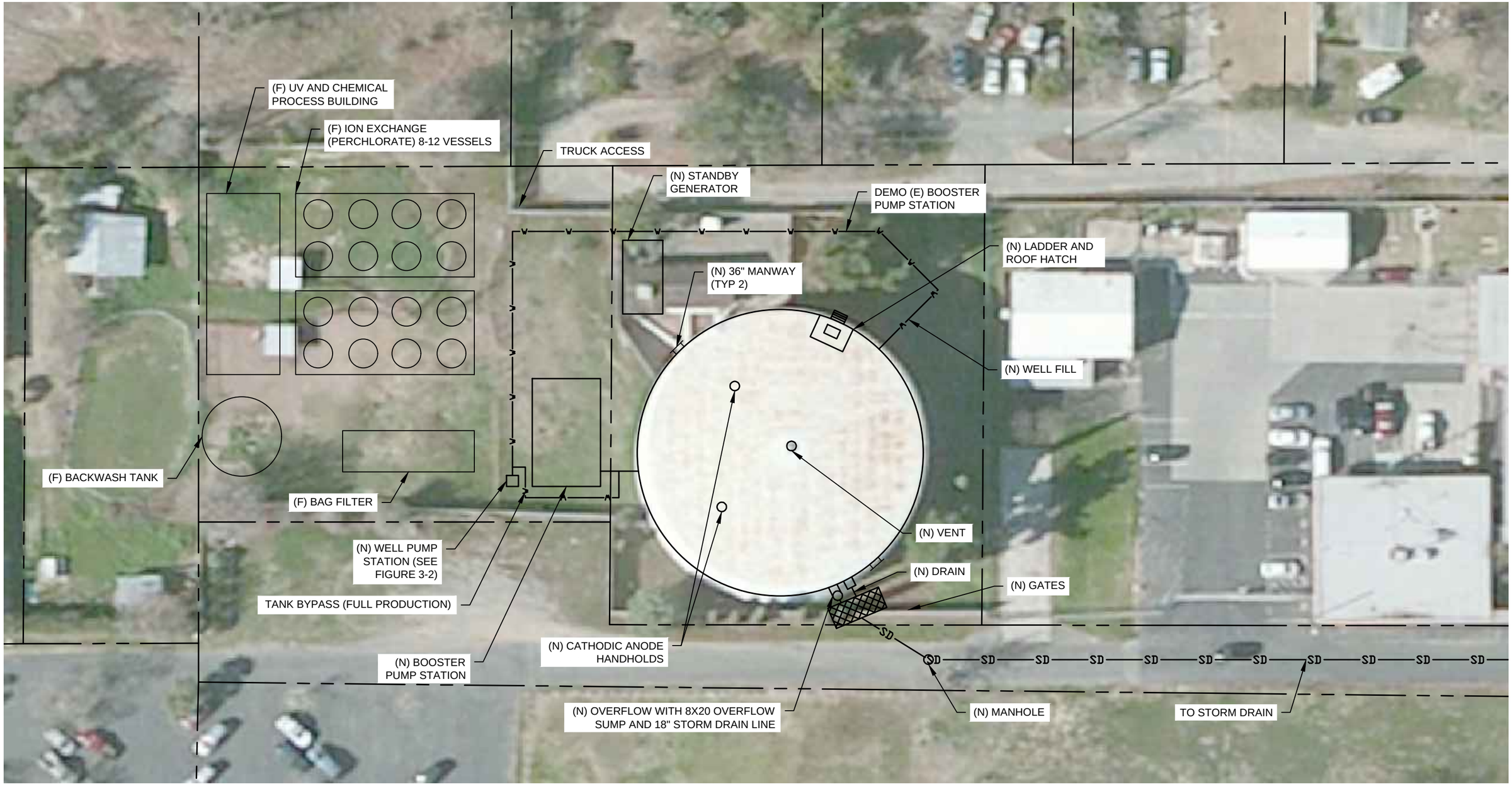

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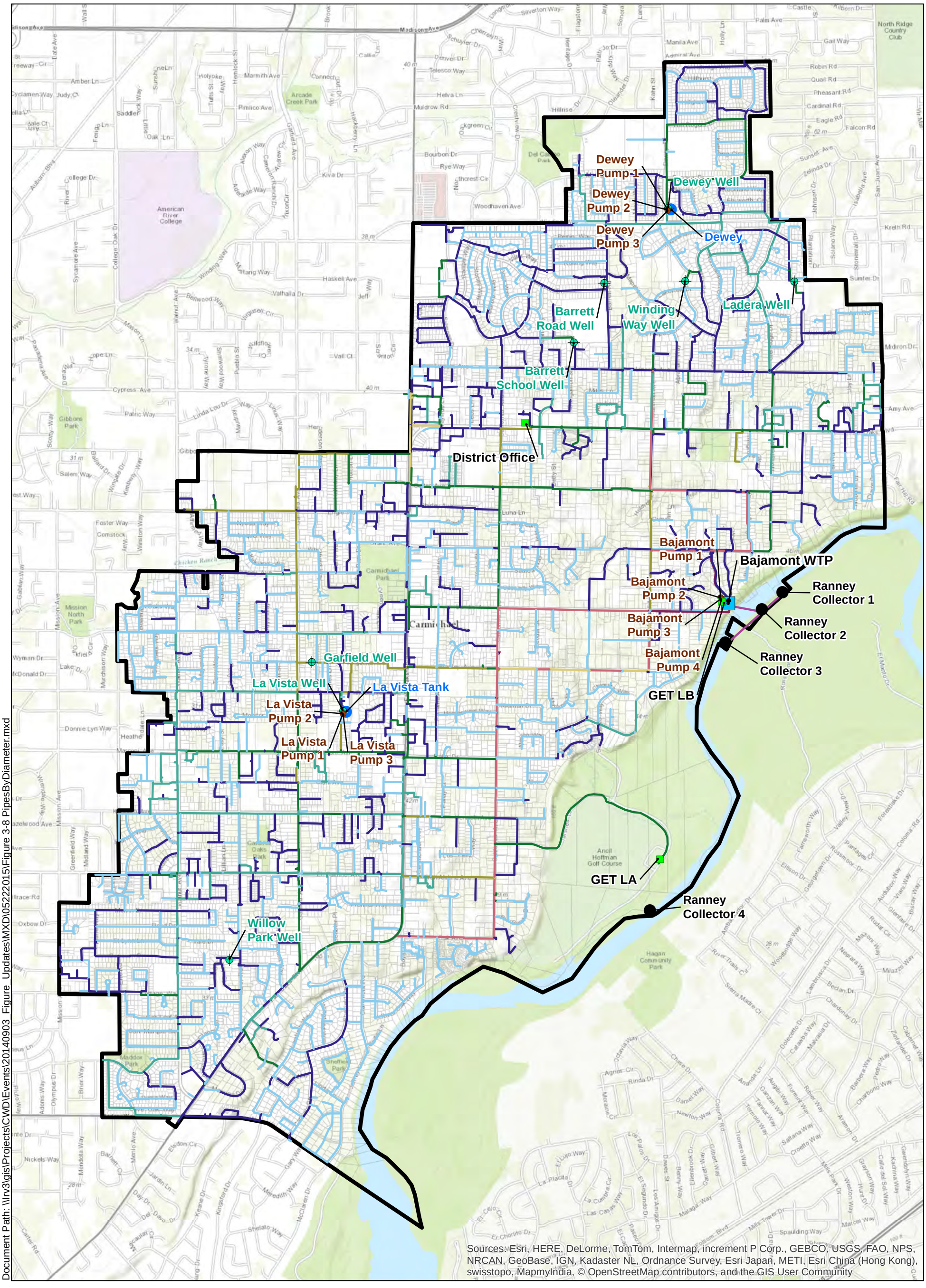
Carmichael Water District
2015 Water Master Plan
Future Groundwater Treatment

La Vista Tank Conceptual Central Groundwater Treatment Plant

June 2015
K/J 1370020.00

Figure 3-7



Document Path: \\lrv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-8 PipesByDiameter.mxd

LEGEND

- Booster
- Diversions
- Tanks Reservoirs
- Wells
- District Facility
- WTP
- Service Area
- Parcels

Pipeline Diameter (Inches)

- 0" - 6"
- 8"
- 10"
- 12"
- 14"
- 18"
- 20"-24"
- 30"
- 48"
- Unknown

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

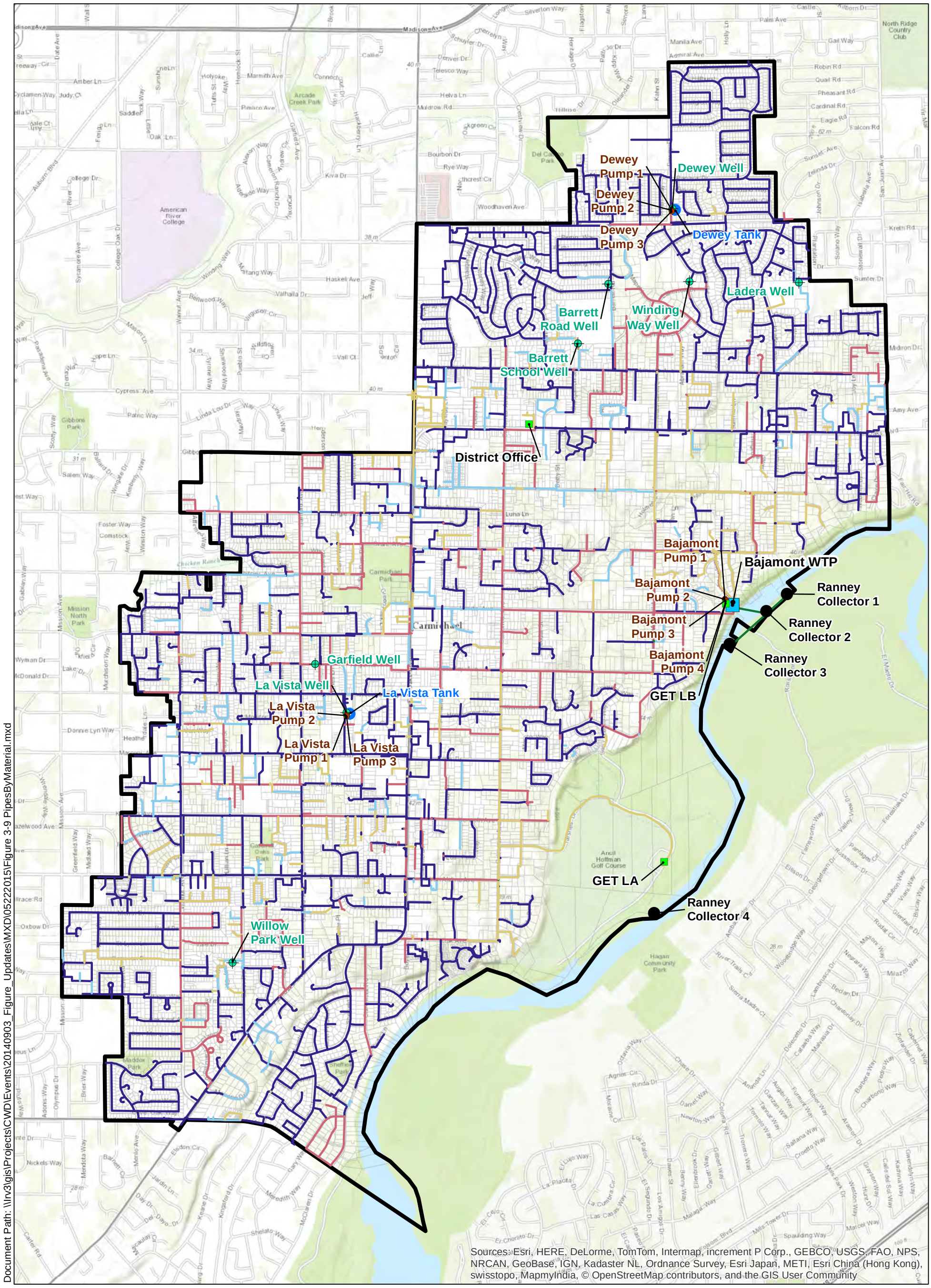
Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

Pipes by Diameter

K/J 1370020*00
June 2015

Figure 3-8



Document Path: \\rv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-9 PipesByMaterial.mxd

LEGEND

- Booster
- Diversions
- Tanks Reservoirs
- Wells
- District Facility
- WTP
- Service Area
- Parcels

Pipeline Material

- Asbestos Concrete
- Polyvinyl Chloride
- Concrete Cylinder
- Ductile Iron
- Steel Pipe
- Other

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

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Carmichael Water District
2015 Water Master Plan

Pipes by Material Type

1370020*00
June 2015

Figure 3-9

Dewey Pump 1
Dewey Pump 2
Dewey Pump 3
Dewey Well
Dewey Tank
Barrett Road Well
Winding Way Well
Ladera Well
Barrett School Well
District Office
Bajamont Pump 1
Bajamont WTP
Bajamont Pump 2
Ranney Collector 1
Bajamont Pump 3
Ranney Collector 2
Bajamont Pump 4
Ranney Collector 3
GET LB
Garfield
La Vista Well
La Vista Tank
La Vista Pump 2
La Vista Pump 1
La Vista Pump 3
GET LA
Ranney Collector 4
Willow Park Well

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapmyindia, © OpenStreetMap contributors, and the GIS User Community

Document Path: \\rv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-10 PipesByAge.mxd

LEGEND

- Booster
- Diversions
- Tanks Reservoirs
- Wells
- District Facility
- WTP
- Service Area
- Parcels

Pipeline Age

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- > 80

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

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Carmichael Water District
2015 Water Master Plan

Pipes by Age

K/J 1370020*00
June 2015

Figure 3-10

Bundle No.	Project No.
0	13, 94
1	9b, 21
2	9a, 29, 75
3	27, 76
4	3, 8b, 23, 30, 37, 45, 77
5	71a, 71b, 74

Dewey Pump 1
Dewey Pump 2
Dewey Pump 3
Dewey Well
Dewey Tank
Barrett Road Well
Winding Way Well
Ladera Well
Barrett School Well
94
District Office
29
9b
77
9a
30
13
Garfield
La Vista Well
La Vista Tank
La Vista Pump 2
La Vista Pump 1
La Vista Pump 3
8b
71a
21
71b
74
37
75
Willow Park Well
76
3
Bajamont Pump 1
Bajamont WTP
Bajamont Pump 2
Ranney Collector 1
Bajamont Pump 3
Ranney Collector 2
Bajamont Pump 4
Ranney Collector 3
GET LB
GET LA
Ranney Collector 4

Document Path: \\rv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-11 Bundles0-5.mxd

LEGEND

- District Facility
- Booster
- Diversions
- Wells
- Reservoirs
- WTP
- Pipelines
- Parcels
- Service Area
- # PSM Project

Bundle Number

- Bundle 0
- Bundle 1
- Bundle 2
- Bundle 3
- Bundle 4
- Bundle 5

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

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Carmichael Water District
2015 Water Master Plan

Planned System Maintenance Projects
Bundles 0-5

K/J 1370020*00
June 2015

Figure 3-11

Bundle No.	Project No.
6	33, 36, 48
7	14, 15, 20, 31, 58a, 69, 78, 79, 80
8	34b, 58b, 59, 68
9	25, 34a, 73a, 73b, 73c, 81, 82
10	11, 35a, 70b, 72b, 72g, 83, 84, 85
11	53, 54, 60, 63b, 71c, 60, 86, 87, 88

Dewey Pump 1
Dewey Pump 2
Dewey Pump 3
Dewey Well
Dewey Tank
Winding Way Well
Barrett Road Well
Ladera Well
Barrett School Well
35b
District Office
34c
87
70a
19
86
72a
17b
72f
64
72e
5b
5a
24
26
Bajamont Pump 1
Bajamont Pump 2
Bajamont Pump 3
Bajamont Pump 4
Bajamont WTP
92
GET LB
41
40
Ranney Collector 1
Ranney Collector 2
Ranney Collector 3
6b
91
90
Garfield
89
60
6a
42
39
La Vista Tank
La Vista Well
88
4
53
55
54
La Vista Pump 2
La Vista Pump 1
La Vista Pump 3
63b
63a
56
66b
66a
66c
32
66d
49a
7a
71c
93
12
7b
GET LA
61
52
Ranney Collector 4
Willow Park Well
44a

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Document Path: \\rv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-12 Bundles6-11.mxd

LEGEND

- District Facility
- Booster
- Diversions
- Wells
- Reservoirs
- WTP
- Pipelines
- Service Area
- Parcels
- PSM Project
- #

BundleNumber

- 6
- 7
- 8
- 9
- 10
- 11

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan

Planned System Maintenance Projects
Bundles 6-11

K/J 1370020*00
June 2015

Figure 3-12

Bundle No.	Project No.
12	12,24,26,35b,38,39,61,72e,89,90,91,92,93,94
13	6a, 40, 41, 44a
14	4, 5a, 5b, 6b, 49a
15	7a, 7b, 17b, 19, 32, 34c, 42
16	52,55,56,63a,64,66a,66b,66c,66d,70a,72a,72f
17	43, 72d

Dewey Pump 1
Dewey Pump 2
Dewey Pump 3
Dewey Well
Dewey Tank
Winding Way Well
Barrett Road Well
Barrett School Well
Ladera Well
35b
34c
District Office
19
70a
86
17b
72f
72a
72e
5b
5a
24
72d
6b
Garfield
La Vista Tank
La Vista Well
La Vista Pump 2
La Vista Pump 1
La Vista Pump 3
89
88
4
60
6a
63b
63a
66b
66a
66c
66d
49a
71c
12
61
7a
93
7b
52
44a
Willow Park Well
26
92
41
40
91
90
39
42
43
55
54
53
56
32
Bajamont Pump 1
Bajamont Pump 2
Bajamont Pump 3
Bajamont Pump 4
Bajamont WTP
GET LB
GET LA
Ranney Collector 1
Ranney Collector 2
Ranney Collector 3
Ranney Collector 4
Woodhaven Ave
Kiva Dr
Rye Way
Hillrise Dr
Del Campo Park
American River College
Carmichael
Ancil Hoffman Golf Course
Hagan Community Park
North Ridge Country Club
Madison Ave
Document Path: \\Irv3\gis\Projects\CWD\Events\20140903_Figure_Updates\MXD\05222015\Figure 3-13 Bundles12-17.mxd

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

LEGEND

- District Facility
- Booster
- Diversions
- Wells
- Reservoirs
- WTP
- Pipelines
- Service Area
- Parcels
- PSM Project

Bundles

- Bundle 12
- Bundle 13
- Bundle 14
- Bundle 15
- Bundle 16
- Bundle 17

N

0 2,000

Scale: Feet

1 inch = 2,000 feet

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Carmichael Water District
2015 Water Master Plan

Planned System Maintenace Projects
Bundles 12-17

K/J 1370020*00
June 2015

Figure 3-13

Section 4: Capital Improvement Plan

4.1 Capital Improvement Plan

This Capital Improvement Plan (CIP) consolidates the recommendations for replacement of assets projected over the next 50 years (2015 through 2065). The projections consider a life-cycle based on the District pipe material standard of ductile iron (DI) pipe. For the purposes of this plan, the assumed life cycle for DI pipe is 100 years. During that period many of the District assets will require replacement more than once. Moreover the DI standard provided a basis for a holistic look at the largest District unknown – how to sustain the buried infrastructure in a planned and financially responsible manner.

Consideration of a 50 year Master Plan must be made with the idea that the farther into the future projects exist, the less specific and accurate will be schedule and costs. For this reason, this CIP is structured with three implementation periods as follows:

- 10-year CIP reflecting specific project recommendations and schedules with known locations and quantifiable features.
- 25-year CIP reflecting specific project recommendations and programmatic schedules for alternative project elements and locations.
- 50-year CIP reflecting programmatic impacts of major project elements requiring planned program development and financial positioning. At this level, project elements, locations and schedules are conceptual.

The CIP includes elements for production facilities, buried infrastructure, operation and maintenance, and programmatic elements (storage fund, metering, vehicles). Expanding the CIP beyond a classical construction project based plan was done to support the Financial Business Plan concept discussed in Section 8 where the CIP is modeled for rate impacts with development of fund and reserve policy recommendations. Multiple options for implementation of the CIP were developed and are discussed in detail in the Financial Business Plan. This section provides the recommended CIP that was developed in conjunction with the business planning process.

4.2 Basis of Cost

The Capital Improvement Plan cost estimates were prepared using prior construction bids, current materials pricing, estimated guides, and engineering judgment. The costs are engineering opinions of probable cost and reflect a conceptual level of accuracy. The estimates include a 25 percent contingency for unforeseen conditions, a 15 percent cost for engineering, administrative and legal costs, and 10 percent cost for environmental review. The environmental review contingency also includes the cost of obtaining Sacramento County approvals to construct within public right of ways.

All opinions of cost are in 2014 dollars and are based on an Engineering News Records 20-Cities Construction Cost Index of 9,870. The Financial Business Plan considers inflation in its analysis.

4.3 Schedule and Consolidated Cost Estimates

The following section provides the schedule and consolidated cost estimate for the capital improvements needed to maintain continued reliable operations of the District.

4.3.1 Meters

The 2003 Master Plan focused on completion of the metering program. This involved installation of meters for all customers over a 10-year period. In 2013, the District completed its metering program and began the second phase of metering, which includes replacement of the meters on an 11-year recurring schedule. A meter replacement frequency of 11-years aligns with the AWWA Standard for accuracy of 2,250,000 gallons for the ¾-inch meter. The 1-inch meter warrantee is for 3,000,000 gallons or an equivalent of about 15 years. AWWA recommends testing every 5 years. The District has opted to replace meters every 11 years rather than implement a costly meter testing program. This provides for replacement of approximately 1,100 meters annually. See Appendix B.1 for annual meter replacement cost breakdown.

4.3.2 Buildings, Vehicles, and Equipment

The 2003 Master Plan allocated an annual $350,000 for maintenance of the District's vehicle fleet, tools, heavy equipment, and miscellaneous building repairs. This Master Plan includes a more comprehensive estimate of annual District expenses to maintain the equipment and non-water infrastructure necessary to operate the District. The estimates for the items included in the CIP to support District operations are included in Appendix B.2 and were developed as follows:

- Distribution –corporation yard, wash rack, solar facility, vehicles and equipment.
- Water Treatment –Water Treatment Plant buildings, well structures, vehicles and equipment.
- District Administrative Services – This category includes two sub units as follows:
  - Financial Services –furniture and office equipment, and vehicles.
  - Administrative Services –field equipment, and meter equipment, computers, security, District Office, and interior improvements.

The District prepared projections of replacement and renewal costs based on the knowledge and insight of the staff and these costs are the basis for the projections. In addition, the District has prepared a Fixed Asset Inventory (FAI) with the original cost of selected assets and a projected replacement cycle. The FAI was reviewed and compared with the staff projections and the CIP incorporates a combined summary of projected costs.

The actual replacement schedule based on physical life verses the project replacement in the FAI remains a judgment decision for the District leadership as the District manages the aging assets. Additional refinement of the FAI is recommended to continue as part of resolving the retirement of assets using a prioritized asset management plan approach.

The cost estimates for maintaining the non-water related assets include anticipated annual costs with a detailed breakdown. The tracking and planning for these expenses should remain

an annual or multi-year decision making process based on physical performance and risk of failure.

4.3.3 Pipe Replacement

The 2003 Master Plan included a list of 72 identified projects that were scheduled to be completed over a 25-year period (by 2028). Figure 4-1 shows the actual replacement over this period by total dollars spent versus projected dollars recommended. The projected investment required specific rate increases not instituted to support the full implementation of the work. During this same period the District accelerated meter installation and instituted cost reductions in response to falling revenue.

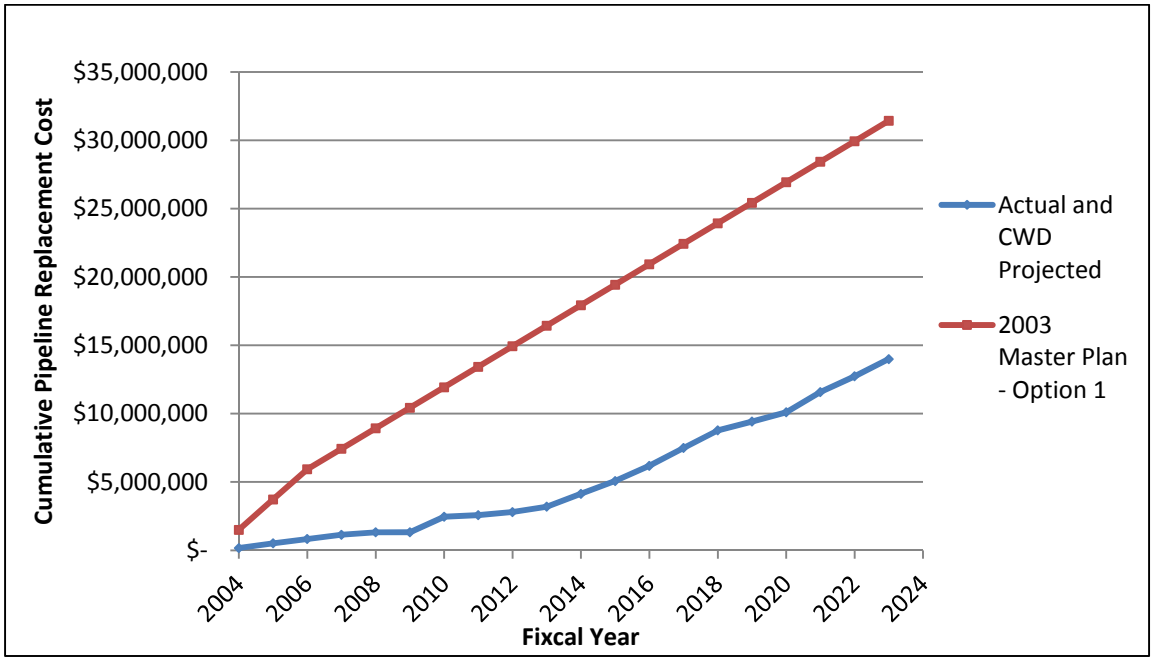

Figure 4-1: Cumulative Pipeline Replacement Cost

In this Plan, seventy-nine projects were identified for the next 15 years based on prior work and District priorities. The projects are shown in Table 4-1 and bundled into groups of projects based on the scheduled completion year. The groups and project details list are shown in Appendix B.3.

Table 4-1: Summary of PSM Project Bundles

Project Bundle #	Planned Construction Year	Bundle Cost	LF Replacement
0	2015-2016	$ 372,929[(a)]	1,930
1	2017-2019	$ 1,025,000	2,550
2	2019-2021	$ 1,047,000	4,100
3	2021-2022	$ 1,120,000	3,500
4	2022-2024	$ 2,663,000	10,100
5	2024-2026	$ 2,513,000	6,800
6	2026-2027	$ 2,211,000	9,350
7	2027-2030	$ 3,266,000	10,000
8	2030-2031	$ 2,429,000	6,000
9	2031-2032	$ 3,869,000	11,850
10	2032-2033	$ 3,769,000	15,700
11	2033-2034	$ 3,345,000	11,050
12	2034-2035	$ 4,487,000	13,380
13	2035-2036	$ 6,485,000	16,950
14	2036-2037	$ 5,998,000	15,200
15	2037-2038	$ 5,370,000	15,450
16	2038-2039	$ 5,015,000	21,100
17	2039-2040	$ 4,798,000	9,950
10-Year Replacement Summary		**$ 26,232,000**	**88,450**
15-Year Replacement Summary		**$ 53,587,000**	**170,530**

(a) Actual project cost

4.3.4 Existing Wells

The 2003 Master Plan outlined a recurring cost of $100,000 every 3 years to cover expected costs (i.e., servicing and replacement of pumps, motors, electrical and control systems on existing wells). Rehabilitation of the wells was not included as a maintenance item. It was assumed that if a well requires significant rehabilitation it will be abandoned and a new well will be constructed. The same recurring cost was included for this Plan.

4.3.5 New Wells

The 2003 Master Plan assumed the construction of five (5) new wells by 2025. The District has not constructed any new wells since the 2003 Master Plan. This Plan assumes construction of three (3) new wells in the 10-year window to replace the four active wells (Garfield, Winding Way, La Vista and Willow Park). These wells will have reached or exceeded their expected useful life within this period.

New well construction projects assume a block building, vertical turbine pump, standby power, and SCADA telemetry tied back to the Bajamont WTP. Land acquisition is not included in the 10-year plan with the assumption that the wells will be built on existing sites.

Section 3 includes a recommendation for drilling two exploratory test holes as part of the siting plan for the Winding Way Well replacement. See Appendix B.4 for well replacement cost breakdown.

4.3.6 Groundwater Treatment

The 2003 Master Plan assumed that new wells built after 2017 would require groundwater treatment based on a combination of new groundwater contamination and new regulatory requirements. This assumption remains an important part of responsible planning and has been included in the recommendations of this Plan for new wells after 2020.

4.3.7 Surface Water Intakes

The Ranney collector surface water intakes were last rehabilitated in 2001 during the construction of the Bajamont WTP. The 2003 Master Plan assumed re-inspection and maintenance cleaning in 2014 and 2024 with a major reconstruction in 2034.

The District has not inspected any of the Ranney collector laterals since 2001 and has only opened the hatch on Collector 3 due to a high water event that caused the Ranney collector to become exposed. It is recommended that the District re-inspect and perform maintenance cleaning every 10 years, with the next re-inspection and cleaning to take place in 2022 and major rehabilitation and reconstruction of the laterals in 2027. Also, it is recommended that a currents and historic capacity analysis be conducted as part of the re-inspection of each collector and all three collectors to identify any degradation in capacity. If no degradation is found prior to cleaning, the capacity analysis should be conducted once before and again after cleaning.

4.3.8 Membranes

The District uses membranes manufactured by Evoqua Water Technologies (previously Siemens Water Technologies). Membrane technology has improved over the past 10 years and is expected to continue to change into the future. It is projected that the WTP will require modification in 2026 to allow for use of a more updated membrane technology (see Appendix A, Membrane Memorandum for additional membrane technology information and replacement cost information).

The existing District membrane replacement schedule utilizes a membrane replacement fund to offset the annual membrane replacement expenditures with the money accumulated in the fund. The ten year projection shows an accumulation of money in the fund to cover future years where the expenditures are higher than the annual funding. The current annual funding is $200,000 per year to the membrane replacement fund.

4.3.9 Surface Water Treatment Plant

The surface water treatment plant is performing well and should continue to be reliable for several years. The CIP includes a water treatment plant upgrade feasibility study as the plant approaches 25 years of service followed by 2 years of substantial investment assumed to be replacement of major equipment and conversion of membranes to newer materials. The building requires periodic cleaning and maintenance but is also performing well.

The HVAC was replaced after the first few years of operation due to noise issues. The new equipment is less than 10 years old and should provide an additional 10 years of service. Similarly the roof is a high quality roof and should perform well until 2023 at which time the roof will have 20-years of service. Failure of the roof prior to 20 years may be a warrantee condition

as the roofing manufacturer is no longer in business leaving the District limited recourse with the roofing material manufacturer.

4.3.10 River Crossing

The recommendations for the river crossing are identical to those in the 2003 Master Plan. The CIP has no capital projects associated with the 48-inch diameter river crossing until 2028, when the crossing will have had 25 years of service. At that time, the CIP reflects the start of a 10-year recurring $250,000 inspection, cleaning, and joint repair program. Relining of the crossing is not projected to occur in the 50-year window of this CIP.

4.3.11 Reservoir Storage

The CIP reflects the reconstruction of the La Vista Tank, Booster Pump Station and Well as a near-term project. The Dewey Tank and Booster Pump Station are in good shape and restoration is projected as a long-term project. Both tanks are shown as being replaced during the next 50 years.

4.3.12 Master Plan Update

The CIP includes a Master Plan, Business Plan and Rate Study effort every 10 years. Additional effort with rate analysis may be necessary each multi-year rate cycle. The District has completed these interim rate adjustments using internal resources and no costs have been included.

4.4 CIP Summary

The estimated CIP schedule is provided in Table 4-2. This schedule is based on starting the project following the completion of the Master Plan, Business Plan, and Rate Study with the first budget year being Fiscal Year 2016-2017. The schedule provided in this Plan will be further evaluated as part of the Business Plan in conjunction with the development of the rates.

The possibility of a continued severe drought and curtailment to surface water supplies may drive the need for an early completion of projects for Barrett School and Barrett Road Wells. In addition, continued water shortages could accelerate the reconstruction of the La Vista Booster Pump Station and possible completion of the SSWD intertie at Mission Avenue.

Table 4-2: CIP and District Building Maintenance Costs

		Distribution System			Water Production								Admin		Technical Services	
Fiscal Years (c)	Planned System Maintenance Project - Description of Work	Meters and Services	Pipeline Bundle - Replacement	Distrib. System - Vehicles, Equip., & Bldgs. (a)	Existing Wells	New Wells (b)	Ground-water Treatment (b)	Surface Water Intakes (Ranney)	Surface Plant (a)	River Crossing	Reservoir Storage and Booster Pumping (b)	Water Prod. - Vehicles, Equip., & Bldgs. (a)	Financial Service - Vehicles, Equip., & Bldgs. (a)	Admin. - Vehicles, Equip., & Bldgs. (a)	Reports and Planning	Total Cost
2016	Pipelines Bundle 0, Fixed Asset Renewal, American River Crossing Removal and Demolition	$ 759,526	$ 372,929	$ 163,000	$ 8,000				$ 180,000	$ 300,000	$ 55,000			$ 31,500		$ 1,869,955
2017	Barrett School Well Centralized Treatment; Ranney Collector Weir, Pipelines Bundle 1a, Fixed Asset Renewal	$ 334,000	$ 512,500	$ 76,400	$ 55,500			$ 75,000	$ 180,000		$ 18,000	$ 5,800	$ 1,500	$ 50,500		$ 1,309,200
2018	Bajamont Treated Water Pump Evaluation and Upgrade, Ranney Collector Study & Inspect/ Clean Collectors, River Crossing Demolition, Pipelines Bundle 1b, Fixed Asset Renewal	$ 30,000	$ 512,500	$ 134,000	$ 10,500				$ 286,000		$ 18,000	$ 106,500	$ 10,700	$ 59,000		$ 1,167,200
2019	Collector 4 Decommissioning, Pipelines Bundle 2a, Fixed Asset Renewal	$ 10,000	$ 523,500	$ 246,600	$ 30,500			$ 350,000	$ 111,000		$ 18,000	$ 46,400	$ 25,400	$ 34,900		$ 1,396,300
2020	La Vista Tank Coating and Repairs, Abandon Ladera and Dewey Wells, Pipelines Bundle 2b, Fixed Asset Renewal	$ 49,000	$ 523,500	$ 257,600	$ 90,000	$ 202,400			$ 202,000		$ 2,013,000	$ 11,000		$ 76,400		$ 3,424,900
2021	La Vista Tank Booster Pump Station, Surface Water Plant Upgrade, Pipelines Bundle 3, Fixed Asset Renewal	$ 11,000	$ 1,120,000	$ 527,600	$ 65,500				$ 301,000		$ 2,626,000			$ 51,600		$ 4,702,700
2022	La Vista Tank Booster Pump Station-Continued, Test Holes, Ranney Collector Study, Pipeline Bundle 4a, Fixed Asset Renewal	$ -	$ 1,210,000	$ 96,400	$ 10,500	$ 350,000		$ 50,000	$ 210,000		$ 2,626,000			$ 29,200		$ 4,582,100
2023	La Vista Well Rehabilitation, Dewey Recoating, Membrane Replacement Study, Pipeline Bundle 4b, Fixed Asset Renewal	$ 7,000	$ 1,064,000	$ 273,800	$ 10,500				$ 210,000		$ 750,000	$ 7,800		$ 36,700	$ 250,000	$ 2,609,800
2024	Winding Way Replacement, Pipeline Bundle 4c and 5a, Fixed Asset Renewal	$ 5,000	$ 1,039,000	$ 59,500	$ 30,500	$ 1,909,000			$ 210,000		$ 18,000	$ 1,000	$ 11,400	$ 45,100		$ 3,328,500
2025	Winding Way Groundwater Treatment, Pipeline Bundle 5b, Fixed Asset Renewal	$ 15,000	$ 1,863,000	$ 136,400	$ 10,500		$ 2,000,000		$ 210,000		$ 18,000	$ 36,200	$ 49,400	$ 66,400		$ 4,404,900
2026	Abandon Winding Way Well, Bajamont Membrane Plant Rehab Year 1, Pipeline Bundle 6a, Master Plan Update, Fixed Asset Renewal	$ 268,000	$ 1,456,000	$ 311,600	$ 10,500	$ 101,200			$ 1,014,000		$ 18,000	$ 19,000	$ 40,700	$ 436,400	$ 350,000	$ 4,025,400
2027	Bajamont Membrane Plant Rehab Year 2, Ranney Collector Major Rehabilitation/Reconstruction of Laterals; Pipeline Bundle 6b and 7a, Fixed Asset Renewal	$ 268,000	$ 1,642,000	$ 185,400	$ 10,500			$ 2,000,000	$ 5,050,000		$ 18,000	$ -	$ 1,500	$ 53,300		$ 9,228,700

Table 4-2: CIP and District Building Maintenance Costs

		Distribution System			Water Production								Admin		Technical Services	
Fiscal Years (c)	Planned System Maintenance Project - Description of Work	Meters and Services	Pipeline Bundle - Replacement	Distrib. System - Vehicles, Equip., & Bldgs. (a)	Existing Wells	New Wells (b)	Ground-water Treatment (b)	Surface Water Intakes (Ranney)	Surface Plant (a)	River Crossing	Reservoir Storage and Booster Pumping (b)	Water Prod. - Vehicles, Equip., & Bldgs. (a)	Financial Service - Vehicles, Equip., & Bldgs. (a)	Admin. - Vehicles, Equip., & Bldgs. (a)	Reports and Planning	Total Cost
2028	Garfield Replacement, Pipeline to La Vista Plant & Centralized Trt Plant at La Vista, Inspect & Repair River Crossing, Pipeline Bundle 7b, Fixed Asset Renewal	$ 268,000	$ 968,000	$ 343,100	$ 30,500	$ 1,630,000	$ 3,163,000	$ 2,000,000	$ 50,000	$ 360,000	$ 18,000	$ 52,100	$ 4,300	$ 74,400		$ 8,961,400
2029	Pipeline Bundle 7c and 7d, Fixed Asset Renewal	$ 268,000	$ 2,232,000	$ 23,400	$ 65,500			$ 2,000,000	$ 50,000		$ 18,000	$ 49,100	$ 31,800	$ 31,900		$ 4,769,700
2030	Pipeline Bundle 8, Fixed Asset Renewal	$ 268,000	$ 2,429,000	$ 39,000	$ 80,500				$ 50,000		$ 18,000	$ 23,000		$ 67,700		$ 2,975,200
2031	La Vista Cathodic Protection, Barrett School Well Field Replacement 2-Wells, Pipeline Bundle 9, Fixed Asset Renewal	$ 268,000	$ 3,869,000	$ 124,700	$ 75,500	$ 3,500,000			$ 1,014,000		$ 50,000	$ 22,000	$ 27,100	$ 70,500		$ 9,020,800
2032	Abandon Barrett School Well and Barrett Road Well, Pipeline Bundle 10, Ranney Collection Inspection, Fixed Asset Renewal	$ 268,000	$ 3,168,000	$ 102,100	$ 75,500	$ 202,400		$ 50,000	$ 50,000		$ 18,000	$ 7,300		$ 57,300		$ 3,998,600
2033	Pipeline Bundle 11, Fixed Asset Renewal	$ 268,000	$ 3,946,000	$ 198,200	$ 55,500				$ 50,000		$ 18,000	$ 70,800		$ 59,000		$ 4,665,500
2034	Dewey Tank and Booster Pump Station Replacement, Pipeline Bundle 12, Fixed Asset Renewal	$ 268,000	$ 4,487,000	$ 193,500	$ 10,500				$ 50,000		$ 2,920,000	$ 1,000	$ 11,400	$ 41,200		$ 7,982,600
2035	Pipeline Bundle 13, Fixed Asset Renewal	$ 268,000	$ 5,360,000	$ 266,800	$ 10,500				$ 50,000		$ 18,000	$ 29,200	$ 49,400	$ 53,400		$ 6,105,300
2036	La Vista Cathodic Protection, Pipeline Bundle 14, Master Plan Update, Fixed Asset Renewal	$ 268,000	$ 7,123,000	$ 173,200	$ 30,500				$ 1,104,000		$ 50,000	$ 19,000	$ 40,700	$ 66,600	$ 350,000	$ 9,225,000
2037	Willow Park Well Replacement; Ranney Collector Study & Inspect/Clean Collectors, Pipeline Bundle 15, Fixed Asset Renewal	$ 268,000	$ 5,370,000	$ 192,500	$ 10,500	$ 1,909,000	$ 2,000,000	$ 150,000	$ 50,000		$ 18,000	$ 9,900		$ 30,200		$ 10,008,100
2038	Dewey Tank Replacement, Inspect & Repair River Crossing, Pipeline Bundle 16, Fixed Asset Renewal	$ 268,000	$ 5,015,000	$ 271,100	$ 10,500				$ 50,000	$ 360,000	$ 1,500,000	$ 44,800	$ 5,800	$ 55,700		$ 7,580,900
2039	Pipeline Bundle 17, Fixed Asset Renewal	$ 268,000	$ 6,200,000	$ 94,400	$ 10,500				$ 50,000		$ 18,000	$ 44,100	$ 31,800	$ 32,400		$ 6,749,200
2040	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 94,200	$ 30,500				$ 250,000		$ 18,000	$ 11,000		$ 53,400		$ 4,725,100
2041	Surface Water Treatment Plant Upgrade, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 318,700	$ 10,500				$ 4,877,691		$ 18,000			$ 240,200		$ 9,733,091
2042	Surface Water Treatment Improvements, Ranney Collector Study, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 331,800	$ 10,500			$ 50,000	$ 1,062,011		$ 18,000			$ 42,700		$ 5,783,011
2043	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 182,600	$ 10,500				$ 50,000		$ 18,000	$ 7,800		$ 55,700		$ 4,592,600

Table 4-2: CIP and District Building Maintenance Costs

		Distribution System			Water Production								Admin		Technical Services	
Fiscal Years (c)	Planned System Maintenance Project - Description of Work	Meters and Services	Pipeline Bundle - Replacement	Distrib. System - Vehicles, Equip., & Bldgs. (a)	Existing Wells	New Wells (b)	Ground-water Treatment (b)	Surface Water Intakes (Ranney)	Surface Plant (a)	River Crossing	Reservoir Storage and Booster Pumping (b)	Water Prod. - Vehicles, Equip., & Bldgs. (a)	Financial Service - Vehicles, Equip., & Bldgs. (a)	Admin. - Vehicles, Equip., & Bldgs. (a)	Reports and Planning	Total Cost
2044	Membrane Upgrade, La Vista Recoating, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 44,700	$ 915,000				$ 50,000		$ 350,000	$ 1,000	$ 11,400	$ 48,500		$ 5,688,600
2045	Well Rehabilitation Projects Phase 1, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 4,000,000	$ 160,900	$ 920,000				$ 50,000		$ 18,000	$ 34,200	$ 49,400	$ 62,400		$ 5,562,900
2046	Well Rehabilitation Projects Phase 2, PSM Pipeline Projects, Master Plan Update, Fixed Asset Renewal	$ 268,000	$ 2,000,000	$ 206,600	$ 900,000				$ 1,014,000		$ 18,000	$ 33,300	$ 40,700	$ 332,200	$ 350,000	$ 5,162,800
2047	Well Rehabilitation Projects Phase 3, Reconstruct Ranney Collectors; PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 2,000,000	$ 146,500	$ 55,500			$ 21,104,000	$ 50,000		$ 18,000	$ 27,000		$ 60,700		$ 23,729,700
2048	Inspect & Repair River Crossing, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 900,000	$ 285,000	$ 10,500				$ 50,000	$ 360,000	$ 18,000	$ 113,700	$ 5,800	$ 59,000		$ 2,070,000
2049	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 800,000	$ 325,800	$ 30,500				$ 50,000		$ 18,000	$ 57,500	$ 31,800	$ 32,700		$ 1,614,300
2050	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 1,000,000	$ 122,100	$ 10,500				$ 50,000		$ 18,000	$ 11,000		$ 55,600		$ 1,535,200
2051	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 650,000	$ 43,500	$ 10,500				$ 1,014,000		$ 18,000			$ 194,400		$ 2,198,400
2052	Ranney Collector Study, PSM Pipeline Projects	$ 268,000	$ 250,000	$ 110,200	$ 10,500			$ 50,000	$ 50,000		$ 18,000			$ 53,900		$ 810,600
2053	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 160,400	$ 30,500				$ 50,000		$ 18,000	$ 3,300		$ 42,700		$ 822,900
2054	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 83,000	$ 10,500				$ 50,000		$ 18,000	$ 1,000	$ 11,400	$ 36,900		$ 728,800
2055	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 131,000	$ 10,500				$ 50,000		$ 18,000	$ 31,500	$ 50,900	$ 55,600		$ 865,500
2056	PSM Pipeline Projects, Master Plan Update, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 394,700	$ 10,500				$ 1,014,000		$ 18,000	$ 19,000	$ 40,700	$ 66,100	$ 350,000	$ 2,431,000
2057	Ranney Collector Study & Inspect/Clean Collectors, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 113,100	$ 30,500			$ 150,000	$ 50,000		$ 18,000	$ -		$ 34,200		$ 913,800
2058	Inspect & Repair River Crossing, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 163,800	$ 65,500				$ 50,000	$ 360,000	$ 18,000	$ 165,800	$ 4,300	$ 45,400		$ 1,390,800
2059	New Well and Groundwater Treatment Plant, Surface Water Treatment Plant Improvements, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 32,400	$ 80,500	$ 1,909,000	$ 2,000,000		$ 6,000,000		$ 18,000	$ 49,100	$ 31,800	$ 55,200		$ 10,694,000
2060	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 385,700	$ 75,500				$ 250,000		$ 18,000	$ 23,000		$ 62,400		$ 1,332,600
2061	New Well and Groundwater Treatment Plant, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 355,300	$ 80,500	$ 1,909,000	$ 2,000,000		$ 4,877,691		$ 18,000	$ 22,000	$ 28,700	$ 85,400		$ 9,894,591
2062	Ranney Collector Study, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 102,600	$ 55,500			$ 50,000	$ 50,000		$ 18,000	$ 7,300		$ 45,900		$ 847,300

Table 4-2: CIP and District Building Maintenance Costs

		Distribution System			Water Production								Admin		Technical Services	
Fiscal Years (c)	Planned System Maintenance Project - Description of Work	Meters and Services	Pipeline Bundle - Replacement	Distrib. System - Vehicles, Equip., & Bldgs. (a)	Existing Wells	New Wells (b)	Ground-water Treatment (b)	Surface Water Intakes (Ranney)	Surface Plant (a)	River Crossing	Reservoir Storage and Booster Pumping (b)	Water Prod. - Vehicles, Equip., & Bldgs. (a)	Financial Service - Vehicles, Equip., & Bldgs. (a)	Admin. - Vehicles, Equip., & Bldgs. (a)	Reports and Planning	Total Cost
2063	New La Vista Tank, Surface Water Treatment Plant Improvements, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 215,900	$ 10,500				$ 1,500,000		$ 4,692,000	$ 59,100		$ 68,900		$ 7,064,400
2064	Membrane Upgrade, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 295,400	$ 10,500				$ 50,000		$ 18,000	$ 5,000	$ 11,400	$ 39,500		$ 947,800
2065	PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 205,400	$ 30,500				$ 50,000		$ 18,000	$ 2,011,000	$ 50,900	$ 63,800		$ 2,947,600
2066	PSM Pipeline Projects, Master Plan Update, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 148,800	$ 10,500				$ 1,014,000		$ 18,000	$ 19,000	$ 40,700	$ 306,600	$ 350,000	$ 2,425,600
2067	Ranney Collector Study & Inspect/Clean Collectors, PSM Pipeline Projects, Fixed Asset Renewal	$ 268,000	$ 250,000	$ 188,200	$ 10,500			$ 150,000	$ 50,000		$ 18,000	$ 5,000		$ 36,300		
	Totals	$ 11,449,000	$ 96,733,000	$ 9,487,400	$ 4,238,000	$ 13,622,000	$ 11,163,000	$ 28,079,000	$ 34,275,393	$ 1,440,000	$ 18,297,000	$ 3,318,600	$ 752,800	$ 3,879,800	$ 2,000,000	$ 238,734,993

(a) See 100-Year Corp. Plan for Back-up

(b) Engineering services added to Production Cost Estimates.

(c) The District Fiscal Year incorporates two calendar years; for example Fiscal Year 2016/17 is shown as 2016

Section 5: Strategic Water Issues

This section addressing the **Strategic Water Issues** was developed in collaboration with Tully & Young, Inc. - Comprehensive Water Planning, a Water Resources Specialty firm. This Chapter's content was prepared by Gwyn-Mohr Tully (Tully & Young, Inc.) in collaboration with Sean Maguire (Kennedy/Jenks Consultants).

5.1 Introduction

This section of the Master Plan addresses the strategic water management issues facing the District. The issues facing the District vary in their complexity and geographic scope. In some cases, issues are entirely local and involve specific identifiable actions that are easily discerned. But in other instances, issues are complex with statewide and even global significance that require management actions aimed at mitigating the local risk. All of the issues described in the following sections, however, are relevant to the District's short-term and long-term water management efforts. The following discussion identifies critical District water resource protection challenges with recommended actions, explains the broader water management issues and various forums where the issues are being discussed, and recommends how the District can prioritize and engage in the most critical issues both now and in the future.

A number of challenges are facing the District – both internally and externally. It is clear that the management of the District's water assets has become exponentially more complicated since the 2003 Master Plan. Indeed, the worsening four-year drought crisis has illuminated the lack of statewide water planning, highlighted the growing insurgency of federal and state regulatory agencies into local and regional issues, and underscored the District's water asset and water conveyance vulnerabilities. Critical is the continued diligence in perfecting the District water rights to American River flows and protecting the ability to provide a balanced water supply during wet and dry years to meet customer demands. Additionally, the District must be prepared to control a dynamic assortment of issues that continue to evolve in light of the State's limited water resources. This control begins by forming an adaptive issue management structure that enables swift issue identification, clear issue prioritization, and effective issue engagement strategies. This section outlines an engagement framework and recommends the short-term and long-term management actions for the District's Board and staff.

5.2 Broad Strategic Recommendations

The analysis contained in this section results in a detailed and prioritized list of strategic planning recommendations. This section summarizes the specific strategic recommendations into seven (7) recommended broad strategic actions that may help guide the District as new issues arise. These recommendations are:

- Perfect existing American River surface water supply assets.
- Manage groundwater supplies, monitor Aerojet contamination cleanup and remediation and participate in guiding North Area Basin management strategies.
- Engage in groundwater legislative issues. Actively promote the District's groundwater management needs in this engagement.

- Engage in Lower American River Flow Management Standard issues.

- Utilize regional working groups (Regional Water Authority [RWA], Northern California Water Association [NCWA], Association of California Water Agencies [ACWA] and North State Water Alliance [NSWA]) to engage in Bay Delta Water Quality Control Plan Update and additional legislative efforts.

- Establish relationships with State Water Resources Control Board and staff, Legislators and Legislative staff, as well as the Governor's Office.

Participate and hold lead positions in RWA, SGA and the Water Forum. Lead discussions on key issues pertinent to the District and prepare information for participating stakeholders.

5.3 Intensifying Competition for Water

Perhaps the biggest challenge facing the District is the intensifying competition for water statewide. Fresh water for agriculture and municipal use is an increasingly limited resource, and ongoing ecosystem management challenges, including preservation of endangered and threatened fisheries, create an ongoing and persistent need to balance uses of this finite resource. As a result, there are numerous competing interests that could affect the District's water resources and it is important to understand the context and challenges these interests pose in the coming years.

Like other California water agencies, the District faces elements of change that permeate and underlie the related specific issues that are further described later in this chapter. Specifically, the competition for limited water resources is tied to many of the following issues:

- California's hydrology is changing and fluctuating due to climate change and expanded water use.

- California's population continues to swiftly grow adding pressure to limited water resources and outdated storage and conveyance systems.

- California's need for water is growing in order to satiate new urban, industrial, agricultural and environmental demands.

- California's and the Federal Government's Legislators and Regulatory Agencies are expanding their involvement in local water management issues.

- California's groundwater basins are rapidly depleting and some basins are undergoing significant contamination events.

All of these elements of change generate actions and projects that drive the exponential expansion of smaller issues that impact the District's water management. For instance, as a response to hydrological uncertainty and increased urban and industrial demand, southern California export interests have reopened the debate on north of Delta water diversions (formerly the peripheral canal discussion and now coined the Delta Tunnels and Bay-Delta Conservation Plan (BDCP)) that require the District's attention and engagement. The increased attention on the State's changing natural and demographic circumstances create new forums

where water issues are debated and new issues for those forums to debate. These forums and issues will be examined more closely throughout the remaining subsections in this section.

5.3.1 California's Hydrology

California's hydrology is in a state of flux. Specifically, climate predictions coupled with measured temperature increases and observed trends in snowpack storage and stream runoff indicates that changes are occurring in California's hydrological systems. California's Department of Water Resources has observed less natural storage in snowpack (California's largest system of storage) due to warmer temperatures that cause earlier snowmelt and larger runoff events. In other words, even if precipitation amounts in California remain fairly static in the face of a changing climate, the reduced natural storage and earlier runoff events appear to be reducing water supply reliability throughout the State. The existing storage and conveyance systems – most of which were built in the 1970s – are inadequate to handle these sorts of changes.

Changes to California's hydrology, however, are not new. The dendrochronological record shows that the State has undergone 50 to 90 year wet and dry cycles over the last 10,000 years and has been plagued by extreme droughts lasting over 10 years in this same time period.[2] California's current water supply and conveyance systems were designed to handle hydrological uncertainties with a much shorter duration. In other words, California's storage and conveyance systems are not sufficient to handle water supply for acute droughts lasting 5 years or more or for climatic trends resulting in reduced annual precipitation and early runoff.

In short, California's hydrology is changing and the District will need to develop and implement new strategies to manage its assets to protect its ratepayers from negative impacts resulting from these changes.

5.3.2 Population Growth

California's population continues to expand, putting further pressure on the allocation of its limited water resources. In 2014, California's population was estimated at 38 million people. This number should be compared against the entire population of Canada with a total population approximating 34 million people. By 2050, the United States Census Bureau predicts that California's population will swell to 51 million people. Providing safe and reliable water supplies to meet this increased human demand in light of climate and hydrological trends will be a huge challenge over the next 35 years.

5.3.3 Expanding Demands

The demand for water in California goes beyond meeting only the needs of people in urban environments. Water demands are expanding across numerous sectors of California's economy as well as in various environmental stewardship and conservation locations. For instance, the growth in water demand to meet agricultural needs, like expanding permanent crops, industrial development, like oil production, and commercial product development, like water-rich soy sauce, are changing the distribution and value of water assets. This economic growth parallels the population expansion requiring new sources of water in both normal and dry years.

[2] Professor Ingram, UC Berkeley 2014.

Similarly, there is tremendous growth in environmental water demands. In California, there are 34 species and subspecies of fish that are listed as either threatened or endangered by the State of California or the federal government. Other avian and terrestrial species also rely on water supplies, and trends indicate that the regulatory agencies will connect water resources with these non-aquatic species as well. Similarly, water quality requirements in California's Delta and in upstream systems (like the cold water pool below Shasta Reservoir) further expand the demand for water resources in the environmental setting. This trend of dedicating water resources to environmental purposes continues to expand as the relationship between water and healthy ecosystems becomes further understood.

5.3.4 Government Engagement

Both the federal and state governments continue to expand their jurisdiction into water resource management. The expansion is occurring in historically regulated sectors – like surface water management – but is also moving into historically unregulated sectors – like groundwater. The regulatory engagement expansion is arising from not only traditional water regulatory agencies, like the SWRCB and the United States Bureau of Reclamation (USBR), but also is greatly expanding in non-traditional water regulatory agencies, like California's Department of Fish and Wildlife (DFW). For example, DFW requires a streambed alteration permit for any change to any diversion facility on a natural watercourse. Such a permit can greatly expand and complicate changes to traditional water diversions derived from a pre-existing water system. The regulatory regime not only needs to meet the diversion and conveyance requirements of the SWRCB, but also the regulatory objectives of DFW – which can completely modify a planned and engineered system (see the promulgation of fish screens on Sacramento River diversion facilities). This expanded reach into the water sector from new federal and state regulatory agencies will continue in California as more water is needed to meet specific regulatory objectives.

In addition to the state and federal growth in regulation, there is also regulatory growth at the local and regional levels. There are literally thousands of local agencies, special districts, joint powers authorities, and private companies in California that regulate water. In addition, as water becomes a preeminent factor in land use issues and environmental enhancement, the number of local agencies and special districts impacting water will grow, further complicating the regulatory burdens permeating water management in California. In the Sacramento region, for instance, Sacramento Local Agency Formation Commission (LAFCO) and SACOG are expanding their interests in affecting water resource management. In short, the District can expect expanded government and regulatory activity in the area of water resource management.

5.3.5 Groundwater Depletion and Contamination

Groundwater depletion and contamination issues are rapidly emerging into the forefront of California's water management consciousness. There are 515 identified groundwater basins and subbasins (collectively "basins") in California and that number continues to grow. Each of these basins has its own set of water supply and quality issues, water demands to satisfy, and regulatory systems governing the resource. In some areas, groundwater is heavily regulated through sophisticated plans, hydrogeological analyses, and integrated local and regional governance. In other areas, groundwater is wholly unregulated and massive depletions are occurring at alarming rates causing wells to run dry and land subsidence. In response to these unregulated areas, California's legislature has enacted a sweeping set of groundwater laws and regulations.

Groundwater contamination is also implicating the reliability of groundwater resources. Local contamination in the Sacramento region caused by industrial development has resulted in a far-reaching regulatory structure requiring clean up and mitigation. Other longer-term contamination issues – like nitrogen fixation in the soils and water systems of the Central Valley – have traditionally been unregulated. In some areas of the Central Valley, the groundwater contamination situation has required a complete cessation in water use for human consumption. As the scientific understanding of water quality issues associated with human activity and development become better understood, the implications to groundwater cleanup and use will likely expand, impacting water resource management for small districts throughout California.

5.4 Description of Water Assets

The District has a number of water assets in its water supply portfolio. These assets are derived from the earliest days of the District's formation to new assets that have yet to be developed. This section will explain the District's water assets.

5.4.1 District Formation

Understanding the formation of the District is important to informing the nature and extent of the water rights that currently serve the District's customers. Section 1.3 provides the historical setting for the District's formation that underlies the origin of the District's water assets.

Through a recent examination of historical documents, surface waters from the American River and its tributaries were being diverted and conveyed to serve many lands of the Carmichael Colonies that now reside within the District's current service area. These water rights were derived from historical mining claims delivered through the North Fork Ditch as well as farming and ranching activities in and around the Carmichael area. By 1914, residents and farmers in the Carmichael area determined that the water diversion and conveyance systems serving water to the Carmichael region were in disrepair and improvements had to be made.

In 1915, the newly formed Carmichael Irrigation District (now Carmichael Water District) sought to better substantiate the region's water rights. Accordingly, the group hired an engineer and filed a water right claim with the State Water Commission in San Francisco in order to perfect and expand their water diversions from the American River. These water rights are still used by the District today.

5.4.2 California's Water Rights System

California has a complex water rights system that has its origins in the laws of many foreign nations, including laws embraced by the Romans in the early Common Era. All water in California belongs to the people of the State and a water right is merely usufruct – meaning a water right holder has only the right to use the water not a fee simple ownership interest like a property owner typically possesses in land.

The legal system for water is made up of numerous forms of water rights and entitlements including: riparian and littoral rights, pre-1914 appropriative rights, post-1914 appropriative rights, overlying groundwater rights, adjudicated water rights, appropriative groundwater rights, contract water entitlements, the public trust doctrine, pueblo water rights, federal reserved water rights, prescriptive water rights, area of origin law, foreign, developed and salvaged water rights, and reclaimed and recycled water rights. All of these rights and entitlements are subject to

Article X, Section 2 of the California Constitution that requires that all waters of the State be put to "reasonable and beneficial use" and that "waste is prohibited." The numerous types of water rights and entitlements coupled with the complexity of California statutory, regulatory, and judicial law make the system of implementation nearly impenetrable. In recent SWRCB hearings during the 2015 drought crisis, the intricacies and complexities imbedded in the water rights system were on full display as regulators grappled with incongruent statutory mandates, unclear administrative authorities, and inconsistent legal precedent and interpretations. The District's numerous water rights and entitlements are interwoven into this complex system and changes to one part of the system, even if seemingly remote in connection, invariably affect the District's ability to retain and use its water assets.

In a simple sense, California water rights law is based on the principle of "first in time, first in right" and any waste of water is strictly prohibited. This principle means that the more senior water rights may reasonably divert all of the supply they are entitled to under their water rights in times of shortage while junior water rights holders are curtailed entirely. This priority system and the reasonable use doctrine were reaffirmed in the *City of Barstow v. Mojave Water Agency* California Supreme Court case in 2000 and remain the primary legal principles governing California water law today. Yet, even today, these precedential doctrines may be undergoing further modifications as will be explored in later subsections of this section.

5.4.3 Surface Water Assets

The District has a diverse water supply portfolio that incorporates both surface and groundwater rights and entitlements. Specifically, the District has three post-1914 appropriative water rights, an unexecuted entitlement for Area D water use, pre-1914 appropriative water rights, remediated and reclaimed water entitlements, appropriative groundwater rights, and banked groundwater entitlements. Each of the water assets has specific legal characteristics that allow their usage under prescribed circumstances and within specific locations. Moreover, each of these water assets is subject to unique legal limitations and other contractual limitations associated with other voluntary water agreements (like the Water Forum Agreement described later in Section 5.5). In addition, technical limitations associated with water supply, water quality conditions, and infrastructure further limit the utility of each water asset. Figure 5-1 graphically depicts the District's post-1914 appropriative water rights and their characteristics. This section will explain the primary characteristics of each of the District's surface water rights and entitlements.

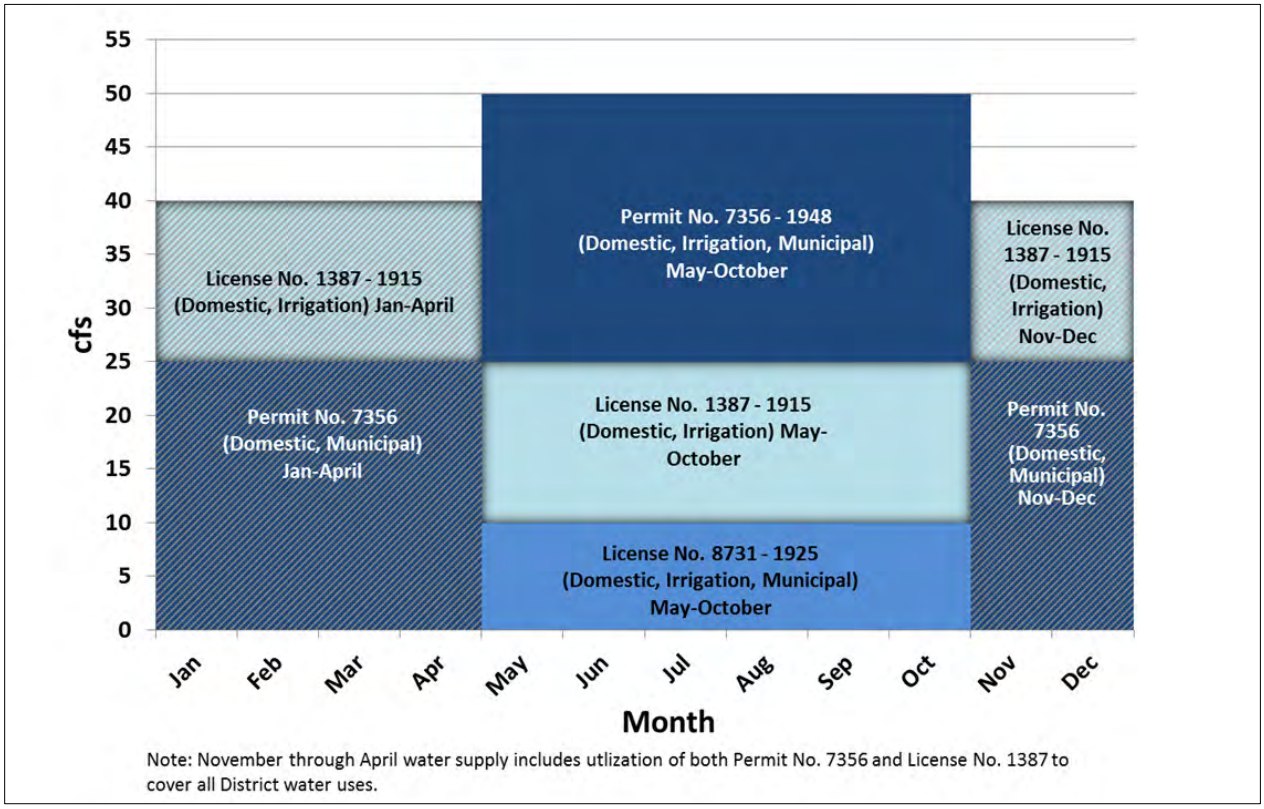

Figure 5-1: Post-1914 Water Rights

5.4.3.1 License 1387

One of the oldest District water assets is its post-1914 appropriative water right license number 1387. This water right license has a 1915 priority date for a water diversion of 15 cubic feet per second (cfs) from January 1 to December 31 of each year from the natural flow of the American River for domestic and irrigation uses within the boundaries of the Carmichael Irrigation District (now Carmichael Water District). Each of these characteristics is important to understanding the disposition of the water asset in the District's water supply portfolio.

The 1915 priority date is relatively senior in the overall picture of water rights in California. But post-1914 water rights, like this license, were the first water rights that were subjected to the ongoing regulatory jurisdiction of the State Water Resources Control Board (formerly State Water Commission). This jurisdiction has recently become more paramount as demand for water grows throughout California. In 2014 and again in 2015, for example, the SWRCB declared under its jurisdictional authority that all post-1914 water rights diverting from "natural flow" were to be curtailed due to a lack of sufficient water in the Sacramento River watershed system (including specifically the American River Watershed). Pre-1914 water rights, however, even if they were perfected merely months before the District's water right was perfected, were not curtailed and are entitled to a full allotment of water under those rights' terms. This "line in the sand" that separates "junior" post-1914 water rights from "senior" pre-1914 water rights is significant in understanding the long-term reliability of all of the District's post-1914 surface water assets. It is, however, entirely possible that pre-1914 water rights are also curtailed in 2015 as Sierra snowpack – the primary storage system that regulates natural flow – is at record lows.

License 1387's domestic and irrigation "purposes of use" have specific meanings in California law and limit the applications to which the water under this license can be applied. Section 660 of the California Code of Regulations defines "domestic uses" as:

> "…the use of water in homes, resorts, motels, organization camps, campgrounds, etc., including the incidental watering of domestic stock for family sustenance or enjoyment and the irrigation of not to exceed one-half acre in lawn, ornamental shrubbery, or gardens at any single establishments. The use of water at a campground or resort for human consumption, cooking or sanitary purposes is a domestic use."

Section 661 of the California Code of Regulations defines "irrigation uses" to include: "any application of water to the production of irrigated crops or the maintenance of large areas of lawns, shrubbery, or gardens." Any uses of the water under license 1387 for items other than those expressly recognized in these regulatory definitions are prohibited.

The name and boundary of Carmichael Water District has changed over time. The District was formed under California irrigation district law and was called "Carmichael Irrigation District" until its name changed to "Carmichael Water District" in the 1980s. The District is still subject to the rules and laws governing irrigation districts even though the District has changed its name to "Water" district – which are governed by an entirely separate set of laws in the California Water Code. The boundary of the District has also changed over time – expanding to incorporate new areas in need of water service that were not present during the District's formation. The water rights place of use designation is not clearly delineated and is generally described as able to serve those areas within the "District's boundaries." As such, the expansion of the District to include other new areas has allowed the use of water in those new areas without incident.

5.4.3.2 License 8731

The District has a second post-1914 appropriative water right license. License 8731 has a 1925 priority date to divert 10 cfs of water from the natural flow of the American River for domestic, irrigation and municipal uses within the boundary of Carmichael Irrigation District from May 1 to November 1 each year. Many of the issues described in the previous section apply to the substantive components of this water right. The addition of "municipal use" to this water right is important. Specifically, Section 663 of the California Code of Regulations defines municipal use as: "the use of water for the municipal water supply of a city, town, or other similar population group, and use incidental thereto for any beneficial purpose." Comparatively, municipal use as defined in the California Code of Regulations has much broader application within the District as compared to the uses confined by the definitions of domestic use and irrigation use. Accordingly, the District's junior water rights (including License 8731 and Permit 7356 described next) are needed to satisfy particular types of municipal uses throughout the water year within the District's boundary. However, these rights have junior priority as compared to senior pre-1914 water rights holders, which can make them more susceptible to dry period curtailment, especially as the competition for water escalates in the Sacramento River watershed.

5.4.3.3 Permit 7356

The District's third post-1914 appropriative water right is also paramount to the District's water supply portfolio. The District's water right permit 7356 has a priority date of 1948 and allows for diversion of up to 25 cfs of the natural flow of the American River for domestic, irrigation and municipal uses from January 1 to December 31 of each year. Unlike licenses 1387 and 8731,

Permit 7356 has not been perfected and remains unperfected in the water permit stage. A water right permit is issued by the State Water Resources Control Board (SWRCB) after a request is made through a water right application to divert water from an identified surface water source and an hydrological and engineering report justifies the availability of water under the defined parameters. The permit issued to the District by SWRCB contains specific terms and conditions that must be met before the water right can be perfected and a water right license issued. Generally, such terms include construction of all necessary diversion and conveyance facilities as well as application of all of the water identified in the permit to the identified beneficial uses. The terms of the permit must be perfected by the date identified in the text of the permit. In Permit 7356 the original completion date was identified as 1951.

The District had historically been successful in receiving extensions of time from SWRCB to perfect its water use under the permit. In 2005, however, the District sought another extension of time to perfect the water right permit but SWRCB denied the request. Specifically, the District petitioned the SWRCB that it would apply all of the water under its water permit to beneficial uses by 2025. The SWRCB disagreed with this assessment and denied the District's request for a permit extension based upon the District's inability to expand its demands within its service area and the reliability of its other available water assets.

In 2013, District staff met with the SWRCB staff and Director Charles Hoppin and requested that the District perfect the water right as much as possible based upon the conditions prevailing in the District in 2005. The SWRCB staff agreed and the District is currently organizing information to present to the SWRCB to perfect as much of the water right as possible in order to obtain a water right license. Importantly, however, it is unclear to what extent the SWRCB will approve use of water under this water right. The denied permit extension request lacked evidence that the District was utilizing this water resource at all. But subsequent investigations definitively demonstrate that the District is using the water asset in all months of the year based on one identified purpose of use "municipal", the expanded contamination of groundwater in the District's service area, and the District's peak hourly needs during the high demand months of June through September. Importantly, it is likely that any license issued by SWRCB will be conditioned with new terms – like Term 91 – that will limit the availability of this water asset under certain hydrological and regulatory conditions affecting Delta water quality and aquatic species.

5.4.3.4 SMUD Area D Water Rights

The Sacramento Municipal Utility District (SMUD) has water rights for storage and power production in the upper American River watershed. These water rights are based upon long-held diversions for water use that predate the formation of SMUD. The City of Sacramento has cooperated with SMUD and obtained the right to divert this water and use it for municipal purposes within designated areas of use in the Sacramento region. One of these areas, Area D, overlaps part of the District along Walnut Avenue. Thus, this portion of the District may be capable of applying SMUD's Area D water supply for uses in the defined area.

According to the 1978 Master Water Plan for the District (Dewante & Stowell, July 1978), there are approximately 390 acres of the District within Area D. The report indicates that 4.42 cfs could be available to the District under the SMUD Area D water rights subject to the District reaching an agreement with the City of Sacramento (City) for sharing of those resources.

The City of Sacramento has a water rights settlement contract with the United States Bureau of Reclamation (Reclamation) that provides for the City making payments to Reclamation in return

for storage rights and re-regulation of their water supply in Folsom Reservoir and Shasta Reservoir. The City has also entered into agreements with other local water agencies that are within the areas of use for the SMUD Area D water rights to provide water to such areas. The status or use of this water by the District has not changed since the 2003 Master Plan but warrants further investigation.

5.4.3.5 Current Natural Flow Surface Water Diversion and Use

In summary, the District utilizes its three post-1914 appropriative rights to the natural flow of the American River of up to 50 cfs, depending on the season of use and the correlating hydrological conditions. As described previously, these rights are under the jurisdiction of the SWRCB and are subject to hydrological fluctuations and the regulatory changes implemented by the SWRCB.

The District's water rights require diversion reporting on a 30-day average basis. The licenses allow for higher instantaneous diversions greater than 25 cfs if "there is no interference with other vested rights." Current District peak diversions at the rated 22 MGD plant capacity exceed 25 cfs and get as high as 34 cfs in the summer months. If the District were to rehabilitate the Deterding Collector untreated facilities at Ancil Hoffman Park for irrigation purposes it would add another 4 cfs of diversion, for a total of 38 cfs instantaneous diversion.

Diversions are less than 25 cfs when averaged on a monthly basis, when maximum day demands were about 18.4 MGD (same as the projected future demands). The SWRCB interpretation of 30-day average, instantaneous, and interference with other water rights are key elements to the reliability of District supply. Current maximum day demands are about 18 MGD, or 27.9 cfs, however historical demands as recent as 2008 were 26 MGD or 40.3 cfs. At best, on an averaging basis the District could prove up on about 40 cfs if the maximum day demand were to continue for a month and were to be met entirely through its licensed and permitted surface water sources. Projected in-District demands based upon the current planned growth projections and land use planning limitations may be insufficient to provide full use of the 50 cfs in water rights.[3]

5.4.4 Remediated and Reclaimed Water Assets

Since 2007 Aerojet/Rocketdyne has been treating and discharging remediated water within the District's water service area for contaminant plume containment. Currently, approximately 3.1 cfs (approximately 2,250 AFY) of remediated water is continuously treated within Carmichael Water District's service area at the GET LA (Ancil Hoffman) and GET LB (Bajamont) facilities. Approximately 50% of the supply is being utilized for irrigation of Ancil Hoffman Golf Course and Park and 50% of the supply discharged to the American River during irrigation periods. The entire flow is being discharged to the American River during the year when irrigation is not necessary. Remediated groundwater that is pumped from within the boundaries of the District should be the property of the District. Securing this water asset would diversify the District's water supply portfolio and in turn, improve the District's long-term water supply reliability. Moreover, securing water assets like this that offset lost opportunities for produced groundwater should also occur.

[3] For instance, the current prohibition on hotels and motels in the Carmichael area may be lifted and necessitate increased water supplies into the system to meet the changed domestic and municipal needs.

The District accounts for the use of this water asset within its service area in reporting water use under its water right licenses and permit. Specifically, under Water Code Section 1010, use of remediated, recycled and reclaimed water supplies within a water purveyor's service area counts towards the beneficial use calculation of the foregone water sources that would have been used instead. In other words, since the District is using the remediated water at Ancil Hoffman in lieu of its otherwise available treated water sources, Water Code Section 1010 protects the treated water sources for other beneficial uses desired by the District. Continually accounting for remediated, recycled, or reclaimed water uses within the District's service area is a critical step in protecting and preserving the District's water assets for future needs.

GET LA with New Ancil Hoffman Irrigation Pump Station

The District's further exposure to groundwater contamination is not clear at this time (see Section 6). But should additional contamination be encountered, a remedy or replacement water supply would be expected from the potentially responsible party. Moreover, the exposure to groundwater contamination may also provide more justification for perfecting the District's surface water assets under permit 7356. Although there was some attempt at this effort in 2005 during the Permit 7356 renewal process, the information about the nature and extent of the Aerojet/Rocketdyne contaminant plume was not fully understood nor well described. If surface water sources become less reliable due to changed climatic, hydrological or regulatory conditions, the damages associated with the contaminant plume to the District's long-term water supply reliability will require resolution and remedy.

5.4.5 Groundwater

The District overlies the Sacramento Area North Area Groundwater Basin locally known as the North Area Basin. The North Area Basin is defined by the California Department of Water Resources in DWR Bulletin 118 as the area bounded on the west by the Feather and Sacramento rivers, on the north by the Bear River, on the south by the American River, and on the east by the Sierra Nevada.[4] The eastern extent of the basin lies along a line approximating a north-south line from Folsom Reservoir to the Bear River. This represents the approximate eastern boundary of the alluvial basin. The western boundary parallels the banks of the Sacramento River. The entire North Area Basin encompasses approximately 548 square miles.[5]

Groundwater occurs in unconfined to semi-confined states throughout the North Area Basin. There are essentially three water-bearing formations in the geological profile: the Turlock Lake and Riverbank formations (from approximately 0-120 feet below sea level at Watt Avenue), the Laguna Formation (from 120 to 400 feet below sea level at Watt Avenue), and the Mehrten Formation (from 400 to 700 feet below sea level at Watt Avenue). These formations are typically composed of lenses of inter-bedded sand, silt, and clay interlaced with coarse-grained stream

[4] DWR Bulletin 118 (2003). Bulletin 118, however, calls the basin the North American Basin.
[5] Some of that area is beyond the identified alluvial basin.

channel deposits. As described below, the District utilizes water from the Turlock and Laguna formations.

5.4.5.1 Percolating Groundwater

The District has the right to pump naturally occurring percolating groundwater from the water-bearing formations in the North Area Basin. Specifically, the District is utilizing a groundwater appropriation right to extract groundwater and deliver it to water users within its service area. An appropriative groundwater right, however, is junior in priority to an overlying groundwater right. An overlying groundwater right allows for the extraction and use of groundwater from the underground formations only for uses upon lands overlying the groundwater basin that the extractor actually owns. In other words, in times of shortage, an overlying groundwater user can theoretically use California judicial law to stop a groundwater appropriator from pumping and delivering any water whatsoever to non-overlying end users.[6]

The SGA Groundwater Management Plan (GMP), however, is a quasi-contractual relationship that organized the water users to prevent judicial conflict based upon senior overlying water rights. The GMP outlines the volumes of water in the basin, the safe yield of the basin, and recharge expectations that water users rely on in planning and using their groundwater assets. Accordingly, the District's right to pump percolating groundwater is subject to the terms and conditions agreed upon by numerous regional water purveyors in the SGA GMP.

5.4.5.2 Banked Groundwater

The Sacramento Groundwater Authority also developed rules and regulations for banking groundwater within the North Area Basin. These rules and regulations are collectively called the Water Accounting Framework (Framework). The Framework recognizes investments by the SGA member agencies in the development of conjunctive use programs and supports groundwater banking programs that enhance the long-term sustainability of the groundwater basin. With adoption of Phase III in 2010, the SGA Board established that the Framework is a living process and must include regular review to evaluate whether the Framework is accomplishing its intended objectives. Since the SGA groundwater banking criteria is a living document, it will likely change over time. As such, the District should be diligent in monitoring potential changes in order to prevent reduction in the availability of its stored water assets.

According to the parameters of the water accounting framework, the District has been pumping less naturally occurring percolating groundwater each year since 1998. The District has a targeted groundwater pumping allocation of 6,646 acre-feet per year that it has reduced by nearly 5,000 acre-feet annually. This reduction in groundwater use was largely made possible through the completion of the Bajamont WTP in 2001. As a result of the District's implementation of proactive conjunctive use, the District has banked over 50,000 acre-feet of groundwater in the basin since 1998, as shown in Figure 5-2. This water may now be available as a District resource and buffer for dry year access, or for selling credits to other interested parties in the basin that could benefit from the stored supply.

[6] There have been numerous cases on this issue and other legal principles, like prescription and "reasonable use", have been used to alter rulings based strictly on land and water status pumping status.

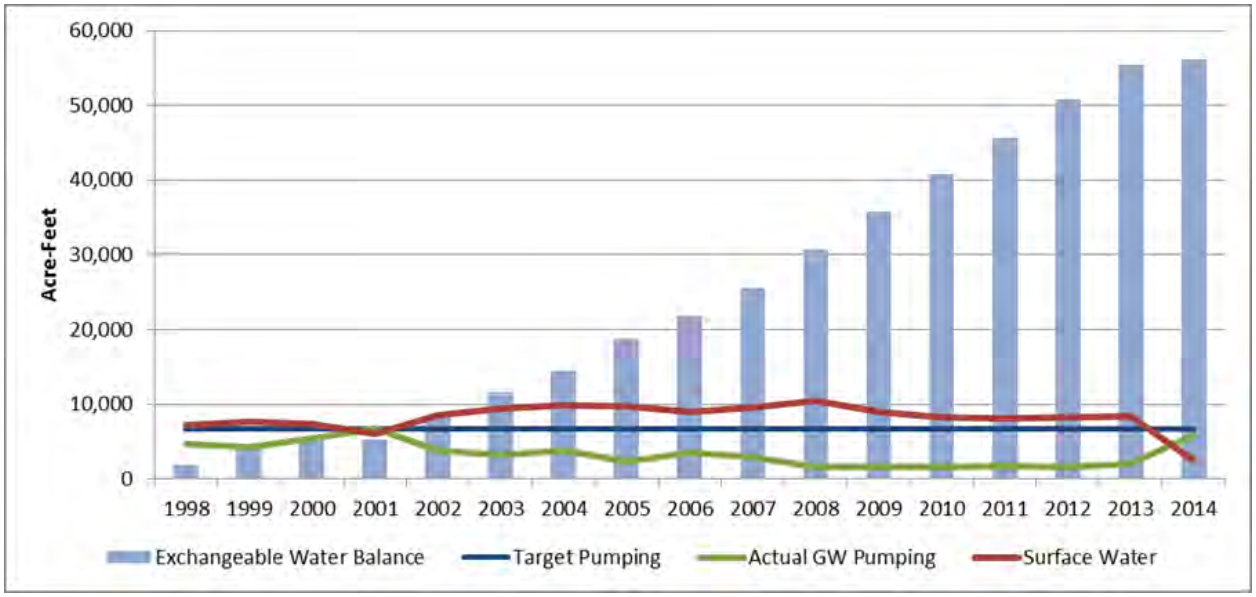

Figure 5-2: Potential Exchangeable Groundwater Banking Assets

Banked groundwater has a special meaning in the context of California law. Water that could have otherwise been taken but was not taken and instead preserved for future use is treated as a beneficial use of water. As such, the banked water gains a more senior water right priority even above those of overlying groundwater users. The reason for this designation is that – but for the forbearance actions of the potential user, the water would not otherwise be present in the basin. Therefore, the water is banked and protected for future use. The SGA Accounting Framework further solidifies this principle by overlying an agreement among participating agencies about the disposition of banked water in the basin.

It is important to note, however, that the Water Accounting Framework as it currently exists does not include groundwater pumping associated with the Aerojet/Rocketdyne groundwater remediation activities. Aerojet currently extracts approximately 2,565 acre-feet per year from the basin within the District's service area at the GET LA and GET LB facilities. Although the District is not responsible for these extractions, it may be necessary to consider this groundwater pumping along with other remediation efforts in future assessments of overall groundwater basin sustainability.

5.4.6 Regional Utilization of Treated Water Capacity

The Bajamont WTP was expanded from 17 to 22 MGD capacity due to groundwater contamination threat. At the same time the District has experienced a decline in overall system demands, thereby potentially "freeing up" some of the capacity at the water treatment plant for other regional uses. Sharing of resources has been explored with several agencies in the region, including Del Paso Manor Water District, Fair Oaks Water District, and most recently, Golden State Water Company (GSWC). The District is working with GSWC and others to use available treatment capacity for regional benefit, including constructing a pipeline from the Bajamont WTP across the American River to be able to provide service to the Rancho Cordova area, which has been highly impacted by the Aerojet/Rocketdyne groundwater contaminant plumes.

5.4.7 Interties with Neighboring Water Systems

The District has several interties with neighboring water systems including Sacramento Suburban Water District, Fair Oaks Water District, and Citrus Heights Water District. These interties provide the capability for emergency mutual aid amongst the water systems, as well as a mechanism for transferring water when the opportunity is available. In addition, the District has an Emergency Mutual Aid agreement with Del Paso Manor Water District, but there is not currently a connection between the systems to convey water. As discussed in the previous section, the District is also reviewing opportunities for a new intertie with GSWC, which would greatly expand the District's intertie capacity.

GSWC has lost many wells due to groundwater contamination since the 1990s and is actively seeking replacement water supplies. The District opportunity is to use available capacity in Bajamont WTP and wheel remediated groundwater discharged to the American River at Buffalo Creek by Aerojet/Rocketdyne, extracted at the District's Ranney collectors, and deliver the water to GSWC through a new pipeline to be constructed underneath the American River, connecting the two water systems. Upon construction of the pipeline, there is also the potential that a booster pump could be installed that would enable GSWC to convey water to the District in case of such a need.

San Juan Water District conducted a hydraulic capacity test in 2012 of its surface water treatment plant, which included a test of the ability of Carmichael Water District to receive surface water from San Juan via interconnections with Fair Oaks Water District and Citrus Heights Water District. The test was successful and confirmed that there is sufficient hydraulic head for the District to utilize the interconnections as a supply source if necessary or desired.

Another potential interconnection could be with Del Paso Manor Water District (DPMWD). DPMWD currently maintains 100 percent groundwater supply, but documented in its 2009 Water Master Plan the desire to practice conjunctive use through use of its City of Sacramento/SMUD Area D water. Although the two water districts are not adjacent to one another (Sacramento Suburban Water District is in between), they are both non-fluoridated and therefore have compatible water supplies.

One option for obtaining the Area D water is via an interconnecting pipeline and pump station from Carmichael to DPMWD. This pipeline could also provide an opportunity for DPMWD to convey groundwater to the District, if desired. The diversion of Area D water from the District's points of diversion would need to be confirmed and accepted by the City of Sacramento and SWRCB. The acceptance of this point of diversion could also provide a potential opportunity for the District to access its Area D water for use in its service area.

Other interties with Fair Oaks Water District have been explored, including the construction of a small booster pump station which would allow Carmichael Water District to wheel water to Fair Oaks Water District. The existing intertie between the districts currently only allows Fair Oaks Water District to provide water to Carmichael Water District due to differences in system elevations and operating pressures. These intertie investigations are still pending.

5.4.8 Area of Origin

Despite the great efforts to protect the body of laws commonly known as Area of Origin law, Area of Origin rules pertaining to the water rights associated with Folsom Reservoir and the

developed project supplies may not provide the District with any long-term water supply reliability. The gist of Area of Origin law is that agencies located within the "area of origin" have the right to develop water supplies to the detriment of the federal developed project supplies and gain a senior water right priority to those supplies. In the American River Watershed, water rights that pre-date the priority of the federal project are numerous and account for nearly all of the flow in the American River during the summer months. As seen from the 2014 drought, all post-1914 water rights, including federal project rights, have been curtailed from diversion because of insufficient flows.

Moreover, many entities within the Area of Origin have developed reliance upon deliveries of project supplies associated with the water stored in Folsom Reservoir. This local reliance on the presence of water stored in Folsom Reservoir would likely attract significant opposition if there was a diminution in these supplies available to local agencies through an area of origin action. As such, the only realistic option for an area of origin right is to create water storage opportunities for additional winter and spring runoff flows that have the full cooperation of other local and regional water purveyors. But the American River has been declared "fully appropriated" during the majority of months in any given water year which likely prohibits any additional water appropriations that could be used to meet water storage needs.

In addition, building and storing surplus waters in a locally built and financed surface storage facility would be extremely expensive and time consuming. A potentially more realistic alternative may be to capture flows for underground storage – but such an effort would require extraordinary cooperation among participating agencies as well as a significant financial commitment. At this time, the regional entities do not appear prepared to make the commitment to support such a large project.

As described in Section 5.6.9.2, the El Dorado County Water Agency's effort to take advantage of a State held water right filing with a 1920s priority date has met significant regional opposition. Although the District has not formally opposed this filing, any diminution in the District's water supplies posed by the filing would be met with staunch opposition and likely legal challenge. This test of the area of origin system of laws and practical realities indicates that there is not, at this time, sufficient support to move an area of origin claim forward even though the right to do so remains codified in law.

Last, Area of Origin law is comprised of statutory sections contained in the California Water Code. These code sections can be repealed by a simple majority vote of the participating Legislators and concurrence of the Governor at any time. Although Area of Origin language was inserted into the Water Bond text, it may not be reliable for future planning. Accordingly, solely relying upon these statutes to protect area of origin water supplies for future Sacramento Area water users is likely misplaced.

5.4.9 Water Transfers

The District has the ability to perform water transfers. Water transfers in California are based upon the reduction in consumptive use of water supplies within a service area during a defined time period in previous years. Traditionally, urban water transfers have been limited to "groundwater substitution transfers" or "reservoir reoperation transfers." For a groundwater substitution transfer, a water agency serves its customers groundwater in lieu of serving them surface water. For a reservoir reoperation transfer, a reservoir is depleted beyond its normal depletion capacity in anticipation of greater natural refill in the following year. Because of the

District's use of groundwater supplies – especially during this 2014 drought – it should be able to transfer surface water supplies under the groundwater substitution criteria in the future.

The District may wish to engage in another form of water transfer that is yet untested in California. This type of transfer would relate to the volume of water that the District has conserved through implementation of various water conservation measures throughout its service area. These conservation measures are not traditionally recognized reductions in consumptive use – as defined by the SWRCB. Normally, a SWRCB defined reduction in consumptive use transfer applies to fallowed lands or other traditional agricultural reductions in water use. Longer-term reductions in consumptive use have not been acknowledged as transferable water by the SWRCB. Nevertheless, this type of transfer should be available because the District has sufficient technical data to demonstrate that it has reduced water consumption within its service area.

The 2014 and 2015 Drought Declaration by Governor Brown also helped to streamline the water transfer process, thereby increasing the potential that the District may be able to complete a transfer. So long as this drought declaration remains in place, the District could have a streamlined water transfer process available.

California's water market has grown over the last 20 years. Most transfers occur during the summer months when pumping curtailments in the Delta have been lifted and demand for water is at its peak. Depending upon hydrological and regulatory circumstances, water transfers can be lucrative. Prices for water in wet years have been as low as $50 per acre-foot and in dry years, like 2014, as high as $2000 per acre-foot. Recently, south of Delta water contractors have joined forces to preclude bidding for water among their constituents and set flat water prices for all export users. In 2014, the SWP users set a price of $275 per acre-foot but this price was eclipsed by other south of Delta users for locally stored water assets. In 2015, prices have risen as high as $700 per acre-foot and in some locals, even higher.

The District would need to evaluate whether reducing its river diversions or facilitating a conservation-based transaction to accomplish a water transfer would affect customer water quality, contaminant plume movement, and be cost-effective in the long term. Although water transfers can be lucrative and support beneficial use of the District's water assets, opponents of these types of transfers may impede a transfer program's benefit.

5.4.10 Surface Water Storage

The District does not have surface storage and therefore is limited to diversions of the natural flow in the American River. Simply being able to divert under natural flow conditions subjects the District to fluctuations in water supply availability. As seen in 2014 and 2015, the fluctuations can be so dramatic, that the entire right to divert water is completely curtailed.

Surface storage would provide greater certainty that water supply diversions would be available during dry and critically dry years, and provide a buffer against water right curtailments associated with the natural flow of streams. Attaining temporary or permanent storage rights in Folsom Reservoir would expand the flexibility of existing water rights. Storage will also provide improved ability to conjunctively use and market water assets. Some of the options that could provide some surface storage for the District include:

- Bureau of Reclamation – The District has previously requested the Bureau of Reclamation to provide storage. The Bureau has acknowledged these requests and has indicated future storage may be provided, but has not acted on this up to this point.

- Storage Opportunities with Placer County Water Agency and El Dorado Irrigation District's FERC Relicensing Projects. It is unlikely that these agencies would consent to using existing storage capacity but the development of additional storage or other forms of water exchange may open up an opportunity.

- Consider opportunities to exchange remediated groundwater with Reclamation in order to maintain surface storage flows in Folsom Reservoir. These storage rights would require a contract with Reclamation.

- Groundwater Storage – The District could develop specific forms of groundwater storage in order to better protect water assets during curtailment periods. Such storage could consist of Aquifer Storage and Recovery projects or in-lieu groundwater banking and exchange arrangements with water purveyors with better access to groundwater supplies like Sacramento County Water Agency.

5.4.11 Water Use Efficiency

The District maintains an existing comprehensive water use efficiency program. The District participated with the Water Forum Agreement and RWA's Regional Water Use Efficiency program, and the CUWCC and has seen significant improvements in water use efficiency in recent years. The District participates in fixture rebate retrofit programs, large landscape water budget developments, commodity rate metering, employs a public outreach and education program, and many other best management practices to improve water use efficiency. The District also implemented an aggressive water meter retrofit program and completed meter installation of all District customers in 2013. The District will continue to comply with the Water Conservation Act of 2009.

The 2012 meter data indicated an 11 percent unaccounted-for water, with reduced unaccounted-for water in 2013 and 2014 of about ten percent. Ten percent (10%) or less unaccounted-for water is generally considered within acceptable limits. This is the first time the District has been in a position to quantify water consumption to determine the possible lost water. Unaccounted-for water loss can be due to the following:

- Meter inaccuracy
- Unpermitted construction water
- Water system flushing
- Leaks in water mains, valves, and fire hydrants
- Leaks in services prior to the meter

The 2015 UWMP legislation includes a greater focus on quantifying leak and unaccounted-for water which will require DWR to prepare a guideline for conducting the evaluation. DWR working with AWWA, prepared the Water Conservation Guidebook No. 5 focusing a leak audit on the following key steps:

1. Quantify water sources

2. Quantify water use
3. Evaluate meter accuracy
4. Calibrate meters
5. Conduct leak survey
    a. Sonic Survey of all valves

The District has an annual leak detection program compliant with the California Urban Water Conservation Council (CUWCC) best management practice. The District should consider reviewing and updating its existing leak detection program if necessary to ensure consistency with the recently adopted UWMP Act amendments once the guidelines are released by DWR. Losses due to leaks tend to be constant whereas losses due to meters tend to be proportionately larger during the peak use period. The District could enhance the leak survey by evaluating winter minimum demand readings. This might include a special meter reading cycle to provide a firm correlation between days meter read and water production in order to reduce the uncertainty that occurs when comparing the bimonthly readings.

The Water Conservation Act requires a 20 percent reduction in per capita local agency water use by 2020. The District's plan for compliance with this mandate and current level of participation in the various Best Management Practices (BMPs) is documented in the 2010 UWMP and will be reviewed and updated for the upcoming 2015 Urban Water Management Plan Update.[7] Current Best Management Practices implemented either by the District or Regional Water Authority are presented in the latest UWMP. UWMP's are updated every 5-years ending in 0 and 5.

While the District will maintain a robust conservation program into the future, the benefits of continued membership in the CUWCC should be evaluated and a recommendation as to future participation developed. Recent amendments to the UWMP act have reduced the specific BMP reporting requirements and CUWCC membership may not be critical to achieving the 20x2020 water use reduction targets.

5.4.12 American River Water Quality

The District has one of the better quality surface water supply sources in the State of California. The American River is low in dissolved solids, has very few upstream urban discharges, and is considered "generally excellent" in the 2013 American River Watershed Sanitary Survey. All regulated drinking water parameters fall below maximum contaminant level standards. The District's plant provides state-of-the-art treatment to assure microbiological safety and a high degree of American River water filtration, exceeding the current Surface Water Treatment Rules. The District is a participant in a technical committee on revising the American River Watershed Sanitary Survey, which included:

- Placer County Water Agency
- GSWC
- El Dorado Irrigation District

[7] The 2015 UWMP is now due in June 2016 in order to incorporate 2015 demand information.

- Carmichael Water District
- San Juan Water District
- City of Sacramento
- City of Roseville
- Sacramento County Water Agency
- City of Folsom
- East Bay Municipal Utility District
- Folsom State Prison

Urban runoff, non-point source pollution and recreation use are cited as sources of the fecal coliform bacteria found in the untreated river water in concentrations that increase in the downstream direction. The survey included recommendations for Carmichael Water District to change its coliform monitoring location to post-Ranney collectors, if possible.

Discharges to the American River from the Aerojet site occur through Buffalo Creek, a tributary that joins the American River upstream of the District's Ranney collectors. Aerojet also operates two other discharges from the District's service area at Bajamont (GET LB) and Ancil Hoffman Park (GET LA). Both GET LA and LB discharges occur downstream of the District's active Ranney collectors. While the discharges meet requirements of the National Pollutant Discharge Elimination System (NPDES) permits and stringent clean up requirements, there have been occurrences of violations of the discharge. Dilution and mixing with the river provides a considerable buffer against any risk of the remediated groundwater compromising District operations. It is important, however, that the District remain vigilant in monitoring Aerojet discharge compliance through reviewing Aerojet annual compliance reports, and actively participating in SGA Contamination Task Force meetings to stay current on remediation activities.

5.4.13 Recommendations for District's Water Assets

The analysis throughout Section 5.4 has focused on the District's water assets as well as facts and circumstances derived from the District's effort to secure, protect, and use its water assets. The purpose of this section is to outline the list of actions and to prioritize those actions so that the District may take appropriate steps to protect its water assets and secure long-term supply reliability.

5.4.13.1 High Priority Actions

1. Begin process with SWRCB to perfect water right permit 7356 based on 2005 water use data. This effort will require gathering and submitting data to the SWRCB as part of a formal petition effort and a formal hearing with legal representation.

2. Add municipal use as a beneficial use to license 1387. This effort will require filing a petition to add a beneficial use with the SWRCB. It will likely require a formal hearing with legal representation.

3. Begin examining water supplies that may provide more security in extreme droughts like the ongoing 4 year drought. Potentially identify the availability of remediated and discharged groundwater as a permanent source of water supply.

4. Continue accurate reporting of water usage under all of the District's water rights. Incorporate water conservation savings calculations as provided for in Water Code Section 1011 in order to preserve water assets.

5. Expand use of Aerojet/Rocketdyne remediated and reclaimed water supplies within the District boundaries. Record use of water assets in water reporting documents as per the requirements of Water Code Section 1010 in order to preserve water assets.

6. Continue protecting the District's appropriative groundwater right to percolating groundwater as per the SGA GMP. Defend the terms of the GMP and participate in any updates and activities associated with the GMP.

7. Continue protecting and banking groundwater as per the SGA's Water Accounting Framework. Defend the terms of the framework against interests looking to require the District to lose control of banked water supplies.

8. Engage the Bureau of Reclamation and federal legislators on using Folsom Reservoir to store the District's water assets under certain conditions.

9. Prepare a detailed drought plan that incorporates water supply curtailment, demand management, short-term transfers and other opportunities to mitigate drought circumstances.

10. Seek opportunities to store the District's surface water assets. Opportunities may include working with Reclamation and other regional purveyors to develop surface and subsurface storage opportunities.

11. Expand and secure water interties with neighboring agencies in order to better manage critical drought situations and emergency shut downs of the water system.

12. Monitor Aerojet/Rocketdyne contaminant plume migration and consider remedies to handle plume incursion further into the District's boundaries.

5.4.13.2 Medium Priority Actions

1. Secure Aerojet water supplies as a District asset. Aerojet's contamination plume has infiltrated the District's service area minimizing the District's ability to extract and use its naturally percolating groundwater resources.

2. Investigate and secure SMUD Area D water supplies for District use. The District should work with the City of Sacramento to understand and secure this water asset in the context of diversifying the District's water supply portfolio.

3. Expand groundwater banking actions within the SGA Accounting Framework and District Operational opportunities. The District should continue to account for its in-lieu recharge with the accounting framework but may also consider additional active recharge opportunities in the basin either through spreading basins or through aquifer storage and recovery efforts.

4. Consider adding additional beneficial uses to the District's post-1914 water rights including instream dedication, groundwater banking, and environmental enhancement.

Adding additional uses will allow the District to fully utilize its water assets for other beneficial purposes in the region and protect them for long-term supply reliability.

5.4.13.3 Low Priority Actions

1. Engage in surface water transfers for District benefit. The District should consider developing in-lieu surface water transfers with other regional and through-delta agencies. These transfers not only secure the water asset in the context of state and regional agencies, but also generate revenue that can be used to improve the District's CIP or PSM programs.

2. Understand opportunities to use the District's available treatment and conveyance capacity for other regional benefit. The District should work with other regional purveyors to potentially use the available capacity in the District's facilities.

3. Explore opportunities to expand post-1914 appropriative water rights place of use within Sacramento, Placer and El Dorado counties. Expanding the place of use may enable the District to exchange water assets in times of shortage in order to meet its local need.

4. Track Area of Origin legal protections as they develop in various forums. Monitor any opportunities to use the area of origin statutes for District benefit.

5.5 Regional Forums and Programs

Throughout the broader Sacramento watershed, there are numerous forums that participate in developing and advocating water planning and management issues. These forums generally serve the District's needs by advocating positions on policy and legal issues and defending intrusions into local and regional water management and water rights issues. In short, these entities' objectives are aimed at protecting the region's water supplies. However, the importance of water resources in California has exponentially grown and, in line with this growth, the forums that discuss water issues have expanded and diversified. The purpose of this subsection is to: (1) describe the regional water groups that the District should be monitoring, (2) outline the programs and issues that each forum is coordinating, and (3) assess the District's engagement opportunities in these forums in order to maximize the effectiveness of implementing the District's water management strategies.

5.5.1 Water Forum (and Water Forum Successor Effort)

In 1993, the City of Sacramento and Sacramento County created the Water Forum to address concerns over both water supply reliability and environmental degradation in the Sacramento Region and the Lower American River (LAR). Specifically, the region was experiencing a prolonged drought and surface and groundwater conditions were becoming critical. Moreover, there was an increasing awareness of the environmental conditions along the LAR and that further dilapidation of the LAR might lead to permanent problems. The LAR supports 43 species of fish, including federally protected species – fall run Chinook salmon and Central Valley steelhead.

The Water Forum brought together a diverse group of business and agricultural leaders, citizens groups, environmentalists and water purveyors in an effort to protect water supplies for human and industrial consumption as well as enhance environmental conditions in the lower American

River. The Water Forum continues to uphold these objectives today through the Water Forum Agreement and the Lower American River Flow Standard efforts.

5.5.1.1 Water Forum Agreement

The Water Forum Agreement (WFA) is a signed document that seeks to meet specific objectives in the American River watershed. The Agreement is a package of linked elements with two, co-equal objectives: to provide a reliable and safe water supply for the region's economic health and planned development to the year 2030; and preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. In order to meet these co-equal objectives, the Water Forum Agreement incorporates seven key elements: increased surface water diversions; actions to meet customer needs while reducing diversion impacts in drier years; support for improved pattern of fishery flow releases from Folsom Reservoir; Lower American River habitat management; water conservation; groundwater management; and Water Forum Successor Effort.

The Agreement, however, also contains other more specific sub-Agreements called Purveyor Specific Agreements (PSA). Carmichael Water District signed a PSA. Unlike many other regional water purveyors, Carmichael's PSA does not require the District to reduce diversions in drier or driest years to meet Lower American River flow needs. Moreover, the District's PSA acknowledges the District's right to use groundwater as well as its right to transfer its surface water assets. However, any forbearance of surface water supply above a baseline number of 12,000 acre-feet per year may only be transferred after it is used to implement the "Improved Pattern of Fish Flow Releases" in the lower American River. In other words, this water may only be transferred after it reaches the mouth of the American River. If the District uses less than its 12,000 acre-foot baseline surface water supply, then any amount below that number may be transferred to anywhere in the American River watershed and beyond. As such, the District's PSA does partially limit the District's ability to fully manipulate its water rights and entitlements.

5.5.1.2 Lower American River Flow Management Standard (FMS)

The lower American River supports 43 species of fish, both native and non-native species as well as endangered and threatened species. The river habitat also supports numerous other terrestrial and avian species – some of which are listed on the federal Endangered Species Act like the valley elderberry longhorn beetle.

The objective of the lower American River Flow Management Standard Project (Project) is to help achieve the coequal objectives of the Water Forum Agreement by creating a legally enforceable, durable, and protective flow management regime for the LAR. In particular, the Project seeks to:

- Establish minimum flow requirements and water temperature objectives that are protective of the fisheries resources in the lower American River;
- Identify criteria for implementing the new flow requirements;
- Provide operational flexibility through the establishment of a multi-agency group that would regularly convene to address operational and related issues; and
- Develop a monitoring and evaluation program to verify the efficacy of the new instream flow requirements for the lower American River.

The Project would amend the Water Forum Agreement by incorporating the flow management plan into the Agreement. And, in accordance with the WFA, the Water Forum would present the FMS Update to the SWRCB as proposed amendments to Reclamation's permits (No. 11315 and 11316). Specifically, there are two primary flow requirements associated with the proposed amendments:

- A minimum release requirement (MRR) from Nimbus Dam between 800 and 2000 cfs; and

- A downstream flow requirement at the H Street Bridge of no less than 250 cfs between January 1 and September 15 and 500 cfs between September 16 and December 31.

The MRR would be suspended if either runoff to Folsom Reservoir is projected to be less than 400,000 total acre-feet (af) or if Folsom Reservoir is projected to fall below 200,000 af in storage at any time within a 12-month period. In addition, the Project seeks to establish temperature criteria. These criteria include:

- For steelhead trout:

    - 65° F or less average daily water temperature at Watt Avenue Bridge between May 15 and October 31;

    - If 65° F cannot be achieved, the target daily average water temperature at Watt Avenue may be increased incrementally (1° steps) to no more than 68° F; and

    - If the aforementioned objectives cannot be achieved for three consecutive days or exceed 1° F for a single day, the parties shall devise alternatives to improve water temperature conditions.

- For fall run Chinook salmon average daily water temperature target shall be 60° F or less at Watt Avenue Bridge in October and 56° F at Hazel Avenue in November.

The Lower American Flow Management Standard effort is a critical issue for American River water diverters like the District. Criteria proposed in the FMS are locally negotiated standard that can improve fish habitat and viability in the LAR. However, SWRCB and the fisheries services may anticipate that these solutions do not go far enough and propose alternative solutions that could further implicate water rights and supplies in the American River. This issue is of paramount importance to the District and the District's water assets and should be monitored closely.

5.5.2 Regional Water Authority (RWA)

The Regional Water Authority (RWA) is a joint powers authority formed in 2001 to promote collaboration on water management and water supply reliability programs in the greater Sacramento, Placer, and El Dorado County region. It is an outgrowth of the Water Forum in order to allow regional agencies to collectively implement the provisions of the Agreement. RWA represents 24 water suppliers and associated agencies in the greater Sacramento Area. The mission of RWA is to serve and represent the regional water supply interest and to assist Members in protecting and enhancing the reliability, availability, affordability, and quality of water resources. A nine-member Executive Committee is elected annually to guide RWA.

In September 2013, RWA Board unanimously adopted the updated Goals and Objectives for the RWA Strategic Plan. The four goals are: Planning Goal, Implementation Goal, Information/Education Goal, and Advocacy Goal.

- Planning Goal seeks to develop a regional water reliability plan to identify the most promising regional opportunities to improve water supply reliability; evaluate and respond to external impacts on the region's water supplies and operations; and create an Implementation Plan for the Planning Goal and update it annually.

- Implementation Goal seeks to promote implementation of the American River Basin Integrated Regional Water Management Plan; support a lower American River Flow management Standard that is consistent with the Water Forum coequal goals; support implementation of water transfers among agencies intra-and interregional that are beneficial for the region; support programs to benefit from economies of scale in purchasing; fully implement the regional mutual aid program template for equipment, manpower, and water supply; promote improvements in water use efficiency in the region to meet future water needs; and create an Implementation plan for the implementation goal and update it annually.

- Information and Education Goal seeks to educate and inform members and other interested parties on water management issues affecting the region; raise RWA profile and credibility to external audiences through a focused public outreach effort; develop and maintain strong partnerships to advance RWA member interests; develop a comprehensive public outreach and education program among members to create and implement a consistent message for RWA and the region; and create an Implementation Plan for the Information/Education Goal and update it annually.

- Advocacy Goal seeks to engage state and federal legislators representing the region and legislators on relevant committees to discuss an agenda for legislative action that represents a collective RWA member vision on items of regional importance; and evaluate, comment, and advocate on statewide water regulatory issues that may impact the region and its water supply reliability.

5.5.2.1 Restructure of Joint Powers Authority

In October of 2013, the RWA members amended its Joint Powers Authority in order to be a more effective entity in furthering its membership's objectives. Specifically, RWA modified its voting structure so as to allow the membership to take positions on various issues without the memberships' unanimous consent. This change in voting structure is likely to elevate RWA's effectiveness in advocating and analyzing water issues throughout California's legislative and regulatory processes.

5.5.2.2 Integrated Regional Water Management Plan

In April of 2004, sixteen of RWA's members and associate members elected to embark on the development of an Integrated Regional Water Management Plan (IRWMP) on behalf of the entire RWA membership. RWA's IRWMP's addresses complex water resource management challenges by identifying water supply and infrastructure issues and finding regional cooperative solutions and financing mechanisms to resolve the challenges.

RWA's IRWMP provides the following benefits:

- Establishes a common vision and goals and a stronger regional understanding of water resources issues and potential solutions.
- Creates opportunities to identify projects that align with the vision and goals.
- Creates opportunities to develop multi-partner projects with better economics of scale and more potential funding sources.
- Establishes a framework to monitor and evaluate the region's progress toward meeting its goals.
- Establishes an adaptive process to address tomorrow's water resources challenges.

The District has been active in identifying issues and developing solutions as part of the IRWMP process. The IRWMP process in California legislative and regulatory law is becoming the paramount planning forum that allows regional agencies to obtain state funding from legislative enactments and proposition initiatives. Continuing participation in RWA's IRWMP process is critical to meet the District's long-term water management objectives.

5.5.3 Sacramento Groundwater Authority

The Sacramento Groundwater Authority (SGA), formerly the Sacramento North Area Groundwater Management Authority, was formed as a joint powers authority and charged with the management of the Sacramento Region's North Area Groundwater Basin. The SGA's formation in 1998 resulted from a coordinated effort by the Sacramento Metropolitan Water Authority and the Water Forum to establish an appropriate management entity for the basin. SGA draws its authority from a joint powers agreement signed by the cities of Citrus Heights, Folsom and Sacramento as well as the County of Sacramento to exercise their common police powers to manage the underlying groundwater basin. In turn, these agencies chose to manage the basin in a cooperative fashion by allowing representatives of the 14 local water purveyors and representatives from the agricultural and self-supplied pumper interests to serve as the Board of Directors of the SGA.

SGA is a critically important water management entity in the Sacramento region. Carmichael Water District participates as an active member within the SGA framework in order to protect its percolating groundwater assets, banked groundwater assets, and remediated groundwater assets. Accordingly, the District should continue its work with SGA and further develop a leadership interest on the SGA Board in order to further its long-term groundwater management objectives.

5.5.3.1 SGA Groundwater Management Plan

SGA has adopted and is implementing a Groundwater Management Plan (GMP) that meets the pertinent statutory criteria and that incorporates both RWA's IRWMP as well as the Water Forum Agreement. Sacramento Groundwater Authority last updated the Groundwater Management Plan in 2008 and in 2013 began a process to revise the Plan. SGA also develops biannual reports on the state of the basin. There are eight regional groundwater management objectives, and SGA has assessed progress made with each objective in the 2013 Basin Management Report as follows:

- Maintain or improve groundwater quality in the SGA area to ensure sustainable use of the groundwater basin: SGA is making good progress toward meeting this objective. With the noted exception of regional contamination plumes, groundwater quality is very good in the basin and suitable for public water supply needs.

- Maintain groundwater elevations that provide for sustainable use of the groundwater basin: This objective is being met. SGA member agencies have implemented a variety of programs in recent years that are helping to meet this objective. Groundwater elevation contour maps included in this report clearly show that conjunctive use programs continue to produce tangible results.

- Protect against potential inelastic land surface subsidence: This objective is being met.

- Manage groundwater to protect against adverse impacts to surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area: SGA is continuing to meet this objective. Past model runs during development of the Water Accounting Framework demonstrated no significant adverse impacts to surface water flows.

- Protect against adverse impacts to surface or groundwater quality resulting from interaction between groundwater in the basin and surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area: SGA is making progress toward meeting this objective.

- Educate on the need to achieve recharge to the aquifer of appropriate quality and quantity to ensure basin sustainability: SGA is making progress toward this objective. SGA is coordinating with pilot projects to evaluate recharge in stormwater detention basins near Elk Grove and in a former gravel mining operation south of Rancho Cordova.

- Maintain a sustainable groundwater basin to help mitigate potential water supply impacts resulting from an uncertain climate future and an increasingly unreliable state and federal water delivery system: SGA is making good progress toward meeting this objective. The completion of the Water Accounting Framework was a significant step toward defining both the amounts and responsibilities of sustainable levels of groundwater use in the central part of the SGA area.

- Maintain a sustainable groundwater basin underlying the SGA area through coordination and collaboration with adjacent groundwater basin management efforts: SGA is making good progress toward meeting this objective. SGA continues to regularly coordinate with representatives of Placer County and the Sacramento Central Groundwater Authority.

The District should continue active engagement and participation in the Groundwater Management Plan update process.

5.5.3.2 SGA Water Accounting Framework

The Sacramento Groundwater Authority has developed a Water Accounting Framework, which is a tool to encourage policies and procedures to promote and support conjunctive use operations within the SGA area. The Framework recognizes investments by the SGA member agencies, including the District, in the development of conjunctive use programs and supports

groundwater banking programs that enhance the long-term sustainability of the groundwater basin. With adoption of Phase III in 2010, the SGA Board established that the Framework is a living process and must include regular review to evaluate whether the Framework is accomplishing its intended objectives. As such, the SGA groundwater banking criteria is a living document and will see changes that will require continuous District input. The District's banked groundwater assets are further described in Section 5.4.5.2 supra.

5.5.4 Sacramento Central Groundwater Authority

The Sacramento Central Groundwater Authority (SCGA) is a joint powers authority established under the police powers of the City of Elk Grove, City of Folsom, City of Rancho Cordova, City of Sacramento and Sacramento County. In November of 2006, the SCGA adopted a groundwater management plan to establish a framework for maintaining a sustainable groundwater system in the Central Sacramento Groundwater Basin (Central Basin). The Central Basin is essentially bounded by the American River on its north, just south of the Cosumnes River on its south, to the west at the Sacramento River and to the east the Sierra Nevada.

The SCGA is working towards establishing broader water management and groundwater banking objectives. And, although Carmichael Water District is not located with the Central Basin boundaries, issues that affect the District's disposition and use of its water assets do occur in that area. For instance, the origin of the Aerojet/Rocketdyne groundwater contamination plume began in the Central Basin and continues to pose issues within that basin. Actions that affect plume development and movement in the Central Basin may translate into response in the North Basin. As such, the District should monitor SCGA's activities and work with SCGA staff and stakeholders.

5.5.5 Northern California Water Association (NCWA)

The Northern California Water Association's (NCWA) mission is "to advance the economic, social, and environmental sustainability of the Sacramento Valley by enhancing and preserving its water rights, supplies, and water quality." NCWA's member agencies include water districts, water companies, small towns, rural communities and landowners that beneficially use both surface and groundwater water resources in the Sacramento Valley. NCWA represents the entire Sacramento Valley, which extends from Sacramento to north of Redding, and between the crests of the Sierra Nevada and the Coast Range. Carmichael Water District is not a member of NCWA.

NCWA, however, is the recognized voice on Northern California water issues. NCWA regularly brings together the water leaders in the region to protect the region's water rights and supplies by working with Congress, the State Legislature, state and federal agencies, and various stakeholders throughout the state. In fact, NCWA has been the dominant influence in identifying and addressing water issues in the Sacramento Valley – and usually addresses these issues long before other water management agencies have identified the issues' critical components. NCWA has also led and encouraged efforts for water resources managers to implement sustainability initiatives and integrated regional planning across this diverse region.

NCWA is focused on the upcoming Bay Delta Water Quality Control Plan Update and on protecting regional water rights. In doing this and developing strategies to address these issues, NCWA has identified "the policy of the State of California… to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in

improved regional water supplies, conservation and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts." (Water Code §85021.) This strategy of articulating statutory mandates that require decision-makers to address their critical management decisions puts the onus on them to prove legality.

The District should monitor the issues identified by NCWA and NCWA's responses and actions relevant to those issues. And the District should consider taking an active role in NCWA's long-term water supply management efforts.

5.5.6 Sacramento Area Council of Governments (SACOG)

The Sacramento Area Council of Governments (SACOG) is an association of local governments in the six-county Sacramento Region. Its members include the counties of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba as well as 22 regional cities. SACOG has historically provided transportation planning and funding for the region, and has served as a forum for the study and resolution of regional issues. Recently SACOG has become active in California's ongoing water supply debates and planning. Specifically, SACOG is an active member of the North State Water Alliance, described below. As such, SACOG will likely take a more active role on behalf of the Region in water planning issues as it becomes politically expedient to do so.

5.5.7 North State Water Alliance (NSWA)

The North State Water Alliance (NSWA) is a growing coalition of cities, counties, water providers, business, agriculture and community groups in Northern California with interest in resolving California's and NSWA Region's water issues. NSWA's common geography and interests have brought these groups together to work closely on water issues. NSWA's mission is to promote responsible statewide water solutions that protect the economy, environment and quality of life for the north state and for all Californians.

The Founding Partners of the North State Water Alliance include:

- Northern California Water Association (NCWA)
- Sacramento Metro Chamber of Commerce (Sac Metro)
- Regional Water Authority (RWA)
- Mountain Counties Water Resources Association (MCWRA)
- Sacramento Area Council of Governments (SACOG)

During a press conference held at the State Capitol in 2014, NSWA leaders and supporters called upon the California Legislature and Gov. Jerry Brown to act quickly on a water bond that improves statewide water supply reliability for people and nature and that meets the following criteria:

- Maintain water rights – for stability and certainty in water operations.

- Advance new water storage and operational improvements – to increase flexibility in managing water during dry periods.

- Increase groundwater storage – recharge, storage and extraction projects for safe drinking water supplies.

- Improve urban water management – maximize statewide water savings through projects that support recycling, stormwater management and conservation.

- Protect and restore watersheds and ecosystems – prioritize migratory corridors needing immediate assistance including those for salmon and steelhead and water supplies along the Pacific Flyway.

The NSWA is an effort to expand the political influence of Northern California's water interest groups. Lacking extremely large population hubs like those of the Bay Area and Los Angeles, the NSWA group intends to utilize geography and the urban and rural interests within that large geography to influence water policy. The District should encourage RWA's management and staff to actively participate in the NSWA and empower the NSWA to be politically effective.

5.5.8 Association of California Water Agencies (ACWA)

The Association of California Water Agencies (ACWA) is the largest coalition of public water agencies in the country. Originally created in 1910, its nearly 450 public agency members collectively are responsible for 90 percent of the water delivered to cities, farms and businesses in California. It has a primary mission to assist its members in promoting the development, management and reasonable beneficial use of water in an environmentally balanced manner.

ACWA identifies issues of concern to the water community and the general public. The association accumulates and communicates the best available scientific and technical information to the public and policy makers; facilitates consensus building; develops reasonable goals and objectives for water resources management; advocates sound legislation; and fosters cooperation among all interest groups concerned with stewardship of the state's water resources. In addition to its public agency members, ACWA has numerous affiliate members that include mutual water companies as well as other non-profit and non-public water suppliers. Hundreds of firms and corporations with an interest in water also belong to ACWA as associate members. A 33-member Board of Directors governs the association. The membership is organized into 10 geographic regions, which play an active role in setting the association's policy agenda.

The District is an ACWA member. The size of ACWA has made it difficult to be an effective advocate of statewide water policies that benefit all of its members. In 2009, ACWA took political actions that were adamantly against the needs of its northern California membership. These actions nearly resulted in a mass exodus of northern California interests from ACWA's membership as distrust permeated the Association's leadership ranks. Instead, ACWA's board policies were modified to prevent factional dominance.

In 2014, ACWA was active in helping facilitate the Governor's Water Action Plan, groundwater legislation, and potential modifications to the Water Bond. There is still a mistrust of ACWA's management activities after the 2009 legislative session and water purveyors have been cautious in watching ACWA's leadership in formulating and advocating for new water policy.

The District should maintain its membership but should be dutiful in monitoring the actions of the ACWA board members so as not to repeat the problems in 2009.

5.5.9 Legal Defense and Political Organizations

There are numerous legal defense and political organizations that work within the American River watershed region. Only a few of these organizations, however, will be described in this section. The primary purpose of these types of organizations is to defray costs associated with legal representation and advocacy. There are three primary organizations that affect the American River basin. They are:

- Sacramento Valley Water Users Joint Defense Agreement – The Sacramento Valley Water Users Joint Defense Agreement was established in the 1990s to handle issues associated with the development and implementation of the Bay Delta Water Quality Control Plan. This Agreement has been signed by numerous water agencies in the American River Watershed.

- American River Watershed Joint Defense Agreement – Recognizing that some water issues are isolated in priority to the American River region, a group of American River water diverters established this joint defense agreement to defray costs associated with battling these issues.

- Sacramento Region Water Alliance (SRWA) - The SRWA is an organization of local water purveyors that recognized common issues in addressing legislative and regulatory issues. Specifically, SRWA organized funding sources to hire a lobbying firm to advocate for particular water related issues in the California Legislature. The SRWA is going to be subsumed into RWA as RWA establishes its new mission under the modified Joint Powers Agreement.

5.5.10 Recommendations for Regional Engagement

The analysis in this section has focused on the various forums where water issues are identified, debated, and addressed. The number of forums, tracking the issues addressed in each forum, and understanding each forum's effectiveness is of paramount importance to the District. As such, this section prioritizes the forums in which the District should participate and how the District can participate in other forums that may be addressing issues of concern.

5.5.10.1 High Priority Forum Participation and Key Issues to Address

1. Water Forum and Water Forum Successor Effort – The District should actively participate in the Water Forum in order to monitor specific issues associated with the Water Forum's ongoing implementation of the Water Forum Agreement. Specifically, the District should understand:

    a. Modifications to the Water Forum Agreement.

    b. Development and implementation of the Lower American River Flow Management Standard.

2. Regional Water Authority – The District should actively participate in RWA and continue to hold Board and Executive Board positions in order to guide RWA actions in a number of areas. The primary issues related to engagement in RWA are:

    a. Integrated Regional Water Management Plan Update.

    b. Funding for IRWMP programs.

    c. Legislative and Regulatory Advocacy that is developing as part of the newly established Advocacy Goal.

    d. Understand the regional mutual aid program for equipment, manpower and water supply.

    e. Address water management issues associated with implementation of the Water Forum Agreement beyond the LAR FMS.

    f. Understand RWA's position (or help develop position) on the Bay Delta Water Quality Control Plan Update.

3. Sacramento Groundwater Authority – The District should actively participate in SGA and continue to hold Board and Executive Board positions in order to guide SGA actions in a number of areas. The primary issues related to engagement in SGA are:

    a. RWA/SGA IRWMP integration.

    b. Groundwater Management Plan update.

    c. Water Accounting Framework modifications.

    d. New groundwater legislation and implications to SGA GMP and Water Accounting Framework.

    e. Use SGA as a platform to develop and implement groundwater legislation that the District has historically promulgated.

4. Sacramento Regional Water Alliance – the District should continue to work with the SRWA until it fully merges into RWA. The District should seek to work with SRWA members to:

    a. Use lobbying effort to further the District's objectives.

    b. Challenge suppositions by participants in this forum on effective engagement strategies.

    c. Address groundwater legislation and water bond legislation.

    d. Morph SRWA effort into RWA's Advocacy Goal.

5.5.10.2 Medium Priority Forum Participation and Issues Addressed

1. Northern California Water Association – the District should spend time understanding how NCWA works and whether or not NCWA is worth joining for purposes of better advocacy and issue engagement. The District should assess membership costs and the value added for membership in the organization. At the very least, the District should work with NCWA staff to:

    a. Monitor strategies with key legislators and regulators.

    b. Encourage RWA membership in NCWA and constant contact and participation by RWA Executive Director.

    c. Understand NCWA position on Bay Delta Water Quality Control Plan update.

2. North State Water Alliance – the District should work within RWA to engage efforts of the NSWA. This new alliance is the preeminent driver for gaining broader political influence in issues of statewide concern. The Water Bond discussions and lobbying efforts may be channeled through the NSWA and the District should look for other issues like the Bay Delta Water Quality Control Plan to push through this group.

3. Association of California Water Agencies – the District should continue to engage and monitor the actions of ACWA. The District should request that RWA provide annual updates on key agenda items that are developed and discussed at ACWA meetings.

4. American River Watershed Joint Defense Agreement – the District may consider joining this joint defense group in order to work through broader issues affecting the American River. Specifically, the upcoming Bay Delta Water Quality Control Plan Update may impact all AR water users and a joint defense may defray costs and assist with expert analysis of issues.

5.5.10.3 Low Priority Forum Participation and Issues Addressed

1. Sacramento Area Council of Governments – SACOG is beginning to further engage in water supply and management issues in the American River watershed. SACOG is a member of the NSWA so participation with NSWA through RWA should allow the District to understand SACOG's water engagement statewide.

2. Sacramento Valley Water Users Joint Defense Agreement – the Sacramento Valley Joint Defense Group may be a good engagement strategy in order to defray costs associated with very large water supply reliability issues including the BDCP and Bay Delta WQCP Update. The District should consider participating in these venues in order to best assess legal and regulatory issues that will affect large areas of northern California.

5.6 Regional and Statewide Issues Affecting Water Assets

California is replete with water-related issues. The complexity and sophistication of the various issues as well as the diverse forums in which these issues are discussed make tracking each of them very difficult. The purpose of this section is to describe the most pertinent regional and

statewide water issues facing the District and to assess the District's best opportunities to engage and influence these issues.

5.6.1 Bay Delta Water Quality Control Plan Update

The Water Quality Control Plan (WQCP) is the responsibility of the State Water Resources Control Board (SWRCB). The SWRCB updates this plan every 3 years, with the intent of protecting the beneficial uses of water within the Bay-Delta and its tributaries as well as the water quality issues associated with managing the states' waters to meet these beneficial uses. The last Bay-Delta WQCP update was completed in 2006 and is described in the 2003 Master Plan.

The recent update process started in 2009 and is a multi-phase effort to review both water quality and stream flow rates for Delta tributaries to meet Delta outflow requirements. Phase 1 is currently under development and is providing recommended flow regimes for future management of tributaries to the San Joaquin River. In this Phase, it is becoming increasingly clear that upstream water rights will be modified in some way to meet recommended flow criteria downstream. Update to the Phase 2 Sacramento prior Water Quality Control Plan Update and possible Phase 3 Water Rights reallocation will consider the Sacramento River and tributaries and potential water rights changes. As such, phases 1, 2 and 3 of the WQCP update should be monitored by the District in order to understand the tactics and implementation goals of the SWRCB in phase 1 and then the application of those goals to phases 2 and 3.

The specific threats to the District posed by the WQCP Update relate to the District's water rights and the water supplies that embody those water rights. The WQCP Update could radically change the volumes of water available for diversion under various water rights. Under current conditions, Delta water quality requirements are the sole responsibility of the federal and state projects. In other words, if there is insufficient water in the system to meet the needs of the Delta, then the projects must provide that water from stored supplies. But this oversimplification does not adequately address the prevailing thinking on the water issues.

The SWRCB wants to vastly increase the flow regimes on river systems tributary to the Delta. This increased flow regime is not necessarily the responsibility of the project purveyors. Where natural flows need to be increased on Delta watershed tributaries, junior water right holders' water rights may be jeopardized. Or, in another potential scenario, the SWRCB may attempt to utilize principles under the Public Trust Doctrine to reduce both junior and senior water rights in order to meet additional flow needs. Either scenario impacts the District's water assets.

Furthermore, the District's water right permit 7356 has no limitation at this time when Delta conditions are out of balance. In other words, Term 91 (or another similar term) is not incorporated into the water right. However, upon obtaining a license, the SWRCB may condition the license with language similar to Term 91 – meaning that the District would be forced to curtail use of this water right when the Delta is out of balance. Adding increased flow to the American River watershed and the water supply available to the District under permit 7356 would be much less reliable and much less valuable.

Accordingly, paying very close attention to the Bay Delta WQCP proceedings as well as working with regional stakeholders to develop and propose water supply solutions that meet the primary objectives of the WQCP update is paramount. At this time, NCWA has developed such a

conceptual proposal and the District should work with RWA and NCWA to provide additional input and detail to the proposal so that it can be provided to high-ranking decision-makers.

5.6.2 California WaterFix and California EcoRestore

The Bay Delta Conservation Plan was recently changed to reflect public comments and fulfill the requirement of the 2009 Delta Reform Act. State and Federal agencies are proposing a new sub-alternative—Alternative 4A—which would replace Alternative 4 (the proposed BDCP) as the State's proposed project. Alternative 4A reflects the state's proposal to separate the conveyance facility and habitat restoration measures into two separate efforts: California WaterFix and California EcoRestore.

The California WaterFix would seek to improve water conveyance to water exporters by building facilities that meet export needs. Specifically, the WaterFix would build two tunnels in the north delta that are approximately 150 feet underground and are capable of diverting approximately 3,000 cubic feet per second or total of 4.9 million acre-feet annually to the export communities. The WaterFix is an effort to improve California's infrastructure for delta-watershed export communities.

The California WaterFix would also include habitat restoration. California WaterFix will include approximately 2,100 acres of habitat restoration to mitigate for the construction and operation of the new water facilities. These costs will be paid for exclusively by water agencies benefiting from the project. Through 2020, the WaterFix will pursue more than 30,000 acres of critical Delta restoration under the California EcoRestore program, and pursuant to pre-existing regulatory requirements and various enhancements to improve the overall health of the Delta. Proposition 1 funds and other state public dollars will be directed exclusively for public benefits unassociated with any regulatory compliance responsibilities.

The cost to fix California's primary water delivery system is estimated at $14.9 billion – or about $5 a month for urban water users – and will be paid for by public water agencies that rely on the supplies.

California EcoRestore (EcoRestore) will accelerate and implement a comprehensive suite of habitat restoration actions to support the long-term health of the Sacramento-San Joaquin Delta's (Delta) native fish and wildlife species. Through 2020, EcoRestore will pursue environmental enhancements in the Delta through existing regulatory structures and other identified enhancements. EcoRestore looks to enhance as much as 30,000 acres of land in and around the Delta through this effort. EcoRestore will be funded through Proposition 1 funds and other state funds that are directed exclusively at public benefits.

The District should work with RWA executive management to get a full understanding of the implications of the WaterFix project and EcoRestore project to affect regional water supply reliability.

5.6.3 Delta Plan

The Delta Plan is a guidance document for environmental and water quality requirements in the legal Delta. The Delta Plan is governed by the Delta Stewardship Council (DSC) and requires updating and modification as conditions change. While the Delta Plan does not in itself make changes to system operations or management, it is enforceable and works as the overarching

guidance document for many of the plans and policies being developed to manage the Delta going forward.

The Delta Plan incorporates a requirement to establish delta outflow objectives. Delta outflow objectives can only be satisfied by assessing water rights and supplies in the entire Delta watershed system – from the headwaters of the San Joaquin and Sacramento Rivers to their confluence in the Delta. Although the Delta Plan does not grant jurisdictional authority to the DSC beyond the boundaries of the legal delta, it is ambiguous as to the DSC's authority in managing resources beyond the Delta that have a lasting impact in the Delta. In this way, it is unclear whether the Delta Plan grants DSC the authority to manipulate water assets outside the legal Delta and should be closely monitored by Sacramento area water interests. There is little doubt, however, that the DSC will recommend specific actions to the SWRCB in order to modify delta outflow objectives.

The Delta Plan also calls for a Delta Water Master who has been appointed to help implement the Delta Plan. The Water Master is charged with ensuring that the water diversions and uses in the delta are legal. Specifically, not only is the Water Master tasked with stopping illegal diversions of water, but he is also charged with assessing the reasonable and beneficial use of water in the Delta for irrigation, urban and industrial uses. The Water Master does not have authority to manage water assets outside the legal Delta but the implications of a Water Master with this limited range of water management may not meet the Delta Plan objectives. Accordingly, the District should be monitoring the Delta Plan and its implementation through participation in the RWA.

5.6.4 National Marine Fisheries Service Biological Opinion

The National Marine Fisheries Service (NMFS) or Biological Opinions are important planning tools in assessing how the state and federal water projects will meet fishery needs in the Delta in the course of project operations, including export pumping. A revised Plan of Operations is currently being developed by the U.S. Bureau of Reclamation and NMFS and will implicate Lower American River flows, fishery species propagation to avoid jeopardy, and ultimately could affect available diversions for the District.

The implications to this operating plan are significant. First, the operating plan will identify the ways physical, biological, hydrological, and chemical conditions affect fish species throughout the water system. These assessments will provide a backdrop for the species conditions that will need to be met through actions in many forums.

Second, the operating plan will identify the ways the issues associated with the species can be addressed. For instance, the opinion may conclude that more water supply is necessary to meet species needs or that specific water quality issues must be addressed for species' benefit. These considerations are important baseline conditions for understanding the potential implications to the District's water assets.

The Revised Plan of Operations will affect storage and releases from Folsom Reservoir. Although the District's water rights are not dependent upon storage in Folsom, operational decisions could affect the availability of diversion capacity below the dam in certain hydrologic conditions. Importantly, however, is that releases of upstream project water supplies to meet the Biological Opinion needs, may require upstream diverters that relied upon the availability of

those supplies to seek use through other sources – namely senior water rights to the natural flow of the American River.

Additional diversions from senior water rights on the American River as compared to stored water or water made available through settlement contract, could implicate the District's ability to divert its water assets. As experienced in 2014, the District's junior water rights can be curtailed when other senior water rights receive their full allotment. Here, the Biological Opinions may implicate the District's water assets even though the District's diversions have no official link to Folsom Reservoir operations or Central Valley Projects (CVP) contracts.

In short, the Operations plans should include acknowledgment of the District's diversions and criteria for making water available for the District's diversions.

5.6.5 2014 Groundwater Legislation and Regulation

The State of California has historically not regulated groundwater pumping, except in adjudicated groundwater basins where a Water Master has been appointed. Several attempts have been made by California's Legislature and the SWRCB to assert jurisdiction over water, but most have failed. More recently, however, the expanded jurisdictional reach has succeeded and in 2014 the California legislature passed a sweeping groundwater management bill that will change California's groundwater management efforts permanently.

Continued overdraft conditions and poor water quality conditions in many groundwater basins throughout California prompted the action. In fact, groundwater overdraft in some areas of the state have caused land subsidence. In other areas, domestic groundwater wells have run dry requiring the state to intervene with money and facilities to handle crisis conditions. As such, the State adopted the groundwater management legislation to rebalance groundwater supplies throughout California.

5.6.5.1 2014 Legislation

Assemblyman Dickinson and Senator Pavley developed legislation that will address the State's ongoing groundwater overdraft and groundwater contamination issues. The new legislation essentially does two things: (1) it requires the development of groundwater sustainability agencies by 2017 in areas with groundwater issues; and (2) it requires the development of groundwater sustainability plans by the groundwater sustainability agencies by 2025. Failure to develop groundwater sustainability agencies and groundwater sustainability plans will invite the regulatory agencies within the state of California to determine the areas groundwater sustainability agency and groundwater sustainability plan.

The development of the groundwater sustainability agencies (GSA) is the first step in complying with the legislation. The GSA's require development of joint powers authority's or other relationships through management agencies and individuals formed by contract. The key aspect is that the newly formed GSA must have responsibility for managing and regulating groundwater use in the identified groundwater basin.

Identifying the groundwater basin is also a consideration in forming the GSA. Specifically, the groundwater basin may follow political jurisdictions (like county lines), groundwater basin boundaries (that often cross county lines), or potentially smaller-subsets of the groundwater basin already subject to some regulatory jurisdiction (e.g., SGA's jurisdiction over the north area groundwater basin). The definition of the political boundary that will be the basis of the GSA is

an important debate that will affect the District's groundwater assets and groundwater banking efforts.

The development of the groundwater sustainability plan (GSP) will be the second step in the two-step process. The GSP will require the participating agencies to establish groundwater pumping criteria that meet the long-term sustainable yield needs of the identified groundwater basin. Such a formulation may impact the existing structures that were put in place to do the same thing. For instance, SGA has a groundwater management plan that identifies basin safe yield, develops pumping criteria, and allows for groundwater banking through the water accounting framework. It is unclear whether these existing items will be contained in a new GSP that will be developed by a new GSA. The new GSA may determine that existing planning activities related to a groundwater basin must be reconsidered and reinvented. As such, the District should actively participate in the formation of the region's GSA and GSP since groundwater is one of the District's most important water assets.

5.6.5.2 District Supported Groundwater Legislation

The District has produced three groundwater and water transfer pieces of legislation. Each of these pieces of legislation has been introduced to regional stakeholders only to later be rejected by the stakeholders representatives. One bill was sponsored and supported by Assemblyman Salas from the San Joaquin Valley that would protect groundwater banking and in-lieu recharge as beneficial uses of water.

The Governor is also influencing the content of these bills. His platform consists of a more robust groundwater rehabilitation effort as well as promoting policies that support long-term groundwater sustainability for drinking water systems. The other two bills recognized the need to develop a more robust conjunctive management platform in the American River region. All three bills are currently pending further review by RWA and SGA so as to reintroduce them at the appropriate time before the California Legislature.

5.6.6 Regional Groundwater Use and Quality

Groundwater quality continues to be an ongoing challenge for the District. Over the past decade the District has had to deal with the intrusion of regional groundwater contamination as well as the discovery of constituents in several existing wells including perchlorate and NDMA. The District's strategy to maximize surface water production to offset risk of impacted groundwater supplies has been successful up until the 2014 drought. The District now needs to consider ways to maximize beneficial use of its supplies, which may include wellhead treatment and direct reuse for selected facilities.

Included in the 2003 Master Plan were the findings that two contaminant plumes originating from the Aerojet Site pose long-term threats to the District groundwater supply and under a worst-case scenario, the District could be forced to abandon wells or install treatment to remove identified contaminants.

Shortly after adoption of the 2003 Master Plan, the District became aware of the discovery of groundwater contamination within the District service area from the Aerojet plume(s) in February of 2004. Since that time the District has been actively working through a collaborative approach with Aerojet to expedite installation of groundwater extraction and treatment (GET) facilities (LA and LB) within the District in an attempt to effect capture of the plume and halt further migration

and continued degradation of water quality of the groundwater resources available to the District.

The current known contaminant plume extent is periodically updated by Aerojet modeling and monitoring data and includes NDMA, perchlorate, and TCE contaminants. In 2015, Aerojet reported that it had not contained the plume and that plume migration was still occurring. Aerojet has completed installation of the containment remedy and is now in the "effectiveness reporting" phase, where they must monitor capture and ensure there is no leakage of contaminants through the Groundwater Extraction and Treatment Systems. Both GET LA and LB have design components that would allow additional groundwater extraction wells to provide water for treatment in the GET facilities. All current indications from Aerojet/Rocketdyne are that the plumes are contained by the GET facilities, and Aerojet continues a practice of sample and installing perimeter sentry monitoring wells to confirm protection of District groundwater supplies.

The contaminant plumes have not reached any of the District's production wells, and the District should continue to take all steps necessary to protect its wells from contamination. The risk of contamination reaching the wells includes expensive wellhead treatment or the need to identify alternative sources of supply.

Sacramento Groundwater Authority prepared a groundwater vulnerability assessment in 2011, which looked at a number of different risks to groundwater supplies in the region from regional contaminant plumes to emerging contaminants, to local potentially contaminating activities. The study included a number of maps identifying potential local point sources of contaminants ranging from metal shops to dry cleaners, leaking underground storage tanks, and others. Existing naturally occurring mineral contaminants such as iron and manganese and potential anthropogenic sources of contaminants such as perchlorate continue to present isolated issues for certain District sources. The Ladera Well has occurrences of hydrogen sulfide gas and the Dewey Well has an iron bacterium fouling the screens of the well. Others have had trace detections of PCE, which appear to dissipate over time as the wells are pumped. The Barrett Road Well has had detection of perchloroethylene (PCE) near the MCL and perchlorate below the practical qualitative limit (J-flag) of the laboratory analysis method. As a result of the elevated PCE, the Barrett Road Well has been completely disconnected from the water system. The source of the NDMA and perchlorate is currently unknown, and may originate from local or regional sources.

More stringent drinking groundwater quality regulations in the future from the State Water Resources Control Board (which now houses SWRCB-DDW) may result in the necessity to treat all groundwater sources. The District should actively pursue treatment of existing sources where possible to maintain reliable water sources.

5.6.7 Sacramento, Placer, El Dorado, Yolo and San Joaquin Counties Groundwater Planning

Groundwater issues continue their rise to prominence in the broader American River watershed and surrounding environs. The water users in the 5 regional counties encompassing the Sacramento region all face water quality, water depletion, and surface-water connectivity issues. For instance, the hydrological connectivity between the American River and the surrounding groundwater basins is marginally understood but was the subject of a draft SWRCB

Order that drew a hydrological connection calling some traditional groundwater "surface water" and other groundwater remained groundwater.

Similarly, the Cosumnes River basin surface and groundwater connections are well documented. And various interest groups are looking to augment the groundwater basin in order to resuscitate flows in the Cosumnes in other times of the year.

These hydrogeological connections are becoming more paramount. The 2014 groundwater legislative package recognizes and addresses the hydrogeological connectivity throughout the text. This legislative trend is likely to continue.

From a planning perspective, water purveyors in the 5 County Area should be further engaged in the groundwater planning processes of each area. Although several areas have groundwater management plans, other areas do not. The legislative mandate will not only require development of these plans but will also apply punitive actions if one is not. Further, engagement by water purveyors from broader regions may allow for better-coordinated water planning and groundwater banking programs that further the protection of the region's water assets.

5.6.8 Water Transfer Law and Regulations

Existing water transfer laws are geared towards land-fallowing transfers from agricultural to urban water users. Two other types of water transfers – groundwater substitution and reservoir reoperation transfers – have been used by local agencies to move water inside and outside the water region. These types of water transfers should continue.

As described in Section 5.4.9, other types of water transfers should also be explored. For instance, water transfers that dedicate water to environmental purposes may be useful as a purpose of use in the future. In addition, water transfers that dedicate water for groundwater banking under Water Code section 1242 may also be worth pursuing.

But water transfers based upon water conservation activities that result in long-term consumptive use savings have not been tested in the transfer market. Here real water conservation has manifested. Specifically, the District has seen a 20 percent reduction in overall demand due to its water conservation programs since 2005. This water is protected for later use under Water Code Section 1011. However, the reduced consumptive water use associated with the District's water conservation efforts have not yet been ratified by the SWRCB as transferable water. It behooves the District and the rest of the American River watershed region to make sure that the water savings attributed to the conservation efforts are available for consumptive use based transfers.

5.6.9 Upstream Water Rights

Water purveyors throughout the American River watershed are working diligently to perfect existing water rights and to develop new ones that will impact water supplies. The perfection of a water right may take on many forms – from using the entire supply available under the right, to expanding the place of use or purposes of use, to finding new storage opportunities or unconventional uses for the water, to extending the life of a permit, to taking a permit and converting it to a license. All of these items are in play with numerous water rights in the American River watershed perfecting existing water rights permits and area of origin transfers

from the American River watershed. All are on tributaries to the American River and all have demand for use and history of going through the Delta which in dry years both might exacerbate reservoir storage and release issues or provide better multi-year storage options. Two of the American River water rights holders upstream of the District that could affect District diversions include:

5.6.9.1 Placer County Water Agency

Placer County Water Agency (PCWA) currently has five permits that are active but have not yet been perfected. Permit numbers 012855, 013856, 013857, 013858, and 20754. PCWA is working with the SWRCB to obtain an extension to perfect the water supply under its permits. In other words, PCWA has not met the compliance terms already contained in these permits and needs to obtain an extension from SWRCB in order to perfect its use of the water supplies in the permits. An Environmental Impact Report preparation is underway for permit extension.

The key issue here is how permit extensions affect the District's ability to use its water rights in the American River system. Specifically, the issue is whether the expanded use under PCWA's water rights affects the water rights of the District. The District should review PCWA's filings and understand the impacts to all three of its SWRCB regulated water rights.

5.6.9.2 El Dorado County Water Agency

El Dorado County Water Agency (EDCWA) is seeking the assignment of a State filed water right application for American River diversions with a priority date of 1927. This assignment is derived from the period when the state reserved water rights filings on many water systems in preparation for building the State Water Project. In some cases, these rights were not permitted where the state did not build water projects on identified water systems – like the American River watershed. In these instances, the priority date for the water application remains but the actual effort to obtain a permit and put the water to beneficial use has not yet occurred.

EDCWA is looking to use the reserved priority date to develop a 40,000 acre-foot water right on the American River system. If developed, the water right would have a senior priority date to the District's water right permit. And it would affect the reliability of the District's water right because another 40,000 acre-feet of water could be taken out of the system to the District's detriment. The District should investigate the status of this water right, monitor the efforts to develop the right, and work with EDCWA to find an amicable solution to the priority date issue.

5.6.9.3 Upstream Pre-1914 Water Rights

There are numerous pre-1914 appropriative water rights on the American River watershed. All of these water rights are senior in priority to the District's SWRCB regulated appropriative water rights. The major pre-1914 appropriative water rights on the system belong to Pacific Gas & Electric (and a contract with PCWA); the City of Folsom and GSWC, who jointly own a pre-1914 appropriative water right; the City of Sacramento's pre-1914 water right on the American River system and the San Juan Water District which holds a pre-1914 water right derived from historical mining claims on the system. El Dorado Irrigation District also holds several upstream pre-1914 water rights in the upper American River watershed.

The issue with the existence and use of pre-1914 appropriative water rights is whether the water supplies contained within those rights are currently fully used or whether they are still being developed. The District's water supplies could see further diminution in their supply reliability where additional waters are withdrawn from the American River to meet needs of senior water

users. In other words, where pre-1914 appropriative rights begin to be further exercised, the supplies that would have otherwise fulfilled the District's water supply needs are diminished. The District should investigate and understand the water issues associated with regional pre-1914 appropriative water rights and determine whether actions looking to expand those water assets are detrimental to the District's long-term water interests.

5.6.9.4 Downstream Senior Water Rights (Pre-1914 and Riparian)

Other downstream senior water rights could also jeopardize the District's use of its SWRCB regulated water rights. Specifically, unexercised riparian water rights in and around the Sacramento-San Joaquin Delta as well as underutilized pre-1914 appropriative water rights could affect the supply reliability of the District's SWRCB regulated water rights. The District should work with other regional agencies to understand the filings of water rights downstream of the American River watershed to determine whether forbearance of water diversion in the American River watershed will need to occur in order to satisfy these senior water rights priorities.

5.6.9.5 SJWD and SSWD Consolidation

San Juan Water District (SJWD) and Sacramento Suburban Water District are engaged in consolidation negotiations to improve water management in both of their systems. In short, SJWD seeks to deliver pre-1914 appropriative water rights to SSWD for use to preserve those water rights and, in turn, SSWD would provide dry year reliability through management and use of its groundwater resources – both appropriative groundwater rights and banked groundwater.

The consolidation effort is logical from the perspective of the two interested agencies but may have negative implications to the District's water assets. Specifically, any expansion in use of SJWD's pre-1914 appropriative water right would result in less water supply available for the District's post-1914 SWRCB regulated water rights. This potential diminution in supply must be addressed in the consolidation discussions and the District should participate in those discussions in order to make this point succinctly. Moreover, the District may need to seek mitigation from the consolidation proponents or seek other legal remedies to prevent the use of pre-1914 appropriative water rights in the SSWD service area.

Similarly, the increase in pumping through SSWD's facilities to support SJWD in drought conditions may impact the Aerojet contaminant plume's migration. The 2015 letter issued by Aerojet indicates that full containment of the plume has not been achieved. The letter indicates that potential migration of the plume may be caused, in part, by SSWD groundwater pumping. Expanding this groundwater pumping in certain year types to meet SSWD-SJWD joint needs should be investigated as part of the consolidation effort.

5.6.10 Climate Change

Climate change resulting in increased hydrologic uncertainty, more pervasive and longer-lasting droughts, and decreased snow pack in the Sierra's could also influence operations and further increase competition for water supply when it is available. For example, hydrologic modeling of Folsom Dam Operations conducted for the Bay Delta Conservation Plan concluded that Folsom Dam will reach dead pool storage levels approximately once every 10 years, in part due to climate change projections (Sacramento Bee 9-13-13). Dead pool storage is the level at which no additional river releases out of Folsom Reservoir are possible. This is just one example of changes that may occur to the American River water system and the natural flow regime.

The District's existing water assets, however, rely upon the natural flow available in a water system. Natural flow is derived from three primary things: precipitation that falls as snowfall in the upper American River watershed; the amount of precipitation that falls in the upper American River watershed; and the duration of snowpack existence and runoff patterns from snowmelt through the American River watershed. Climate change scientists anticipate that each of these things will be modified in the future.

First, with warming regional temperatures, precipitation will fall more as rain than as snow. Rain does not accumulate in snowpack and tends to rapidly melt existing snowpack. As such, the change in precipitation form can impact the natural flow of the American River watershed by lessening the amount of snowpack in the system.

Second, climatologists predict that in many areas there will be less precipitation due to climate change. If this prediction manifests, the amount of water available for diversion in the American River system will be less – like a perennial drought.

Last, with warming regional temperatures, the timing and pattern of runoff from the snowpack will also likely change. Here, the time period to melt snow in the snowpack will be shortened as the temperatures surrounding the snowpack will rise. This means that there will be earlier snowmelts in the Sierra watershed. Earlier snowmelts mean that the natural flow of the river systems will be higher in the prevailing runoff months but will last for a shorter period throughout the dry periods in the summer. As such, water diversions of the natural flow in summer may be significantly decreased.

The regulatory issues predicted with climate change are perhaps more dire. As described in the previous example, the regulatory issues in the Delta may be greatly exacerbated with climate change requiring longer and more substantial releases of water from existing reservoir systems. Simply put – if sea level rises as predicted, then more water will be needed to meet the delta water quality requirements as promulgated by the SWRCB. Accordingly, there is growing concern that climate change could exacerbate hydrological and regulatory droughts in the American River watershed directly impacting the District's water assets.

5.6.11 State Water Resources Control Board Authority

The State Water Resources Control Board (SWRCB) has expansive jurisdiction over water supplies in California. As described in Section 5.4.2 supra, the State retains ownership of all water in California and water purveyors merely possess the right to use the water. SWRCB has been charged with managing water rights in California and has expanded its ability to carry out this mandate by expanding its reach into surface and groundwater resources.

For instance, in managing surface water resources, the SWRCB has declared that it holds the waters of the state in trust for the people for public trust uses. In California Supreme Court case law, the Public Trust Doctrine takes priority over all other uses of water in the state – in other words, a pre-emptive senior water right that was not recognized until the 1980s. The SWRCB seeks to use this "priority" to further acquire water resources to protect public trust uses.

On the groundwater side, the SWRCB has long been isolated from groundwater jurisdiction. Although it has made political requests to obtain the authority to regulate groundwater, it has generally been thwarted. However, SWRCB has used its regulatory authority to enter the groundwater management arena. The first foray was to establish hydrological connectivity

between certain surface water and groundwater sources. In this instance, the SWRCB reasoned that where groundwater was feeding surface water systems, surface water purveyors had relied on these supplies to fulfill the balance of their surface water rights. As such, some groundwater was subject to SWRCB's jurisdiction.

More recently, the California Legislature is requiring regions to engage in groundwater planning which may give the SWRCB more authority to enforce new planning regulations. Moreover, in Siskiyou County, a trial court has recently ruled that the public trust doctrine applies to groundwater resources. This case will likely be appealed but the implications to groundwater management could be staggering.

Last, the Governor's January 17, 2014 Emergency Drought Declaration and the driest conditions since the 1976-1977 drought have prompted the State Water Resources Control Board to take dramatic action to protect the public trust state water resources. Severe drought conditions have caused the SWRCB to implement water rights curtailments in affected watersheds, including the Sacramento River watershed. As a result, and as a post-1914 junior appropriative water rights holder, the District was ordered to curtail diversions in 2014 and again in 2015 until conditions improve and notice is provided by the SWRCB that diversions may resume. There are limited exceptions for water suppliers with no alternative sources to meet minimum health and safety requirements.

The SWRCB has also adopted an order mandating water use restrictions in local jurisdictions. Wasting water is subject to a $500 per day fine on individual water wasters (e.g., washing down sidewalks, washing cars without a shutoff nozzle, or allowing irrigation to run off property). Water District's must also activate their dry year water plans and ordinances including outdoor water use restrictions. As the SWRCB continues to aggressively pursue assurance of curtailment and water conservation compliance, it is critical that the District take measured actions to assure reliable water supplies by diversifying its water supply portfolio and aggressively protecting the assets currently within that portfolio.

5.6.12 Water Conservation and Water Use Efficiency

The Water Conservation Act of 2009, also known as SBX7-7 signed by then Governor Schwarzenegger implemented new requirements and restrictions on the use of water throughout the State of California. One of the major tenants of the new law is the requirement for Urban Water Suppliers (including the District) to achieve a 20 percent statewide water use reduction on a per capita basis by 2020. The primary reporting and accountability mechanism for tracking progress and compliance towards meeting the conservation targets is via the Urban Water Management Plan water resource planning documents. The District completed and submitted its 2010 UWMP which includes 2015 interim and 2020 SBX7-7 compliance targets.

The District is currently on track to meet the 2015 and 2020 compliance targets, which will be reflected in the 2015-16 UWMP update. An important element of water conservation for the District is preservation of the water right despite the potential decrease in overall water use. In order to accomplish this, the District is advised to account for water demand reduction savings by reporting under water code section 1011 to protect water assets.

The District maintains an existing water use efficiency program in collaboration with the Water Forum Agreement and RWA's Regional Water Use Efficiency program and has seen significant improvements in water use efficiency in recent years. The District also implemented an

aggressive water meter retrofit program and completed full metering of all District customers in 2013. It is anticipated that the District will continue to maintain participation in these programs and support water use efficiency best management practices as a means of complying with the Water Conservation Act of 2009 requirement for a statewide 20 percent reduction in statewide water use on a per capita basis. The District's plan for compliance with SBX7-7 and current level of participation in the various BMPs is documented in the 2010 UWMP and will be reviewed and updated for the upcoming 2015 Urban Water Management Planning cycle. Current Best Management Practices implemented either by the District or Regional Water Authority on the District's behalf are presented in the latest UWMP.

5.6.12.1 Surface Storage

Folsom Reservoir storage operations is also a growing influence on the water supply reliability of the District. Although the District does not possess any storage rights, the Delta requirements coupled with the operations of Folsom reservoir will impact the District's existing water assets.

The District does not have surface storage and therefore is limited to diversions based on available natural flow in the American River. Surface storage would provide greater certainty that diversions would be available during dry and critically dry years, and provide a buffer against curtailments. Attaining temporary or permanent storage rights in Folsom Reservoir would expand the flexibility of existing water rights. Storage will also provide improved ability to conjunctively use and market water assets.

In order to obtain surface storage in Folsom Reservoir, the District would need to seek a contract with the United States Bureau of Reclamation where Reclamation is allowed to capture and use the District's water supply in exchange for providing the District a water supply on a regular basis. This opportunity should be explored with both the American River Watershed Reclamation Director and the Regional Director as well as local federal legislators.

5.6.12.2 Water Supply

The District's water supply is affected by operations at Folsom Reservoir. Specifically, the District's water rights are subject to the availability of the natural flow of the American River. When water is released from storage from Folsom Reservoir, interested parties with surface water rights senior to those possessed by the District look to the natural flow of the river to meet their needs. In other words, where Reclamation is unwilling or unable to provide pre-1914 appropriative water right holders with water to meet their needs, the pre-14 users seek to pull water from the natural flow of the stream to the detriment of the District's water supplies.

This issue was recently raised by pre-1914 appropriative water right holders on the American River. These water users wrote a letter to Reclamation stating that Reclamation was violating their water supply contracts by not protecting pre-14 rights on the system and that this violation would require these contractors to pull their pre-14 rights independently. Accordingly, the water managed in Folsom reservoir has a direct impact on the water supply reliability of the District.

5.6.12.3 Flood Protection and SAFCA

The Sacramento Area Flood Control Agency (SAFCA) is updating its water management plans with Reclamation for flood management purposes. Currently, SAFCA and Reclamation evacuate stored water in Folsom Reservoir in order to manage flood flows from extreme flood events. These management rules are currently undergoing revision. If SAFCA and Reclamation decide to evacuate more storage space in order to manage large flood events then there is an

immediate impact to the supply reliability of all water users in the American River watershed. This water supply impact comes from both the lack of stored water in Folsom Reservoir and the increased need to use Folsom water to meet regulatory requirements in the Delta. As such, the District should understand and participate in the development of flood control criteria for Folsom Reservoir.

5.6.13 California Water Bond

The first California Water Bond was approved in 2009 as part of a comprehensive package of legislative reforms geared towards repairing California's struggling water delivery systems and ecosystems. These reforms were aimed at establishing a new paradigm in California as it related to water diversions, the Delta ecosystem, and long-term water supply reliability throughout the state.

A second Water Bond, Proposition 1, was put to the voters for approval in November 2014. It passed overwhelmingly. The Water Bond provides for $7.545 billion in expenditures (including repurposing $425 million of unspent funds). The key expenditures are for safe drinking water ($520 million) water supply reliability and integrated regional water management projects ($310 million); watershed protection ($1.495 billion); statewide water system operational improvements and storage ($2.7 billion); conservation and watershed recycling ($1.785 billion); groundwater protection and water quality ($900 million); water recycling ($725 million); and statewide flood management ($395 million). In some instances under this provision, the funding is continuously appropriated. The District should monitor the bond situation both through RWA and its participation in the SRWA group.

5.6.14 Recommendations for Regional Engagement

The analysis in this section has focused on the key issues affecting the District's water assets. California's water management system is fluid – regulatory issues continue to appear and then evolve over time with some fading away and others becoming more important. The purpose of this section is to outline the list of issues and prioritize District actions related to those issues so that the District may take appropriate steps to protect its water assets and secure long-term supply reliability. These issues will change over time and should be revisited annually to determine their relevance and prioritization.

5.6.14.1 High Priority Issues and District Actions

1. Bay Delta Water Quality Control Plan Update – The District should engage with regional stakeholders on the WQCP Update. This effort could implicate the District's water assets directly and permanently. NCWA and RWA should work diligently to be in front of this issue with District support.

2. 2014 Groundwater Legislation and Regulation – The District should work to influence the 2014 groundwater legislation implementation. The stakes to the District's groundwater assets are high and the creation of a GSA and GSP will have lasting implications to the District.

3. Regional Groundwater Use and Quality – The District should be constantly vigilant about groundwater use and quality in the North Basin and other surrounding basins. Monitoring within the District is paramount but assessing plume migration, water rights issues, and

associated uses within and without the American River watershed should also be closely monitored.

4. Upstream Water Rights – The District should be very active in understanding and monitoring the upstream water rights on the American River. As a starting point, gaining a detailed technical understanding of the platform of PCWA, EDCWA and the pre-1914 appropriative water right claims would be useful in guiding actions related to these rights.

5. SWRCB Authority – The District should be addressing the expansion of SWRCB authority of surface water and groundwater. The curtailment order in 2014 indicates that the SWRCB believes in wholesale action on classes of water rights rather than individual action per the priority system. And SWRCB's incursion into groundwater regulation should be carefully monitored.

6. Water Conservation and Water Use Efficiency – The District should continue to implement its water conservation and water efficiency measures. Importantly, the District should document the water savings under Water Code Section 1011 and assert control over the conserved water assets for District benefit. District Resolution #05182009-1 enacts this measure to claim control of conserved water.

7. Folsom Reservoir Surface Storage – The District should seek to obtain a surface storage right in Folsom Reservoir. The District should take action on this immediately in light of the 2014 drought and the presence of this condition in the federal decision-makers' consciousness.

8. SJWD and SSWD Consolidation – The District should monitor and participate in the consolidation effort because the District's water assets could be jeopardized with the expansion of pre-1914 water diversion and use.

5.6.14.2 Medium Priority Issues and District Actions

1. District Supported Groundwater Legislation – The District should continue to develop and refine its three groundwater bills. The District should work one-on-one with neighboring agencies to gather support for moving these bills forward.

2. WaterFix and EcoRestore Programs – The District should continue to monitor the WaterFix and EcoRestore Programs and understand the implications of the construction of the tunnels on District's water assets. The District should work with RWA and encourage RWA staff to prepare regular reports on this effort.

3. Regional Groundwater Planning – Groundwater planning in the 5 County areas in and around Sacramento is an ongoing issue. The District should monitor the planning efforts not only to understand them in the context of the 2014 groundwater legislation but also for opportunities to engage these areas with groundwater banking opportunities.

4. Water Transfer Law and Regulations – The District should be active in promoting water transfer law and monitoring the evolving water transfer regulations. Specifically, the District should work with SWRCB staff to develop rules for transferring water conserved under Water Code Section 1011.

5. Climate Change – The District should monitor scientific studies on climate change and the impacts of climate change to the American River watershed. The District may seek to work with RWA to commission an assessment of such impacts through Reclamation's water management efforts.

6. Folsom Reservoir Operations – the District should continue to monitor Folsom Reservoir Operations in order to understand how those operations may impact the availability of natural flow in the American River watershed.

5.6.14.3 Low Priority Issues and District Actions

1. Delta Plan –The District should work with RWA staff to obtain regular updates on the Delta Stewardship Council and the implementation of the Delta Plan. The District should monitor legislative efforts aimed at expanding the authority of the DSC and the influence of the Delta Plan to upstream watersheds.

2. National Marine Fisheries Biological Opinion – The District should monitor through RWA the NMF BOs in order to gather scientific information on identified species as well as understand how the BOs will affect reservoir operations in all of the rim reservoirs (both state and federal).

3. Sacramento Area Flood Control Agency Actions – The District should continue to understand how the SAFCA and Reclamation Folsom Reservoir flood control operations are going to work in the context of water supply operations. The District should encourage RWA to participate in this effort and report back to the District on these issues.

4. Downstream Senior Water Rights – the District should work with RWA to monitor SWRCB proceedings and other venues to understand the nature and extent of downstream senior water rights.

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Section 6: Aerojet/Rocketdyne Regional Groundwater Contamination Response

6.1 Introduction

Groundwater contamination was identified within the District in February 2004, less than one year after completion of the 2003 Water Master Plan. The recommendations of the 2003 Master Plan included additional wells to rebuild the District groundwater production capacity following the successful completion in 2000 of the Bajamont Water Treatment Plant (WTP). This strategic approach continued the historical District management of a conjunctive supply portfolio balancing groundwater and surface water.

GET LA UV Reactors and Open Space for Expansion

In response to the 2004 discovery of contamination, the District shifted water supply investments to focus on expanding the newly completed WTP and did not proceed with construction of the new wells recommended in the 2003 Master Plan. During the next six (6) years groundwater contamination containment systems were constructed within Carmichael including the Groundwater Extraction and Treatment plants (GET) at LA (Ancil Hoffman, GET LA) and LB (Bajamont, GET LB). This work was completed by Aerojet with support from the District, who helped expedite completion by taking the lead of design and construction of the GET facilities. In addition, the District provided technical review of the Aerojet planned groundwater capture modeling and advocated for additional monitoring wells and expanded extraction if required to contain the plume and protect access to the traditionally high quality groundwater in the aquifer below the District.

The estimated cleanup period for the Aerojet plume has been described as 250 years with the initial phases of containing the perimeter of the plume spread completed in 2008/2009. A new monitoring well was constructed near California Avenue and Fair Oaks Boulevard and tested in late 2014 with confirmation testing competed in early 2015. The new monitoring well indicated that NDMA contamination was present beyond projected capture perimeter and the known extent within the District. A continuing investigation plan is being developed by Aerojet, EPA, Department of Toxic Substance Control and the Regional Water Quality Control Board to further expand monitoring wells and extraction well pumping and treatment. The District is providing comments and requesting additional groundwater modeling, monitoring wells and replacement water supply planning.

Groundwater contamination will remain a significant liability impacting the availability to historically high quality groundwater for beneficial use by the District. The discovery of this threat was after the completion of the 2003 Master Plan and has changed the direction of the District's conjunctive management strategy. This Section of the Master Plan provides detailed

discuss of the conditions and activities of the District with recommendations for activities to remain involved in the planning, implementation and monitoring of cleanup.

6.2 District Approach to Regional Groundwater Contamination

In 2004, there was a discovery of a regional groundwater contamination plume with origins in the rocket propulsion manufacturing plant operated by Aerojet within the District's service area. Due to the presence of groundwater contamination, development of a remediated groundwater supply and exploration of cooperative regional responses to lost groundwater pumping capacity have all resulted in challenges to the demands on District leadership. District leadership since the 2003 Master Plan adapted to these challenges in a unique fashion that has been recognized by the regulatory community, other local government bodies and the Aerojet team as effective, proactive and a cooperative framework for expediting investment in the response to the physical challenges of contamination without litigation.

The District undertook the following activities in response to the discovery of regional contamination within its service area.

- Conducted Public Outreach – these activities included multiple Town Hall Meetings to inform the public of the issues and intended actions in response; presentations to Save the American River Association, American River Natural History Association, Carmichael Chamber of Commerce , the Sacramento County Parks Department Board, the Rancho Cordova Contamination Advisory Group, the State Water Resource Control Board, the California Natural Resource Agency Executive Director and to the Association of California Water Agencies.

- Executed Agreements with Aerojet – this effort resulted in the execution of multiple cost reimbursement agreements to allow the District to expedite implementation of groundwater cleanup projects. This effort resulted in the completion of construction of groundwater cleanup facilities within the District's service area on a schedule that cut years out of the process. This work was fully funded by Aerojet and exceeded $10 million in investment in the cleanup north of the American River.

Construction of GET LB GAC Filters and Backwash Tank

- Advocated for Community Interests – the District remained committed to advocating for the community interests by working with Aerojet to include consideration of future groundwater treatment equipment requirements and building the treatment plant buildings large enough to accommodate foreseeable expansion without the need for additional new and disruptive major construction projects within the community.

- Engaged in Review and Comment to Regulatory Reporting – the District, with Aerojet's support, expanded its activities through its review and comment process regarding the

adequacy of the cleanup reporting and regulatory requirements from the perspective of a public water agency responsible for long range water supply reliability planning. This effort is ongoing and has included: expert technical assistance with review of the Aerojet groundwater fate and transport model; proposed monitoring and response to ultra-low level contaminant detections known as J-flag detections that occurred outside the current cleanup perimeter; and review of regulatory cleanup requirements.

- Recommended Increasing Cleanup Goals to Protect the Public Water Supply – the District has continually provided written comments to the regulatory agencies recommending that the contaminant cleanup targets be lowered from just meeting the drinking water maximum contaminant level (MCL) to a level below the MCL that will support the permitting of the groundwater resources as a public water supply without additional treatment through the State Water Resources Control Board, Department of Drinking Water. These recommendations include consideration of cleanup goals below the definitions of Policy Memo 97-005 Policy Guidance for Direct Domestic Use of Extremely Impaired Sources as necessary to restore access to the groundwater resources within the District's service area without requiring additional cost to the District ratepayers for treatment.

- Involved in Regional Planning – the District provided leadership in the Sacramento Groundwater Authority Contamination Task Force and with Aerojet and Golden State Water Company activities in addressing a regional awareness and coordinated response to contamination. This work includes the continuing efforts to develop a cooperative water supply solution leveraging available District treatment capacity with Aerojet remediated water supply availability to meet water supply needs for the Golden State Water Company and providing additional return on the District's investments in the Bajamont Water Treatment Plant.

The discovery of regional groundwater contamination required a dramatic change in the District planning and management activities since the 2003 Master Plan. These changes are addressed throughout this Master Plan. This section provides an overview of the District leadership in addressing the challenges of responding to the contamination in a way that produced tangible physical investment in clean-up and solutions and an intangible avoided cost resulting from an accelerated cleanup schedule and a non-litigated solution.

6.3 Contaminants of Concern in District Wells

The District has experienced periodic very low levels of contaminants at wells without an identified potential responsible part to undertake an investigation and implement remediation if appropriate. The following discussion presents efforts completed in 2007 with regard to an initial evaluation completed by the District with support from Aerojet.

The U.S. Environmental Protection Agency (USEPA), Central Valley Regional Water Quality Control Board, and California Department of Toxic Substances Control (collectively, "Agencies") oversee groundwater remediation activities by Aerojet and have identified the Carmichael area as Western Groundwater Operable Unit (Area 4) as part of the overall Aerojet remediation effort. The Area 4 remediation facilities installation was completed in 2007 and the operable unit designated as operational for the northern side of the American River. However, the agencies have stipulated that the remediation for Area 4 will not be considered final until the sources of Contaminants of Concern (COCs) have been evaluated for the District wells and this work is

continuing under the direction of Aerojet. The most recent efforts include the addition of new monitoring wells within the District in 2014.

The occurrences of COCs include perchlorate and tetrachloroethylene (PCE) in low concentrations at several District drinking water production wells. The affected District wells include the Barrett Road, Dewey, Winding Way, La Vista, and Garfield wells. Perchlorate was first detected in a District well in 2004 and PCE was first detected in a District well in the mid-1990s. Table 6-1 presents a summary of perchlorate and PCE concentrations in District wells:

Table 6-1: COC Concentrations in District Wells[a]

District Well Name	Perchlorate (μg/l)	PCE (μg/l)
Barrett Road	3.6	20
Barrett School	ND	ND
Dewey	1.6	0.8
Garfield	ND	1.3
Ladera	ND	ND
La Vista	ND	1.3
Willow Park	ND	ND
Winding Way	2.4	1.4

(a) Concentrations provided in this table represent averages of detected values provided by the District, and/or Aerojet.
(b) ND – None Detected at or above Laboratory Detection Limits.
(c) μg/l – micrograms per liter.

The COCs identified are chemicals known to have been associated with Aerojet rocket manufacturing and testing activities at their facility near Rancho Cordova, CA. The Aerojet facility is located approximately three miles southeast of the District service area and the known extent of groundwater contamination is within the District service area.

The District conducted an evaluation of the COCs in 2007 including the following evaluation:

- Review of groundwater quality in water production and monitor wells in the vicinity of the District.
- Review of the existing Aerojet MODFLOW groundwater model calibration documentation as provided by Aerojet in February 2007.
- Conduct sensitivity analysis of Aerojet's MODFLOW model to review: a) potential contaminant transport pathways of COCs to District wells and b) likelihood of effective plume capture with current remedy in progress.
- Present general correlation of groundwater quality and transport model review.
- Review District production well vulnerability analyses and historical potentially contaminating activities in the area.

Review of available groundwater quality data indicate that perchlorate and PCE are the only COCs that have been detected in District wells that are also are known to be chemicals

associated with the Aerojet contaminant plumes. COCs were first detected in Aerojet-installed multiple completion monitor wells in the District's service area in 2004. Other COCs that are present in Area 4 but not detected in District wells include n-nitrosodimethylamine (NDMA), trichloroethylene (TCE), and 1, 4-Dioxane.

The Area 4 Aerojet monitor wells with detectable levels of perchlorate in 2007are located at Grant Ave, Ancil Hoffman Park, Bajamont Way, and Rossmoor Bar Park (on the south side of the American River). The affected District wells are approximately 1.5 miles northwest of the nearest Aerojet monitor wells (Grant Avenue Well and Bajamont Way Well). The available data shows that PCE has not been detected in the groundwater in any Aerojet wells or other water purveyor's groundwater production wells in the vicinity of the District. However, PCE had been detected in District wells (Barrett Road, Dewey, Garfield, La Vista, and Winding Way).

Kennedy/Jenks reviewed the Aerojet groundwater model used for GET LA and GET LB capture analysis including a calibration review, sensitivity analysis, and subsequent observed groundwater quality data correlation with the model analyses resulted in the following findings and conclusions:

- The model appeared to be well calibrated in the southern and eastern portions of the model domain that included the Aerojet property and Mather Air Force Base but poorly calibrated in the areas north of Highway 50 and west of Sunrise Boulevard. The calibration was not applied consistently across the entire domain of the Aerojet MODFLOW model.

- The model construction data input parameters are incorrect in the model for the Barrett Road and Barrett School wells. The error changes construction from the A and B layers as modeled to the C and D layers as actually exist. This error affects the capability of the model to accurately demonstrate plume capture. The District has not operated either Barrett Road or the Barrett School wells.

- Based on the calibration data provided, it appeared in 2007 that the Aerojet MODFLOW model adequately addresses remediation in the southern and eastern areas.

- Based on the model calibration data review and input errors identified in 2007, the model reliability in forecasting plume migration in the District area was identified as inadequate to demonstrate capture with the planned remediation system(s) in place.

- The model domain did not extend to key hydrogeological features, did not include known groundwater extraction wells, did not include all municipal groundwater pumping on the north side of the American River, and did not reflect the mapped groundwater gradients for these areas from published historical observations.

- The Aerojet MODFLOW model, when tested in 2007 using published groundwater gradients and historic extractions, predicted failing capture in the District area and predicted a contaminant migration pathway between the proposed Aerojet Area 4 extraction wells 4701 (Ancil Hoffman) and 4706 (Bajamont Way).

- The MODPATH results using the alternative published data showed that, COCs in the Fair Oaks area will migrate towards the northern District wells.

Aerojet subsequently updated the model in response to these conclusions and conducted additional analysis. No changes in the containment plan were disclosed based on the subsequent analysis.

The model predicts that contaminants, including perchlorate, will migrate from the Aerojet facility through the Fair Oaks area to Carmichael. However, the groundwater quality data available for wells in Fair Oaks and Carmichael do not indicate perchlorate to be present in Aerojet wells or public water supply wells in the Fair Oaks area. The District advocated in 2007 for additional monitor wells in Area 4 to define the aquifer and evaluate potential contaminant pathways to wells in the north area of the District with additional wells completed in 2014.

The recommendations of the 2007 COCs evaluation were for the District to continue to work with Aerojet to refine the Aerojet MODFLOW model to improve depiction of the north side of the American River formation, installation of additional monitor wells to evaluate contaminant transport pathways to District wells from the Aerojet plumes, as well as additional screening and investigation of other potential contaminant source sites are necessary to provide a more complete understanding of whether the COCs could be a result of Aerojet activities or localized contamination. These recommendations are still appropriate and the District remains active and in communication with Aerojet regarding remediation effectiveness and the continued investigation of the extent of contamination that may impact the District's access to high quality groundwater.

6.4 Groundwater Water Delivery Reliability

One outcome of the Aerojet groundwater extraction and treatment (GET) is the availability of a new water supply resulting from the extraction of groundwater that would otherwise not reach the surface waters of the state. This new water supply is being used by Aerojet to resolve water supplies lost due to contamination and to potentially provide for waters to develop the Aerojet property. In addition, the GET water is committed to Sacramento County and Golden State Water Company through settlement agreements as mitigation for damaged water supplies.

The District has benefited from a temporary groundwater purchase agreement with Aerojet to provide water to operate the surface water treatment plant during the 2014 and 2015 surface water curtailment action of the SWRCB. This temporary groundwater purchase has been a key element of the District's response to the severe reductions in American River diversions and ability to meet conservation-based demands. The shift in 2004 away from constructing additional groundwater production capacity has left the District vulnerable to severe water supply shortages during curtailment actions limiting surface water diversions.

The District's diversion of GET water from the American River is being conducted under a written agreement with Aerojet and the diversion is predicated on Aerojet first discharging remediated water to the American River. The role of water supply wholesaler is new to Aerojet and the District is working with Aerojet to improve groundwater discharge outage notification and reliability. This effort should include addressing outages as follows:

- Short-term outages – less than 8 hours for planned maintenance; 48-hour prior notification.

- Long-term outages – more than 8 hours for planned maintenance – schedule for non-peak season October through March; 30-day notification.

- Unscheduled outages – response commitment to resolve unscheduled outages with initial response within hours and notification of a resolution schedule within 8 hours.

- Elimination of Non-Response Events – Prior to becoming responsible as a water supply wholesaler Aerojet maintenance events on a Friday might be left inactive until the following Monday. This is not consistent with the need for a firm surface water supply dependent on GET discharge and the District should work with Aerojet to conduct 7 day a week response to groundwater treatment plant outages impacting the available flows in the American River.

The diversion schedule and SWRCB reporting requirements may provide some flexibility for periodic lapses in the balance between groundwater discharge and surface water diversion. Until there is written resolution of the SWRCB policy for this reporting, the District should continue to work with Aerojet to improve reliability and outage reporting to the District.

In addition, the District should continue to secure the use of GET LA and GET LB water production, including any future expanded production, as a water supply available to the District under a long term reuse agreement. It is recommended that the District pursue this agreement with a no cost reimbursement and that the District protect all future contamination and damage resolution options regardless of GET effluent reuse agreements.

6.5 Remediation Monitoring

The regulatory Agencies require annual reporting and periodic additional evaluations of the Aerojet remediation work and results. The District is included in the distribution list for the reporting documents so as to remain informed as to the work and to provide an opportunity to comment.

It is recommended that the District proceed as follows:

1. Send annual letter requesting to be included in the distribution list for all Western Operable Unit publically available reporting and documents. Recommend specifically requesting copies of all documents released for Regulatory Agency comments, copies of all comments received, and all final documents.

2. District review and provide comments to key documents consistent with protecting the interests of the District. This interests include, but are not limited to, the following:

    a. Clean up goals to as low as technically possible to allow for beneficial reuse without treatment.

    b. Accounting of water extractions within the Carmichael Water District service area footprint for consideration of the impact on sustainable yield.

    c. Securing rights for groundwater extracted and reuse for District purposes.

6.6 Sentinel Wells

The District has requested that Aerojet install additional monitoring wells to provide an early warning of previously undetected contamination moving towards the District's operating wells.

This network of monitoring wells is referred to here as sentinel wells. Sentinel wells are recommended to be at a distance of approximately 2,000 feet from existing operating wells and should be of sufficient number to provide for identification of contaminants prior to reaching District wells. Candidate wells include Barrett School Well, Barrett Road Well, Winding Way Well, La Vista Well, Garfield Well and Willow Park Well.

The sentinel well concept is different from the existing monitoring well network required by the Agencies as part of the Aerojet remediation. The monitoring wells are typically targeted to locate the leading edge and just beyond for determination of remediation capture effectiveness. Based on a 500 feet per year travel distance indicated by Aerojet in 2004-2007 the 2,000 foot Sentinel Well offset would provide 4 years to implement a response plan.

There are no sentinel wells installed. The newly constructed California Avenue and Fair Oaks Boulevard well is approximately 2,200 feet from the Barrett School well and has tested positive for NDMA indicating that contamination is very likely within 2,000 feet of the Barrett School site.

A contamination plume is near the 2,000 ft. Sentinel Perimeter at Barrett School Well

6.7 Legal Considerations

The potential for the District having to undertake a legal action resulting from a finding of actual damages resulting from the Aerojet contamination will exist for the next several decades. The complexities of navigating cost recovery and ultimate reimbursement of damages requires the early and continued advice of a competent legal expert in the area of groundwater contamination litigation. The District currently consults with such counsel and it is recommended that they continue to obtain the advice of legal counsel.

Aerojet and the District have proceeded under a cooperative agreement to expedite remediation and demonstrate a mutually beneficial relationship limiting legal costs and investing in remediation. Under this concept, Aerojet has reimbursed the District for costs identified as occurring in response to the contamination. This relationship is unique and should be the first strategy for an Aerojet pay as you go approach to addressing District related issues. However, regardless of the positive and beneficial results of this approach, the District should remain informed and under the advice of competent legal counsel in the area of groundwater contamination litigation.

Section 7: District Organization, Administration and Data Management

7.1 Introduction

This section of the Plan discusses the organization of the District, operation and maintenance responsibilities, and general practices of the District. Recommendations for succession planning and future leadership changes are discussed. A review of information management and recommendation for future improvements to data management and records access is also provided.

7.2 District Organizational Structure

Carmichael Water District was formed as Carmichael Irrigation District under California law in 1916. In the 1980s, it changed its name to Carmichael Water District, though it remains an irrigation district in organizational structure.

The District is a public agency with an elected five member Board of Directors. The District staff is organized into four major departments reflecting the four principle activities of the District. The departments include Administrative Services, Financial Services, Production, and Distribution, and together they provide for all activities.

Figure 7-1 reflects the current Organization Chart and the positions in each department.

7.2.1 Board of Directors

The five (5) member Board is elected based on Divisions of approximately equal customer representation. The District periodically uses census data to approximate the number of service connections for each District Division to confirm each is of approximately equal representation.

The District has benefited for many years by having stable and engaged Board representation, and the voters have acknowledged this good service. The knowledge of the Board regarding local, regional and state water issues is significant and results from the continued investment in the elected leadership participation in local and regional water planning as representatives of the ratepayers.

The District should continue investment in the elected leadership and encourage participation in learning, tracking and contributing to the many important water management activities requiring a District customer voice. The Board, with staff support, periodically reviews and prioritizes outside the District Boardroom activities and develops annual representation assignments including primary and alternate representatives/participants. These activities include, but are not limited to, representation with the Regional Water Authority, Sacramento Groundwater Authority, Water Forum, Association of California Water Agencies, as well as participation in special activities relating to water resources planning and policy issues.

7.2.2 Management

The major areas of responsibility include:

- General Manager
- Assistant General Manager

7.2.2.1 General Manager

The General Manager is responsible for all aspects of District operation and is the key liaison between the elected Board and the District staff. The General Manager is responsible for implementing Board actions and policies and for providing outreach to the community as a visible representative of the organization. The General Manager is also responsible for representing the District and maintaining a high level of knowledge about local, regional, and statewide trends in water resources planning that impact and influence District policy. This includes strategic thinking and development of planning approaches to issues such as the following:

- Provide continuous quality assurance and quality control of District water production activities and compliance with Drinking Water Quality standards, regulatory reporting requirements and maintaining a minimum system pressure.

- Provide labor negotiations, staff/labor dispute resolution, leadership for all staff levels.

- Provide Board briefings, conduct Board requested investigations, provide Board and public reports and compliance with the public information and meeting notice laws.

- Provide employee development and training, develop District staffing plan.

- Provide annual budget planning and track and manage the District costs while balancing revenue with budgeted activities.

- Advocate and enforce Board direction.

- Represent the District in water organizations.

The General Manager duties exceed the short list provided above and include the ultimate responsibility for District operation and performance.

7.2.2.2 Assistant General Manager

The Assistant General Manager is responsible for supporting the activities of the General Manager, as well as the daily operational decisions for all departments within the District. In addition, the Assistant General Manager is responsible for regulatory compliance monitoring, capital projects management, labor negotiations and many other tasks required to maintain services on a daily basis. The Assistant General Manager is also responsible for development of the annual budget alternatives following the direction of the General Manager.

The Assistant General Manager is responsible for being prepared for and to act in place of the General Manager during the General Manager's absence.

7.2.3 Administrative Services

The Administrative Services Department provides leadership, general administrative direction and policy implementation. This department's staff works across all departments/disciplines of the District providing direction and support.

The major areas of responsibilities include:

- Board/Administrative Support
- General Administration and Project/Staff Management
- Human Resources
- Information Technology
- Public Outreach and Water Efficiency
- Meter Reading
- Engineering

7.2.3.1 Board/Administrative Support

Administrative Services staff provides board support for a minimum of 12 board meetings (agendas, packets, minutes and correspondence), board workshops, committee meetings, conferences, town hall meetings and public hearings. Staff provides administrative support to all departments and general administration to all projects, departments and activities of the District.

7.2.3.2 General Administration and Project/Staff Management:

District administration and management consists of staff supervision, regulatory compliance, human resources, information technology/communications operations, public outreach, water efficiency/conservation, engineering, security and facility maintenance, and project management.

7.2.3.3 Human Resources

The administrative services staff provides human resources expertise for the District and its employees including: payroll; benefits management and analysis; regulatory compliance; negotiations; OPEB; safety; emergency response; illness/injury assistance; training; and assistance.

7.2.3.4 Communications Technology

The administrative services staff develops all information and communications technology requirements for the District. Staff maintains the District's computer network to include: hardware (servers, workstations, laptops); software; printers; copiers; telecommunications; monitoring and risk assessment; licensing; and maintenance.

7.2.3.5 Public Outreach and Conservation

Monitor consumer water usage to ensure compliance with District water conservation requirements per the Water Forum agreement, California Urban Water Conservation Council agreement and the District's 2010 UWMP; perform residential and commercial water audits; enforce District efficiency ordinance rules; serve on committees to monitor and provide input on water efficiency/conservation requirement trends; provide and prepare information to customers; and attend seminars for public outreach events (schools/tradeshows); provide District's

response to media requests; update and maintain the District's website; complete the composition of the District's newsletter "Water Ways" and website writing in-house. All articles are researched, written and updated by the staff.

7.2.3.6 Meter Reading

Handle all meter reading for the District including re-reads and verifications.

7.2.3.7 Engineering

Enforce the District's standards and specifications for all construction and maintenance projects within the District through plan check and review and on-site inspections. Respond to fire flow and facility location requests. Maintain District's base map, GPS and GIS database. Develop cost estimates for developer generated fees; monitor Sacramento County improvement projects. Update construction standards and specifications on a regular frequency.

7.2.4 Financial Services

The Financial Services Department maintains the financial documentation for the District: accounting (accounts receivables, accounts payables, general ledger, inventory, and fixed assets management); audit compliance; financial reporting compliance for the COP's and ISA; billing; inventory; and customer service.

The major areas of responsibilities include:

- Accounting and Inventory
- Billing and Collections
- Customer Service

7.2.4.1 Accounting and Inventory

Accounting handles all aspects of the monthly, quarterly, and annual financial activity for the District, including audit compliance. Inventory is responsible for monitoring, assessing and ordering of inventory, inventory paperwork, surplus materials/equipment, and audit and financial reporting compliance.

7.2.4.2 Billing and Collections

Produces and collects water bills for approximately 11,887 connections on a bimonthly basis and produces and collects past due notices, 48-hour notices and shut off notices on a monthly basis. Staff also handles all liens, adjustments to accounts, customer service and A/R audit compliance.

7.2.4.3 Customer Service

Annually receives over 20,500 requests for information (telephone and walk in) and dispatches over 4,000 service calls. Staff also handles about 70,000 payments per year and customer correspondence.

7.2.5 Production

The production department produces water to meet demands for domestic and fire protection use. The District has the capacity to produce approximately 23,000 acre feet of water per year.

The average demand over the past 3 years has been 9,551 acre feet. The production department functions include preventive and corrective maintenance for all mechanical, electrical, chemical feed and SCADA systems. The department responds to water quality issues and maintains water quality through distribution system-flushing and the District's Backflow program.

The department is responsible for compliance with the SWRCB-DDW and the EPA water quality testing programs such as: Total Coliform Rule, Title 22, Lead and Copper, Groundwater Rule, and the Disinfection By-Product Rule (DBPR).

The production department operates the membrane filtration plant located on Bajamont Way. The Bajamont Water Treatment plant continues to be the primary water production source. The production department utilizes groundwater to supplement production during seasonal high demand and has emergency interties available with Sacramento Suburban Water District, Fair Oaks Water District and Citrus Heights Water District through mutual aid agreements.

Area of Focus:

- Compliance with federal and state water quality operations standards
- Sufficiently supply instantaneous demands to all services and maintain sufficient pressure
- Continue to supply a superior product to our customers

Annual Workload: Maintain all mechanical, electrical, chemical feed and SCADA systems for:

- Four (4) active well facilities, one (1) standby well facility, and three (3) inactive well facilities
- One (1) Water Treatment Plant (WTP), three (3) Ranney collectors, two (2) reservoirs and booster pump stations, and twenty (20) chemical feed systems
- Required water quality testing, flushing program and approximately 75 water quality inquiries annually
- Backflow program

7.2.5.1.1 Water Quality

Water quality activities are broken out into the following categories:

Bacteriological Testing:
Bacteriological testing involves district wide sampling of the distribution system once a week. This testing occurs Wednesday of each week.

SWRCB-DDW/EPA Testing (Surface water and Groundwater):
SWRCB-DDW/EPA requirements consist of surface water and groundwater testing for inorganic, secondary standards, general mineral, VOC, SOC, gross alpha, nitrate, nitrite, NDMA, and perchlorate in accordance with Title 22 of the California Code of Regulations. Distribution system testing under the Stage 2 DBPR is completed quarterly.

Sacramento Regional County Sanitation District (SRCSD) Sampling:
Semi-annual testing of the tertiary backwash waste is required by SRCSD to maintain our sewer permit. This testing is required every April and October.

Aerojet NDMA production wells split sampling:
The split sampling with Aerojet is conducted quarterly on the three (3) production wells and annually on four (4) standby wells for NDMA, perchlorate and VOC. Additionally, there is an annual test at each well for 1,4 Dioxane. This testing is reimbursed by Aerojet and is recorded as revenue which offsets the total expense of the testing.

National Pollution Discharge Elimination System (NPDES) Sampling:
The district is required to maintain a Low Threat NPDES permit for all flushing activities within the district boundaries. Sampling is required once per quarter in order to maintain this permit.

Flushing Program:
In the District, there are many dead end mains that require periodic, high velocity flushing to reduce sedimentation and taste and odor complaints. This activity requires the operator to valve off and directionally flush a section of water main until it runs clear and then reverse the process. This causes a scouring effect inside the water main cleaning off loose deposits.

Sanitary Survey:
This survey is required by SWRCB-DDW every 5 years to comply with regulations for all water suppliers using surface water sources. The next Sanitary Survey will be completed in 2018.

Unregulated Contaminant Monitoring Rule UCMR-3:
The EPA requires that all public water systems conduct assessment monitoring of unregulated contaminants every 5 years. The list of 21 contaminants is provided by the EPA.

7.2.5.1.2 Water Treatment Plant Maintenance

The water treatment plant maintenance is broken out into the following categories: chemical feed; CMF (filtrate/solids/tertiary); compressors; generator; heat and air; raw water; treated water; and solids. .

7.2.5.1.3 Well Site Maintenance/Reservoir Maintenance/Ranney Collectors

After the completion of the plant expansion in 2008 the District relied less on groundwater sources. The well site maintenance is broken out into the following categories: controls; chemical feed; and site maintenance.

The reservoir (Dewey and La Vista) maintenance is broken out into the following categories: pumps; controls; generator; site maintenance; inspection; and cleaning.

The collector maintenance, sample stations, GET maintenance, and pressure station maintenance cover maintaining these sites.

7.2.6 Distribution Department

The distribution department provides the transmission and distribution functions that deliver adequate amounts of water for domestic and fire protection use to the District's customers. Department operation and maintenance (O&M) functions include service line repair, water main repair, valve repair, fire hydrant repair, meter repair/change out and maintenance activities. Department planned system maintenance (PSM) functions include: meter installation, service line replacement, minimal water main replacement, mainline valve replacement, fire hydrant replacement and all labor and benefit cost associated with these functions.

The department is responsible for replacements and repairs of water mains, fire hydrants, water services and valves. The department is required to respond to Underground Service Alerts within the Carmichael Water District boundary.

Areas of Focus:

- Comply with Federal, State and County operation and safety codes.
- Deliver adequate water supply for domestic and fire protection use.
- Provide 24-hour emergency service.

Annual Workload – Perform the work necessary for the following estimated services:

- 1,200 Customer Assists
- 1,550 Underground Service Alerts (USA)
- Maintenance and repair of the District's critical infrastructure assets including approximately:
    - 154 miles of active water main
    - 1,329 fire hydrants
    - 2,167 main line values
    - 11,170 water meters
    - 12,003 service line connections

7.2.6.1.1 Replacement and Meter Installation

A service line replacement requires replacement of the water service line from the water main to the customer's service connection known as the curb stop or point of connection, and may include the installation of a water meter. A water mainline replacement involves excavation, installation of water main, mainline valves, pipe fittings and restraints, fire hydrants, service lines, road backfill material, concrete and/or paving. The replacement of mainline valves and hydrants require excavation, installation and backfill. The Sacramento County Improvement Projects consist of relocation of existing pipelines, meters, fire hydrants, etc. that are required

for County roadway improvements. In addition, the meter change out program is an annual 11 year rotation of meters.

7.2.6.1.2 Underground Service Alert and Valve Locations

An Underground Service Alert (USA) requires the location and marking of the District's utilities for work to be completed at a location without disturbing or breaking the District's water lines. USA's are marked for District work, a contractor's work or at a customer's request for private work.

7.2.7 District Leadership and Succession Planning

The District has maintained a stable leadership team for in excess of 20 years and in the following 5-years will likely experience the retirement of the top management positions. The Master Plan provides a foundation of information regarding the general District organizational structure and assets. However, the institutional knowledge and continuity of management will change as those staff with extensive experience with the District leaves the District. The pending changes in management are not unique to the District and are part of a national trend in retirement of employees. The following key considerations may influence the succession planning and actual leadership succession over the next several years:

- Senior management transition will occur at several water agencies within the greater Sacramento area creating significant opportunity for career advancement and competition for qualified candidates.

- 2015 Salary Survey for Senior Management indicates the District General Manager (GM) compensation, based on salary, is the lowest of the 12 local agencies surveyed. In addition, the District GM current salary is below the average entry level (minimum) compensation reported for the 12 local agencies. Current compensation may limit the District's ability to attract and retain highly qualified candidates for the GM position.

- 2015 Salary Survey for Senior Management indicates the District Assistant General Manager (AGM) compensation, based on salary, is the lowest of the 12 local agencies surveyed.

GM responsibilities for the District require diverse knowledge in the operation of a California Special District, resolution of regional water issues/planning, navigation of protecting District interests associated with the Aerojet/Rocketdyne Superfund contamination cleanup and continuing water rights negotiations. Securing a qualified candidate for the GM position may require amendment of the total compensation package to attract and retain the candidate.

This Master Plan recommends that a succession planning strategy be developed with the Board to address the critical changes in staff leadership. In general, we recommend that the focus be on the succession of the General Manager (GM) position and providing the latitude to the new GM to consider an organizational restructuring as part of staffing turnover. A GM succession plan should include the development of a strategy for change with consideration of overlapping transitional periods and development of key promotional pathways to support the education and training of new leadership. Promotional pathways for staff to advance from middle management to upper management provide a benefit of maintaining an institutional knowledge of the operation of the District. Such an approach does not preclude advancement to the GM position, however an outside search for experienced management should also be considered. The

increasing demand for a broad level of water policy knowledge, regional influences and ability of provide the public face of the District are key characteristics of the GM role and require a unique candidate.

The effort to further develop a succession approach could take at a minimum 6 to 12 months. The District has policies, job descriptions and employment performance documents in place for proceeding with a Succession Plan. An important first step could include convening the existing Employee Relations Committee to work with staff including human resources to develop a strategy for meeting the challenge of replacement of the General Manager. The District could also complete a District-wide succession plan of all positions.

It is recommended the District take an in depth look at the critical elements of managing the District and include an exploration of management functions, determine to what extent existing District staff has the tools/skills to move forward and what training and development would strengthen the existing team's performance, if appropriate. An outside consultant may be able to advise the District on development and implementation of a focused strategy.

7.3 Data Management

This section provides a summary of the District data management assets and practices. The ongoing nature of data management systems requires continuous planning, rotation and upgrade of hardware and software as well as training for District personnel using the various programs necessary to operate the enterprise.

This Master Plan provides broad recommendations for system maintenance and renewal with the specific factors influencing changes and decisions regarding investment in changes allowed to occur more frequently than can be described in a 10-15 year planning cycle.

7.3.1 Central Data Management Plan

The District maintains two central data management platforms essential to the operation of the Administration and Financial Services and the Production Department. The software and hardware requirements of the two platforms are unique and not compatible for consolidation. The two systems are as follows:

7.3.1.1 Administration and Financial Services

The District central server is located at the main office on Fair Oaks Boulevard with the primary function of hosting the following key software

- Cogsdale CSM Billing; Billings, collections, work order and service reporting.
- Microsoft Dynamics GP (formerly Great Plains Software) – provides for the financial management and accounting; inventory and operations; work order and service reporting.
- Microsoft SQL Server – provides platform for system operation
- Microsoft Office – word processing and spreadsheet tools
- Microsoft Outlook – e-mail and calendar

- Microsoft Access – database tools

- ArcGIS – geographic information system. Conversion to be completed by June 30th 2015

- KJ Information and Asset Management Systems (formerly K/J Enterprise Data Management Systems) – GIS interface and asset management tool

- Other Systems – There are several other systems necessary to maintaining the District operation such as the telephones, the local area network, wide area network, security and customized applications to meet specific District needs.

The financial system software was upgraded following the 2003 Master Plan from a Spring Brook Utility Software to a business system program developed by Great Plains Software, Inc. (GP). The GP software is now owned by Microsoft as Microsoft Dynamics GP with upgrades having occurred in 2007, 2011 (2), 2012, 2013, 2014 and most recently in early 2015.

Integral to the District Administration systems is the K/J Information and Asset Management System (AIMS) consisting of an open architecture database and GIS interface with user dashboard screens depicting the entire distribution system and horizontal assets. This includes all known pipes, valves, hydrants and appurtenances including meters and meter numbers. The District has deployed AIMS using both a desktop application and laptop applications for use in the District vehicles. This system is beyond the technical support life of the GIS platform and the District is working with an outside consultant to convert to ESRI ArcGIS.

A missing element of district record management is the reporting of leak history and associated condition assessment occurring when a repair is completed. The data as to location, type of leak or failure, repair, and opinion of existing condition is currently residing in hand written daily reports and work order closure reports with an interface to the date, work order number and a locate tied to the location of the reporting individual.

7.3.2 Findings and Recommendations

The District IT and Administration team work with the existing installed software versions and are evaluating the need for upgrading programs based on functional benefits, declining technical support (obsolete) and cost. Master Plan recommendations are as follows:

1. Continue development of Microsoft Dynamics GP upgrade timetable implementing additional functions and providing improved billing flexibility. Work order tracking and reporting interface with GIS asset management should be a critical consideration in upgrade or associated module or aftermarket interface to allow for leak and repair records to be documented in a database for evaluation and association with known assets for ongoing development of condition inventory data.

2. Create leak history and repair reporting interface within AIMS that links the GIS asset identifier for the actual pipe or asset repaired with the event occurrence. Develop template for standardized condition and leak characterization and to provide assessment questionnaire for determining if additional actions or pipe replacement should be scheduled and prioritized as critical to avoid additional recurring failures in the same location.

3. Continue update of the AIMS due to software upgrade and legacy software retirement.

7.3.3 Production Department SCADA

The Production Department provides for the operation of the water treatment plant and groundwater wells. The data management functions occur using the automated Supervisory Control and Data Acquisition (SCADA) program that allows for unmanned operation of the water treatment plant and continuous monitoring and reporting of water production, system pressure, equipment operation times and many other performance parameters. The SCADA was new with the completion of the water treatment plant in 2000. This system is periodically upgraded under the direction of the production department manager.

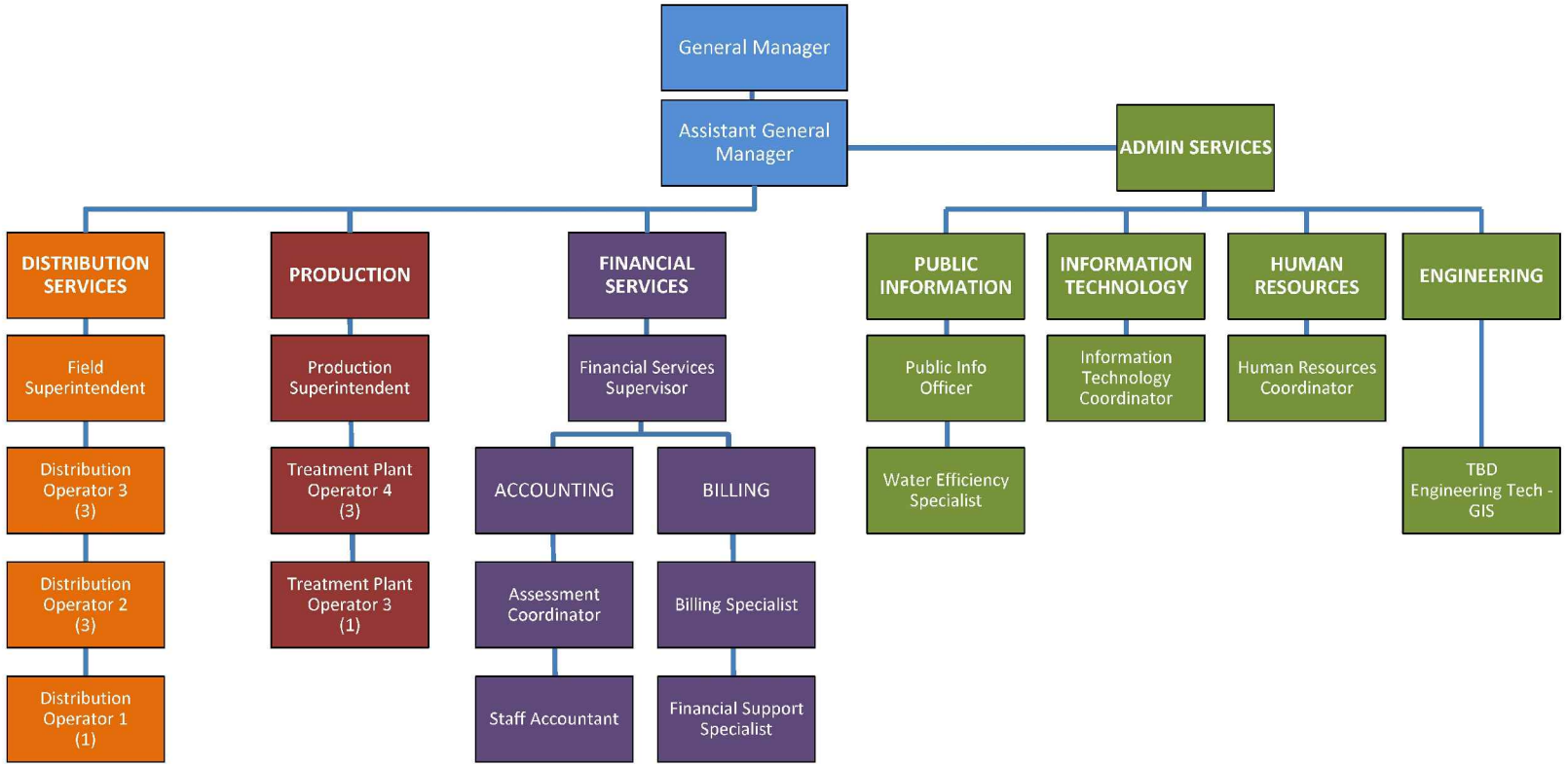
There is not an existing vertical asset management inventory similar to the GIS based distribution system asset AIMS tool. There are well established monitoring practices for tracking critical performance and scheduled replacement of key equipment including the treatment membrane modules. The District tracks performance and replacement schedules using spreadsheets.

7.3.3.1 Findings and Recommendations

SCADA upgrade is not necessary at this time; continue maintenance.

CARMICHAEL WATER DISTRICT

Organization Chart



Kennedy/Jenks Consultants

Carmichael Water District
2015 Water Master Plan
UPDATE

District Organization Chart

June 2015
K/J 1370020.00
Fligure 7-1

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Section 8: Financial Business Plan and Rate Study

The following presents an introduction for the Financial Business Plan and Rate Study prepared as part of the Master Plan update effort. The Reed Group, Inc. served as a subcontractor to Kennedy/Jenks Consultants for the preparation of the business plan and water rate study. The final Business Plan and Rate Study are inserted into this section with the formatting and appearance identical to the documents used in the Proposition 218 Public Hearing and as presented to the Board for consideration.

8.1 Introduction

The 2015 Business Plan provides a ten-year financial analysis of the District's operation and maintenance costs, debt service obligations, and capital program needs, and is used to identify the annual water rate revenue requirements for rate-setting purposes. The business plan model incorporates the first ten years of the capital improvement program, which is identified in the Master Plan. Alternative five-year rate plans are presented for consideration by the District's Board of Directors.

The Water Rate Study provides the cost of service analysis and design of water rates intended to meet the District's service and financial obligations for fiscal year (FY) 2015-2016. The water rate study was conducted with the assistance of a Water Rate Structure Committee (WRSC), comprised of five customers of the District, as well as two Board members. A new rate structure is proposed to better achieve specified rate-setting objectives.

8.2 2015 Business Plan

The successful implementation of the Master Plan and recommended capital improvement program is dependent upon the development of a financial strategy to accomplish Master Plan goals, as well as sustain ongoing operations and meet service obligations. The recommended Business Plan incorporates water rates, other revenues, and reserve policies in a financial strategy that reflects estimated future annual operating costs, debt obligations, and capital program needs and seeks to minimize water rates over the planning period. With the assistance of the WRSC, proposed water rates are intended to meet the District's financial needs, satisfy legal requirements, improve equity across all customers and customer classes, and achieve other rate-setting objectives.

The Business Plan covers a planning period from FY 15-16 through FY 24-25. The business plan addresses each of the following:

- Estimated costs and revenues associated with a potential agreement to treat and wheel water to the Golden State Water Company (GSWC),
- Funding of the ten-year capital improvement program, potentially without issuing additional long-term debt (if the District reaches an agreement with GSWC regarding the treatment and wheeling of water),
- Implementation of recommended reserve policy changes to improve financial stability and security,

- Estimates of annual water rate revenue requirements to meet financial obligations,
- Continued drought conditions and water rationing with a goal, as mandated by the State Water Resources Control Board (SWRCB), of 35 percent in 2015 relative to 2013, and
- A financial strategy for addressing the financial deficit created by water shortage conditions, including water shortage surcharges.

8.3 Water Rate Study

The Water Rate Study addresses rate alternatives for 2015 through 2020 and also addresses each of the following:

- The rate study process, which involved working with the WRSC.
- Identification of water rate-setting objectives.
- Evaluation of customer account and water usage data.
- A cost of service analysis for the allocation of costs to each customer and customer class in proportion with service demands.
- Design of a water rate structure intended to meet revenue needs, satisfy legal requirements, and achieve rate-setting objectives in a fair and reasonable manner.
- Recommendations for updating the District's capital facilities fees, and establishing new fees for customer requested reductions in meter size, and for the use of hydrant meters.

The development of the business plan included workshops with the Board of Directors on December 15, 2014, February 23, 2015, and March 16, 2015. The water rate study included four meetings with the WRSC, which were held on November 24, 2014, January 6, 2015, January 21, 2015, and February 9, 2015.

8.4 2015 Business Plan and Water Rate Study

The following element of the Master Plan incorporates the 2015 Business Plan and Water Rate Study prepared by the Reed Group and is presented in its original format.

CARMICHAEL WATER DISTRICT

2015 Business Plan and Water Rate Study

Final Report

May 14, 2015

THE REED GROUP, INC.

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SECTION I. EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

In 2014, the Carmichael Water District retained Kennedy/Jenks Consultants to prepare a *Master Plan, Business Plan, and Water Rate Study*. The Reed Group, Inc. served as a subcontractor to Kennedy/Jenks Consultants for the preparation of the business plan and water rate study.

The Business Plan provides a ten-year financial analysis of the District's operation and maintenance costs, debt service obligations, and capital program needs, and is used to identify the annual water rate revenue requirements for rate-setting purposes. The business plan model incorporates the first ten years of the capital improvement program, which is identified in the Master Plan. Alternative five-year rate plans are presented for consideration by the District's Board of Directors.

The Water Rate Study provides the cost of service analysis and design of water rates intended to meet the District's service and financial obligations FY 15-16. The water rate study was conducted with the assistance of a Water Rate Structure Committee (WRSC), comprised of five customers of the District, as well as two Board members. A new rate structure is proposed to better achieve specified rate-setting objectives.

The successful implementation of the Master Plan and recommended capital improvement program is dependent upon the development of a financial strategy to accomplish Master Plan goals, as well as sustain ongoing operations and meet service obligations. The recommended Business Plan incorporates water rates, other revenues, and reserve policies in a financial strategy that reflects estimated future annual operating costs, debt obligations, and capital program needs and seeks to minimize water rates over the planning period. With the assistance of the WRSC, proposed water rates are intended to meet the District's financial needs, satisfy legal requirements, improve equity across all customers and customer classes, and achieve other rate-setting objectives.

The Business Plan, presented more fully in Section II of this report, covers a planning period from FY 15-16 through FY 24-25. The business plan addresses each of the following:

- Estimated costs and revenues associated with a potential agreement to treat and wheel water to the Golden State Water Company (GSWC)
- Funding of the ten-year capital improvement program, potentially without issuing additional long-term debt (if the District reaches an agreement with GSWC regarding the treatment and wheeling of water)
- Implementation of recommended reserve policy changes to improve financial stability and security
- Estimates of annual water rate revenue requirements to meet financial obligations

- Continued drought conditions and water rationing with a goal, as mandated by the State Water Resources Control Board (SWRCB), of 35 percent in 2015 relative to 2013, and
- A financial strategy for addressing the financial deficit created by water shortage conditions, including water shortage surcharges.

The Water Rate Study, presented in Section III of this report, addresses each of the following:

- The rate study process, which involved working with the WRSC
- Identification of water rate-setting objectives
- Evaluation of customer account and water usage data
- A cost of service analysis for the allocation of costs to each customer and customer class in proportion with service demands
- Design of a water rate structure intended to meet revenue needs, satisfy legal requirements, and achieve rate-setting objectives in a fair and reasonable manner.
- Recommendations for updating the District's capital facilities fees, and establishing new fees for customer requested reductions in meter size, and for the use of hydrant meters.

The development of the business plan included workshops with the Board of Directors on December 15, 2014, February 23, 2015, and March 16, 2015. The water rate study included four meetings with the WRSC, which were held on November 24, 2014, January 6, 2015, January 21, 2015, and February 9, 2015.

On March 16, 2015, the Board of Directors directed staff to finalize and mail a Notice of Public Hearing on Proposed New/Increased Water Rates, which includes proposed new and increased water rates covering a five-year period, as well as water shortage rate surcharges that could be implemented when the Board of Directors declares various water shortage conditions. A public hearing on the proposed water rates is scheduled for May 20, 2015. The rate proposal reflects the District's revenue needs in the absence of an agreement to treat and wheel water to GSWC. This "No GSWC" scenario is presented in this report, although business plan analyses were also developed that reflect estimated revenues from an agreement with GSWC.

On April 1, 2015, the Governor issued an Executive Order requiring mandatory water conservation to reduce water usage by 25 percent in urban areas statewide. In implementing this order, the SWRCB has proposed requirements for the District to reduce water usage by 35 percent relative to 2013. The potential effects of increased water conservation within the District have been added into the financial analysis presented in this report.

On April 20, 2015, California's Fourth District Court of Appeal issued a decision in *Capistrano Taxpayers Association v. City of San Juan Capistrano* (SJC Decision). The decision addresses Proposition 218's cost of service requirements and, among other things, tiered water pricing. The proposed water rates presented in this report were reviewed with the

District's legal counsel in the light of the SJC Decision and, while some additional explanations have been added to this final report, the water rate calculations and recommendations are unchanged. With regard to the proposed two-tier water rate structure, it is believed that the proposed water rates comply with the mandate in the SJC Decision that tier rates correlate with the actual cost of providing service at the tier levels.

The purpose of this report is to present the Business Plan and Water Rate Study, as well as to document the analyses performed and the recommendations developed during the study process.

BUSINESS PLAN AND REVENUE NEEDS

The District's water rates were last increased in January 2012. In addition, the District, region, and state are in the midst of a multi-year drought, which has reduced water sales and related revenue. While the financial condition of the water utility is not critical, capital improvement needs are not being fully or adequately funded. In addition, due to lower than normal water revenues, the District is at risk of not meeting debt service coverage obligations in the current fiscal year without the use of the Rate Stabilization Fund. If the District violates covenants on outstanding long-debt, it could jeopardize its credit rating and present other financial problems.

Since the District's water rates were last increased, general inflation has risen about 8 percent. While the District has continued to provide water service to its customers, the current financial situation limits its ability to implement needed capital projects at a level consistent with long-term replacement, rehabilitation, and upgrade needs. The capital improvement plan reflected in this report totals about $28.8 million in current dollars (and $34.7 million in future dollars) in new projects through FY 24-25. Current, drought impacted, revenues do not support any level of capital program activity, and the District is depleting its financial reserves.

The District is currently in negotiations to treat and wheel up to 5,000 acre-feet (AF) of water annually from Aerojet to the Golden State Water Company. While the District believes an agreement with favorable terms will be reached, such an agreement is not guaranteed. Much of the business plan analyses performed in this study included an assumption that an agreement would be reached and water deliveries to GSWC will commence in FY 16-17. However, to be conservative, the Board of Directors requested that the proposed water rates included in the Public Notice, regarding new/increased water rates to be considered at the public hearing on May 20, reflect the "No GSWC" scenario that does not rely on an agreement with GSWC.

It is recommended that the District adopt a five-year rate plan for the purpose of meeting the District's current and estimated future financial obligations, including providing adequate funding for an expanded capital improvement program, meeting debt service coverage requirements, and meeting other financial and service obligations. A water rate increase is urgently needed by July 2015 in order to meet current financial obligations. Rate structure changes are also proposed to be implemented with this first rate adjustment. Rate structure changes are addressed in the water rate study portion of

this report. Specific findings and recommendations of the 2015 business plan and proposed financial strategy include:

- It is likely that the current drought will continue through 2015. Even with a return to normal water supply conditions, it will likely take several years for water demand to rebound. Even then, water demands may not return to historic levels. Most of the District's costs are fixed, and the District must meet service demands regardless of water supply and demand conditions. The economic downturn of several years ago, in conjunction with the current drought, has contributed to straining the District's current financial position.
- The District continues to reduce its budget and limit and control costs where possible. However, much of the District's operations are influenced by regulatory requirements, long-term contracts, and other external factors. The District has also sought to supplement revenue where possible, and additional service fees are proposed in Section III of this report.
- The District may need to partially or fully utilize its Rate Stabilization Reserve Fund in the current fiscal year in order to meet required debt service coverage requirements. Without a water rate increase the District may be unable to meet this requirement in the upcoming fiscal year, particularly if water demand continues to be constrained by drought conditions.
- The capital improvement plan for the next ten years totals about $28.8 million (in current dollars). At present, water rates and other revenues do not adequately support the capital improvement needs of the District. In the current year, less than $1 million is being spent on capital improvements. By the end of the ten-year planning period, annual funding for the capital improvement program will need to increase to more than $4 million per year in order to support the long-term capital replacement and rehabilitation needs of the District.
- The capital improvement program has been adjusted to the extent possible to allow for gradual water rate increases, while still meeting service objectives and capital program needs. Improvements to La Vista Tank and Booster Pump Station, scheduled to begin in FY 19-20, create a significant financial hurdle in the capital improvement program. However, if the District (1) enters into a favorable agreement with GSWC, and (2) gradually and consistently adjusts water rates in each of the next five years it should be able to fund these critical projects without issuing additional long-term debt. The next few years are a critical time period in the ten-year business plan.
- The District is in negotiations to treat and deliver water to GSWC. Most business plan analyses assume that water deliveries totaling 5,000 AF per year will begin in FY 16-17. The business plan also reflects certain assumptions regarding the payment of a water treatment plant capacity charge, and ongoing treatment and delivery charge, and a capital replacement charge associated with this service agreement. Until this agreement is solidified, a certain amount of financial uncertainty will persist. If negotiations are successful, new revenues from GSWC may enable the District to reduce one or more of the proposed future water rate increases.

- The District has a current outstanding unfunded OPEB liability of about $1.3 million that has not been addressed. The business plan reflects a strategy to eliminate this liability over a ten-year period while also meeting current retiree obligations.
- The business plan includes recommendations for modifying existing financial reserve policies to improve the District's ability to mitigate and manage financial risk. These policy changes should also enhance the District's ability to limit and smooth water rate increases over time.

In order to meet the District's service and financial obligations, four alternative five-year rate plans were developed that include estimates related to an agreement with GSWC, and one rate plan that excludes an agreement with GSWC. These rate plan scenarios are presented in **Exhibit I-1**. Each of the four primary rate plans achieves similar overall financial objectives during the planning period. The "No GSWC" rate plan presents estimated rate increases that would be needed in the absence of water deliveries to GSWC.

Exhibit I-1
Carmichael Water District
Alternative Rate Plans

Scenario	Overall Water Rate Increases						Com-pounded	5-Yr Rate Revenue (millions)
	July 2015	Jan. 2016	Jan. 2017	Jan. 2018	Jan. 2019	Jan. 2020		
1	12%		5%	5%	5%	5%	36%	$ 54.9
2	12%		6%	6%	5%	5%	39%	$ 55.6
3	14%		5%	5%	5%	5%	39%	$ 55.9
No GSWC	12%		12%	5%	5%	5%	45%	$ 57.6
	July 2015	July 2016	July 2017	July 2018	July 2019			
4	12%	5%	5%	5%	5%		36%	$ 56.2

The rate plans differ in the timing and amount of each rate increase, as well as the increases that may be required in the second five years of the planning period. All rate plans include an initial rate increase in July 2015. Scenarios 1, 2, 3, and "No GSWC" then transition to January rate increases beginning in January 2017 (18 months after the initial rate increase). WRSC committee members generally supported changing the date of water rate increases to the winter, which is a point in time when customers could more easily

absorb changes in bill amounts. Scenario 4 provides an alternative that continues to adjust rates at the beginning of each fiscal year.

During the March 16, 2015 meeting of the Board of Directors, the Board chose to include the "No GSWC" rate plan in the Public Notice to be considered at the May 20, 2015 public hearing on proposed new/increased water rates.

The business plan model reflects assumptions and estimates that are believed reasonable at the present time. However, conditions change. It is recommended that the District review its financial condition annually as part of the budget process, and perform a more comprehensive business plan and rate update study every three to five years. The financial analysis presented in the business plan indicates that the revenues generated by the water rates would not exceed the cost of providing service, including maintaining prudent reserves for specified purposes.

While the proposed rate plan, which includes two 12-percent water rate increases, is based on the "No GSWC" scenario, and the District anticipates that an agreement with GSWC will be reached, the terms of an agreement are not yet known and the District's financial condition continues to be affected by the current drought. It is recommended that prior to the January 2017 rate adjustment the District update the business plan to incorporate the terms of the agreement with GSWC (if reached) as well as information on the District's financial condition and drought recovery (or continuance). This update would assess the need for the second 12 percent rate increase, as well as the continued justification for the water rate structure.

As outlined in the "No GSWC" scenario in Exhibit I-1, the District will be considering a 5-year rate plan during the scheduled May 20, 2015 public hearing. The 5-year rate plan includes an overall 12 percent water rate increase in July 2015 (along with rate structure changes), followed by a 12 percent overall increase in January 2017, and then 5 percent rate increases each January from 2018 through 2020. If adopted, the rate adjustments from January 2017 through January 2020 would effectively be the maximum rates allowed under the Proposition 218 proceeding. The District cannot impose water rates that exceed the cost of providing service.

Annually, during the budget process, the District should review the need for planned water rate increases, as well as the basis for the rates. That annual review should consider the District's planned operating and maintenance costs, debt service and OPEB obligations, planned and necessary transfers to capital fund reserves, the need to replenish depleted operating reserves, and anticipated water service demands. Based on this review, it may be determined that the revenue needs in a given year is less than those anticipated in this study. As a result, it would be appropriate to limit the rate adjustments to the cost of service as determined with consideration of all of the preceding financial and service obligations.

Details of business plan analyses and the recommendation to increase water over the next five years are presented in Section II of this report.

WATER RATE STUDY AND PROPOSED WATER RATES

Exhibit I-2 presents the proposed water rate schedule for July 2015. This rate schedule reflects an overall 12 percent increase in water rate revenue, as proposed in Scenarios 1, 2, and 4 in Exhibit I-1, as well as the "No GSWC" scenario. The water rates presented in this report include rate structure changes, as developed with assistance of the WRSC. The water rate structure has been modified to include:

- Changes to the bimonthly service charges to better align them with the capacity available through the range of meter sizes, and to simplify the structure across the various customer classes

Exhibit I-2
Carmichael Water District
Proposed Water Rate Schedule for FY 15-16

	July 1, 2015		
Water Usage Rates			
Single Family Residential Accounts			
Tier 1 (0-12 CCF)	$	1.19	per CCF
Tier 2 (>12 CCF)	$	1.47	per CCF
Condominiums, Multi-Family, and Non-Resid. Accounts (1)			
All Water Use	$	1.40	per CCF
Bimonthly Service Charge			
3/4" meter	$	44.09	per meter
1" meter	$	67.39	per meter
1 1/2" meter	$	125.63	per meter
2" meter	$	195.52	per meter
3" meter	$	358.59	per meter
4" meter	$	591.56	per meter
6" meter	$	1,173.97	per meter
8" meter	$	1,872.86	per meter
Condominium Living Units	$	44.09	per living unit
Multi-Family Living Units w/ Separate Meter	$	44.09	per living unit
Bimonthly Transitional Flat Water Rates (2)			
Single Family 1", <0.5 acre (SF11)	$	138.90	
Bimonthly Fire Service Charges			
Per Inch of Diameter	$	32.24	

Notes:
(1) Multi-family includes duplexes, triplexes, fourplexes, and apartment complexes. Non-residential includes commercial, parks, schools, and dedicated irrigation service connections.
(2) The District will continue to have flat rates until all accounts are transitioned to metered billing.

- Maintaining a uniform water usage rate structure for condominiums, multi-family, and non-residential accounts

- Providing a two-tier water usage rate structure for single family customers, rather than the uniform rate structure.

In addition to reflecting the cost of service for usage within each tier, the two-tier water usage rate structure has been designed to help protect the affordability of basic water usage and to provide further incentives for water conservation. A majority of the WRSC supports the two-tier structure, although that support was not unanimous. The higher rate for the second tier reflects the District's cost of water conservation programs, as well as the current cost of supplemental water purchases.

Section III of this report provides details on the water rate study process, working with the WRSC, rate-setting objectives, and water rate calculations. Information is also presented on how the proposed water rates may affect customer's water bills.

WATER SHORTAGE RATE SURCHARGES

Section II of this report includes a financial analysis related to various water shortage conditions, and presents a financial strategy for addressing the financial deficit created by reduced water sales. A part of the financial strategy is to implement water shortage surcharges into the normal water rate structure. **Exhibit I-3** presents the proposed water shortage rate surcharges, which would be triggered when the Board of Directors declares a water shortage emergency. The water shortage rate surcharges, which vary depending on the shortage condition, create a temporary increase in the water usage rates and provide additional revenue to help bridge the financial deficit created by reduced water sales.

The District has defined water shortage conditions as shown below. Each condition also includes various restrictions on water usage; those restrictions increase with the increased severity of the water shortage.

Normal condition	No water use restrictions
Water alert	Water use reduction goal of 1% to 20%
Water warning	Water use reduction goal of 21% to 30%
Water crisis	Water use reduction goal of 31% to 40%
Water emergency	Water use reduction goal of 41% to 50%

The water shortage rate surcharges are a tool for the District to manage the severe financial impacts associated with drought conditions and would generate revenue to cover operational costs that may not otherwise be recovered due to reduced water sales. The water shortage surcharges are designed so that customers achieving required water use reduction goals would have lower water bills than they would have with normal water rates and normal water usage. However, customers that do not meet water use reduction goals may see higher water bills.

The proposed strategy for addressing water shortage conditions calls on the District to more fully fund the Rate Stabilization Reserve Fund to provide additional capacity for bridging the financial deficit created by shortage conditions. It is recommended that the money in this reserve fund be increased over the ten-year planning period, beginning in FY 16-17, until it reaches $3.0 million. Under the proposed water shortage financial strategy the District would utilize a portion of this reserve to help bridge the financial deficit.

Under the more severe water shortage conditions annual transfers of rate revenue to support the District's capital improvement program would be reduced and/or deferred.

Exhibit I-3
Carmichael Water District
Water Shortage Surcharge Rate Structure

	Normal Supply	Water Alert	Water Warning	Water Crisis	Water Emergency
Use Reduction Goals -->	None	1% to 20%	21% to 30%	31% to 40%	41% to 50%
Water Shortage Surcharge (1)	**None**	**None**	**30%**	**40%**	**50%**
Water Usage Rates, with Surcharge Applied (2)					
Single Family Customers					
Tier 1 (0 to 12 CCF/2-mo.)	$ 1.19	$ 1.19	$ 1.55	$ 1.67	$ 1.79
Tier 2 (> 12 CCF/2-mo.)	$ 1.47	$ 1.47	$ 1.91	$ 2.06	$ 2.21
Condominimums, Multi-Family and Non-Resid. Customers (3)					
All Water Usage	$ 1.40	$ 1.40	$ 1.82	$ 1.96	$ 2.10
Bimonthly Service Charges (4)					
All Meter Sizes	Varies		No Change to Service Charges		

Notes:
(1) Water shortage surcharges are incremental increases in normal water usage rates applied during Water Warning, Water Crisis, and Water Emergency conditions declared by the Board of Directors.
(2) This section shows water shortage surcharges applied to proposed FY 15-16 water rates, for illustrative purposes. The percentages shown would be applied to any then-current water rates in future years.
(3) Multi-family includes duplexes, triplexes, fourplexes, and apartment complexes. Non-residential includes commercial, parks, schools, and dedicated irrigation service connections.
(4) No changes to the fixed bimonthly service charges are proposed during water shortages.

Details of the water shortage financial analysis and multi-pronged response strategy are presented near the end of Section II. Based on information available in March 2015, it is recommended that the District adopt the proposed water shortage surcharges in the same rate adoption process as rates for the upcoming fiscal year, but not implement water shortage surcharges in 2015. A permanent increase in water rates is urgently needed, and temporary surcharges would not adequately address the District's immediate needs and ongoing obligations.

CAPITAL FACILITIES FEES AND OTHER FEES

Exhibit I-4 presents a proposed update of the District's capital facilities fees. The capital facilities fees are a capacity charge, as defined by Section 66013 of the Government Code, paid when a new connection is made to the water system (or an existing service is up-sized). The proposed capital facilities fees are based on the system buy-in methodology for calculating this type of fee, and reflect the estimated reasonable cost of capacity in the water system.

Exhibit I-4
Carmichael Water District
Proposed Capital Facilities Fees

Meter Size	Capital Facilities Fees
3/4" meter	$ 4,428
1" meter	$ 7,380
1 1/2" meter	$ 14,760
2" meter	$ 23,616
3" meter	$ 44,280
4" meter	$ 73,800
6" meter	$ 147,600
8" meter	$ 236,160

Details on the calculation of the capital facilities fees are presented near the end of Section III of this report. Recommendations for new charges related to customer requests to downsize their water meters, as well as procedures and fees for hydrant meter rentals are also included at the end of Section III.

SECTION II. BUSINESS PLAN

This section of the report describes the 2015 Business Plan and related recommendations for the District. The ten-year business plan (1) provides an analysis of the District's current and estimated future operating and maintenance costs, debt service obligations, and capital program needs, (2) presents a financial strategy for meeting the District's financial and service obligations, and (3) is used to determine annual water rate revenue requirements. The annual rate revenue requirement is the amount of revenue needed from water rates to cover planned operating, maintenance, debt service, and capital program costs with consideration of other revenues and financial reserves.

The section of the report has been revised from prior drafts of the report in that it reflects the "No GSWC" scenario in the primary business plan exhibits. This scenario is consistent with the Public Notice that includes proposed new/increases water rates to be considered by the Board of Directors on May 20, 2015. Prior drafts of this report primarily reflected a scenario with water deliveries to GSWC.

This section also presents an analysis of the financial impacts associated with water shortages and the financial deficit created by reduced water sales. Water shortages can present financial risks, and a strategy for mitigating these risks is proposed.

FUND STRUCTURE AND CASH FLOWS

The business plan was developed through analyses using an annual cash flow financial planning model. As a cash flow model, it differs from standard accounting income statements and balance sheets. The business plan reflects sources and uses of funds into, out of, and between the various funds and reserves of the District.

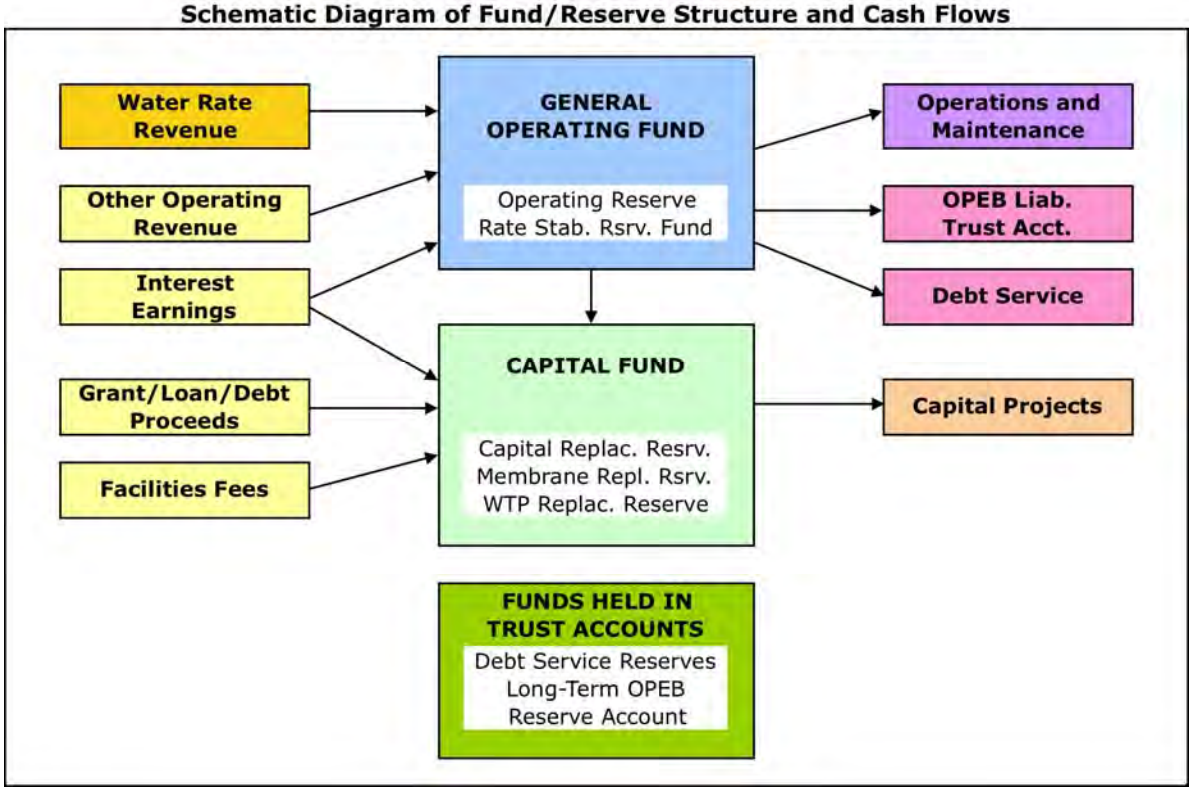
The business plan model reflects the District's current fund and reserve structure and also incorporates new reserves to the existing structure for specified purposes. This structure was discussed with staff and presented to the Board of Directors during workshops, to provide a helpful framework for evaluating the financial needs of the District and for clearly demonstrating how operating and maintenance costs, debt service obligations, and capital program needs are addressed. The proposed fund and reserve structure is summarized below. **Exhibit II-1** is a schematic diagram of the funds/reserves and major cash flows associated with the business plan model. **Appendix A**, at the end of this report, presents details for a proposed financial reserve policy.

An understanding of the fund/reserve structure is helpful in understanding the financial plan worksheets that model estimated annual cash flows through the District from one year to the next. The fund/reserve structure is comprised of:

- ***General Operating Fund*** – The General Operating Fund is the primary fund within the District. Most of the water system's revenues, including water rate revenues, flow into the General Operating Fund and all operating and maintenance costs, including debt service payments, are paid out of this fund. Funds are also

transferred from the General Operating Fund to the Capital Fund to help pay for capital projects intended to rehabilitate and upgrade facilities.

Exhibit II-1
Carmichael Water District
Schematic Diagram of Fund/Reserve Structure and Cash Flows



- *Operating Reserve* – Under the current reserve policy, the District maintains an Operating Reserve equal to 25 percent of annual operating and maintenance costs, excluding debt service costs. The purpose of the Operating Reserve is to provide sufficient funds for working capital, as well as funds for continued operations in the event of unplanned operating and maintenance expenditures or for safeguarding revenue volatility. The current policy states that the District shall not adopt a budget that would result in an Operating Fund balance that is lower than the target minimum Operating Reserve. In addition, current policy states that the Board of Directors shall not approve use of funds that would result in an Operating Fund balance lower than the Operating Reserve target minimum, unless an emergency condition exists.

  Changes are recommended on the purpose, amount, and use of the Operating Reserve, as described later in this section and in Appendix A.

- *Rate Stabilization Reserve Fund* – The District maintains a Rate Stabilization Reserve Fund to provide funds for use to ensure financial and customer rate stability in responding to conditions including, but not limited to, unforeseen operating and/or capital expenditures; revenue losses due to water shortages, drought, or other conditions; natural or man-made disasters; or major transmission is distribution main failures. The Rate Stabilization Reserve Fund

is also authorized by bond documents to be used in meeting debt service coverage requirements (as described later in this section). Funding and use of the Rate Stabilization Reserve Fund is made by action of the Board of Directors. At present, using this reserve fund for debt service coverage purposes is a primary function.

Changes are recommended on the purpose, amount, and use of the Rate Stabilization Reserve Fund, as described later in this section and in Appendix A. In particular, it should also serve as the District's drought/emergency fund.

- *Emergency Reserve* – Current policy allows an Emergency Reserve, however this reserve has never been funded. It is recommended that the District eliminate this reserve, and utilize the Rate Stabilization Reserve Fund for this purpose, as described later in this section and in Appendix A.
- *Available Balance* – The balance in the General Operating Fund in excess of the target amounts for the Operating Reserve and the Rate Stabilization Reserve Fund is shown in the business plan model as Available Operating Fund Balance. After all other obligations are met this available balance is used to offset rate increases. The business plan model generally seeks to reduce any positive balance over time. A negative (deficit) balance would indicate a shortfall in maintaining the desired minimum Operating Reserve and Rate Stabilization Reserve Fund.

- ***Capital Fund*** – The Capital Fund is used to account for revenues and funds available and committed for capital project expenditures. Capital projects funded from this fund are intended to replace, rehabilitate, upgrade, and expand the water system to meet current and future capacity needs of the District. The business plan model generally seeks to maintain and build a positive balance in the Capital Fund while also covering the costs of planned capital improvement projects. Three reserves within the Capital Fund include:
  - *Membrane Replacement Reserve* – While not reflected in current policy, the District maintains a Membrane Replacement Reserve to accumulate funds for the replacement of membrane filters at the water treatment plant. The District currently adds $200,000 per year to this reserve, and uses funds from the reserve when membrane filters need to be replaced.

    The Membrane Replacement Reserve should be formally incorporated into the District's reserve policy. Recommendations on the purpose, amount, and use of the Membrane Replacement Reserve are included later in this section and in Appendix A.
  - *Water Treatment Plant Replacement Reserve* – Because of the sizable investment in the water treatment plant (WTP), the District should establish and begin funding a WTP Replacement Reserve to provide funds for the eventual replacement of WTP equipment and structures. This reserve may help reduce or even eliminate the need for future long-term debt and, over the long-term, allow for lower water rates than might otherwise be required.

The WTP Replacement Reserve should be formally incorporated into the District's reserve policy. Recommendations on the purpose, amount, and use of the WTP Replacement Reserve are included later in this section and in Appendix A.

- *Capital Replacement Reserve* – The District's current reserve policy established this reserve to provide funds in support of the District's ongoing capital replacement program, and to minimize or avoid the need for future long-term debt. Through this policy the District seeks to maintain an amount in the Capital Replacement Reserve sufficient to cover annual capital replacement program costs, as scheduled, with consideration of annual contributions to the reserve. Funds in the Capital Replacement Reserve are used exclusively for capital replacement projects planned and approved by the District. The District should maintain annual transfers from the General Operating Fund at a level sufficient to achieve the required target amount, as identified in long-term financial planning analyses. Capital facilities fee revenue is also deposited into the Capital Replacement Reserve.

  The District should continue to utilize the Capital Replacement Reserve. Recommendations on refining the purpose, amount, and use of the Capital Replacement Reserve are included later in this section and in Appendix A.

BUSINESS PLAN ASSUMPTIONS

The business plan was initialized with the FY 14-15 budget and financial conditions as of the beginning of the fiscal year. It also reflects the draft budget for FY 15-16, prepared by staff in February 2015. The business plan model also reflects the District's debt service obligations and the capital improvement program as identified by the Master Plan during the ten-year planning period.

The process used to develop the business plan involved estimating future revenues and expenditures based on estimates of future conditions using budgets, existing debt service schedules and the capital improvement plan from the Master Plan. The business plan is based on the best available information and its assumptions are believed to be reasonable; however, no assurance can be provided as to the accuracy and completeness of future estimates. The proposed annual rate adjustments will help protect the District and ratepayers from some of the risk and uncertainty associated with business plan assumptions. Primary assumptions reflected in business plan analyses are described below, with additional information presented in **Exhibit II-2**.

- *Interest Rates* – Interest earned on fund/reserve balances is estimated to be 0.25 percent from FY 15-16 through FY 17-18, 0.5 percent from FY 18-19 through FY 20-21, and then 0.75 percent per year for the remainder of the planning period. Interest calculations are based on beginning-of-year fund/reserve balances. The initial interest rate reflects the current return from the Local Agency Investment Fund (LAIF), as well as a gradual return towards historical averages. Interest accrues to each of the funds. The District also pays interest on outstanding long-term debt obligations. The interest payments on outstanding debt are those contained in existing contracts and repayment schedules.

Exhibit II-2
Carmichael Water District
Strategic Business Plan Assumptions

	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
Financial Assumptions												
General Inflation			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Personnel Cost Inflation				5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Overall Staff Level (FTEs)	25	25	25	25	25	25	26	27	28	28	29	30
Construction Inflation				3.0%	3.0%	3.0%	3.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Interest Earnings			0.25%	0.25%	0.25%	0.5%	0.5%	0.5%	0.75%	0.75%	0.75%	0.75%
Customer Base and Water Sales												
No. of Cust. Accounts	11,528	11,538	11,550	11,573	11,596	11,619	11,642	11,665	11,689	11,712	11,736	11,759
No. of 1" Equiv. Mtrs.	13,601	13,611	13,623	13,646	13,669	13,692	13,715	13,738	13,762	13,785	13,809	13,832
Customer Growth	10	10	12	23	23	23	23	23	23	23	23	23
Customer Growth Rate	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Conservation Factor	-6.5%	-19.0%	-12.0%	10.0%	8.0%	8.0%	4.0%	2.0%	0.0%	0.0%	0.0%	0.0%
Water Sales (CCF)	3,799,000	3,080,000	2,714,000	2,992,000	3,238,000	3,504,000	3,651,000	3,732,000	3,740,000	3,748,000	3,756,000	3,764,000
Water Sales (AF)	8,721	7,071	6,230	6,869	7,433	8,044	8,382	8,567	8,586	8,604	8,623	8,641
Water Production (AF)	9,641	7,686	6,772	7,466	8,080	8,744	9,110	9,312	9,332	9,352	9,372	9,392
Losses & Other Uses	-9.5%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%
GSWC Water Sales	**0**	1 = Yes; 0 = No	GSWC water sales									
Water Sales (AF)			-	-	-	-	-	-	-	-	-	-
O&M Water Rate ($/AF)			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Facilities Fee (1" Conn.)	$ 1,570	$ 1,570	$ 7,380	$ 7,601	$ 7,829	$ 8,064	$ 8,306	$ 8,638	$ 8,984	$ 9,343	$ 9,717	$ 10,106

- *Inflation Rates* – The business plan analyses include general inflation at 3.0 percent per year, personnel cost inflation at 5.0 percent per year, and construction inflation starting at 3.0 percent per year and increasing to 4.0 percent per year in FY 20-21. General inflation is currently about 3.0 percent per year, as reported by the Bureau of Labor Statistics for the San Francisco-Oakland-San Jose area. Construction inflation, as indicated by the *Engineering News Record's* 20-Cities Construction Cost Index has been about 3.0 percent per year for the past five years, but also higher prior to that time. Each of these inflation assumptions has been reviewed with staff and is reasonable for financial planning purposes.

- *Growth Projections* – The business plan assumes that the customer base (number of active service connections) will grow by 0.1 percent per year through FY 15-16, and then increase to 0.2 percent for the remainder of the planning period. Because the District's service area is largely built out, this estimate is believed to be reasonable for planning purposes and has been reviewed with staff.

- *Customer Demand* – The current drought is continuing through 2015, and the business plan has been revised to reflect that water demand may be further constrained through FY 15-16 in order to achieve the 35 percent water use reduction goal proposed for the District by the SWRCB. Average customer water demands are then assumed to gradually rebound from the drought levels over a five-year period, beginning in FY 16-17. By FY 24-15, customer demand is estimated to rebound to about 3,764,000 CCF (8,641 AF), which is still below historical levels. While a return to normal water supplies in 2016 is reflected in the business plan analysis, continuation of the drought could result in sustained reduced customer water demands. The assumption used is believe reasonable for planning purposes and has been reviewed with staff.

- *Staffing Levels* – At present, the District has 25 authorized full time equivalent (FTE) staff positions. Historically, the District has had up to 30 authorized positions. In 2011, with limited financial resources and sensitivity to economic conditions, the District reduced the number of positions by five in order to reduce costs and limit the 2012 water rate increase. The business plan reflects the gradual addition of 5 staff positions. One position would be added each year in FY 19-20, FY 20-21, FY 21-22, FY 23-24, and FY 24-25 at an average cost of existing staff.

- *Operation and Maintenance Costs* – The financial plan model is based on current operating and maintenance costs as reflected in the draft FY 15-16 operating budget, with future estimates influenced by the inflation, growth, water demand, and staffing assumptions described above. Estimates of future costs were reviewed with staff for reasonableness.

- *Water Purchases* – In FY 14-15 the District purchased water from Aerojet due to drought conditions and limited water supplies on the American River. The business plan reflects that the District will purchase an additional 5,882 AF in FY 15-16, due to continued drought conditions. The analysis assumes a cost of $85 per AF, however District staff anticipates the actual cost may be greater.

- *Water Wheeling to Golden State Water Company* – The District is in negotiations to wheel (treat and deliver) water to Golden State Water Company (GSWC).

Preliminary business plan analyses had assumed that 5,000 AF per year will be delivered beginning in FY 16-17. Estimated terms of this arrangement include payment of an initial WTP capacity charge, an O&M charge for water deliveries, and a capital replacement charge for future improvements to the WTP. To be conservative in establishing water rates, the Board of Directors has included a "No GSWC" rate plan in the Public Notice related to proposed new/increased water rates to be considered on May 20. Business plan details included in this revised report now reflect this "No GSWC" scenario.

- *OPEB* Liability – Based on the 2014 actuarial analysis, the District estimates that it will have a current outstanding unfunded OPEB (Other Post-Employment Benefits) liability of about $1,323,000 at the end of FY 14-15. In addition, the unfunded liability is increasing each year. Constrained finances at the present time preclude addressing this long-term liability in FY 15-16. The business plan includes $440,000 in FY 16-17 (increasing at 1 percent per year) to be placed into an OPEB Reserve Trust Account. At this level of funding, it is estimated that the outstanding long-term unfunded liability will be eliminated by the end of the planning period. Actuarial analyses should be updated every two years to gage progress on meeting this financial obligation. Each year, the unfunded OPEB liability increases, and this *increase* is included as an operating expense in the calculation of debt service coverage (described below). The money set aside to reduce the long-term liability is shown as a transfer from the General Operating Fund into a Long-Term OPEB Reserve Account that the District plans to establish and have held by a trustee.

- *Existing Debt Obligations* – Existing long-term debt obligations are summarized in **Exhibit II-3**. A final payment of the 2009 Installment Sale Agreement occurred in FY 14-15. This leaves the 2010 Water Revenue Refunding Certificates of Participation (COPs) as the District's only long-term debt. The District currently pays about $2.2 million annually on debt service for this issue. One of the requirements associated with the financing is to maintain rates and other revenues at levels sufficient to meet debt service coverage requirements. The District is required to maintain water system revenues at a level that covers all ongoing operating and maintenance costs, as well as 1.20 times annual debt service. Due to the current drought conditions (with reduced water sales) current revenues may be insufficient to meet this requirement. If this is the case, then the District will utilize some or all of its Rate Stabilization Reserve Fund to provide additional revenue sufficient to meet the coverage requirement[1]. The business plan recommends increasing water rates sufficiently to meet the debt service coverage requirement, without use of the Rate Stabilization Reserve Fund, which may be exhausted at the end of the current fiscal year.

[1] This is the primary purpose of the Rate Stabilization Reserve Fund, which is authorized in COP documents. Moneys taken out of the Rate Stabilization Reserve Fund count as revenue for debt service coverage calculations.

Exhibit II-3
Carmichael Water District
Summary of Debt Service Obligations

	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
2009 Installment Sale Agreement											
Principal Payment	178,732										
Interest Payment	1,394										
Total Payment	180,126	<-- Final payment to be paid from DS reserve account									
Remaining Balance	-										
2010 Water Revenue Refunding COPs											
Principal Payment	1,105,000	1,150,000	1,185,000	1,245,000	1,305,000	1,355,000	1,410,000	1,470,000	1,540,000	1,605,000	1,665,000
Interest Payment	1,085,550	1,046,200	999,325	938,575	881,350	828,150	772,850	707,900	640,350	577,450	512,050
Total Payment	2,190,550	2,196,200	2,184,325	2,183,575	2,186,350	2,183,150	2,182,850	2,177,900	2,180,350	2,182,450	2,177,050
Remaining Balance	23,505,000	22,355,000	21,170,000	19,925,000	18,620,000	17,265,000	15,855,000	14,385,000	12,845,000	11,240,000	9,575,000
2019 New Debt Issue (may be required under the "No GSWC" scenario)											
Principal Payment						105,000	115,000	120,000	130,000	135,000	140,000
Interest Payment						350,000	344,750	339,000	333,000	326,500	319,750
Total Payment						455,000	459,750	459,000	463,000	461,500	459,750
Remaining Balance					7,000,000	6,895,000	6,780,000	6,660,000	6,530,000	6,395,000	6,255,000

- *New Long-Term Debt* – If the District is successful in negotiating a favorable agreement with GSWC for the delivery of 5,000 AF per year, and the District consistently adds to the Capital Replacement Reserve, then the District may not need to issue new long-term debt during the 10-year planning period. However, if an agreement is not reached, then new debt may be needed in FY 19-20 in order to fund construction of La Vista Reservoir and related improvements. The business plan presented herein includes a $7.0 million debt issue with a 5.0 percent interest rate and 30 year term. It includes 3 percent in issuance costs and the funding of a debt service reserve, which would be held in a trust account. Annual debt service would be about $460,000.
- *Capital Improvement Program* – The capital improvement plan, as developed within the Master Plan, includes multiple projects totaling about $28.8 million (in current dollars) over a ten-year period. The business plan assumes that capital projects will be funded from water rates, capital facilities fees, other potential revenues, and available reserves. The capital improvement plan reflected in the business plan is summarized in **Exhibit II-4**.

Exhibit II-5 provides the details of the business plan model for the "No GSWC" scenario illustrated in Exhibit I-1 and Exhibit II-6). The business plan model was used to develop multiple scenarios (including scenarios with GSWC water deliveries), perform sensitivity analyses related to certain assumptions, and evaluate the implications of various courses of action. This scenario also reflects additional water conservation in FY 15-16 necessary to achieve state-mandated 35 percent water use reduction, relative to 2013, by the District. **Exhibit II-6** summarizes five different business plan scenarios developed using the model. Each of these scenarios essentially achieves the same financial objectives, but allow for different timing and magnitude of rate adjustments. **Exhibit II-7** graphically summarizes the annual revenues, expenses, and year-end General Operating Fund balance through the planning period resulting from the "No GSWC" scenario listed in Exhibit II-6 and reflected in Exhibit II-5. Other scenarios are similar, except they include both costs and revenues related to treating and wheeling water to GSWC and exclude any new long-term debt.

Exhibit II-4
Carmichael Water District
FY 15-16 to FY 24-25 Capital Improvement Plan (1)

Capital Improvement Projects	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
Meters and Services	759,526	334,000	30,000	10,000	49,000	11,000	-	7,000	5,000	15,000
Pipeline Bundle - Replacement	372,929	512,500	523,500	523,500	523,500	1,120,000	1,210,000	1,064,000	1,039,000	1,863,000
Distrib. System - Vehicles, Equip., & Bldgs.	163,000	76,400	134,000	246,600	257,600	527,600	96,400	273,800	59,500	136,400
Existing Wells	8,000	55,500	10,500	30,500	90,000	65,500	10,500	10,500	30,500	10,500
New Wells	-	-	-	-	202,400	-	350,000	-	1,909,000	-
Groundwater Treatment	-	-	-	-	-	-	-	-	-	2,000,000
Surface Water Intakes (Ranney)	-	75,000	-	350,000	-	-	50,000	-	-	-
Surface Water Treatment Plant (2)	180,000	180,000	286,000	111,000	202,000	301,000	210,000	210,000	210,000	210,000
River Crossing	300,000	-	-	-	-	-	-	-	-	-
Reservoir Storage and Booster Pumping	55,000	18,000	18,000	18,000	2,013,000	2,626,000	2,626,000	750,000	18,000	18,000
Water Production - Vehicles, Equip., & Bldgs.	-	5,800	106,500	46,400	11,000	-	-	7,800	1,000	36,200
Administrative - Vehicles, Equip., & Bldgs.	31,500	52,000	69,700	60,300	76,400	51,600	29,200	36,700	56,500	115,800
Tech. Serv. - Reports and Planning	-	-	-	-	-	-	-	250,000	-	-
Capital Improvement Program Totals	**1,869,955**	**1,309,200**	**1,178,200**	**1,396,300**	**3,424,900**	**4,702,700**	**4,582,100**	**2,609,800**	**3,328,500**	**4,404,900**
Totals Inflated to Future Dollars	1,870,000	1,348,000	1,250,000	1,526,000	3,855,000	5,505,000	5,578,000	3,304,000	4,383,000	6,032,000
Inflation Factor	1.00	1.03	1.06	1.09	1.13	1.17	1.22	1.27	1.32	1.37

Notes:
(1) Estimated costs in future years have been rounded.
(2) Includes membrane replacements, which are funded from the Membrane Replacement Reserve.

Exhibit II-5
Carmichael Water District
2015 - 2024 Strategic Business Plan -- 35% Demand Reduction in 2015 and No GSWC Agreement

	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
Overall Water Rate Increase (July) -->		**12%**									
Overall Water Rate Increase (January) -->			**12%**	**5%**	**5%**	**5%**	**6%**	**6%**	**6%**	**6%**	**6%**
OPERATING FUND											
Beginning Balance	4,257,800	3,821,880	2,679,700	2,753,200	3,313,800	4,097,300	4,382,900	4,538,500	4,864,900	5,277,200	5,655,600
Revenues											
Water Sales	8,653,000	9,232,000	10,109,000	11,353,000	12,338,000	13,205,000	14,075,000	14,950,000	15,879,000	16,866,000	17,913,000
Ancil Hoffman Park	84,907	86,200	87,500	88,800	90,100	91,500	92,900	94,300	95,700	97,100	98,600
Private Fire Services	86,500	96,900	108,500	113,900	119,600	125,600	133,100	141,100	149,600	158,600	168,100
GSWC Water Sales		-	-	-	-	-	-	-	-	-	-
Water Service Fees	15,000	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,100	19,700
Miscellaneous Revenues	5,000	5,000	5,200	5,400	5,600	5,800	6,000	6,200	6,400	6,600	6,800
Aerojet Testing Reimb.	5,000	5,000	5,200	5,400	5,600	5,800	6,000	6,200	6,400	6,600	6,800
COTP Revenue	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Backflow Testing Prog. Fees	19,671	29,795	29,800	29,800	29,800	29,800	29,800	29,800	29,800	29,800	29,800
Interest Income	5,000	5,000	6,700	6,900	16,600	20,500	21,900	34,000	36,500	39,600	42,400
Total Revenues	8,894,078	9,494,895	10,387,400	11,639,200	12,641,800	13,521,000	14,402,200	15,299,600	16,241,900	17,243,400	18,305,200
Expenses & Transfers											
Administrative Services	2,321,913	2,186,225	2,373,300	2,466,900	2,564,500	2,718,600	2,882,000	3,055,600	3,179,600	3,372,400	3,576,900
Financial Services	720,254	763,385	797,600	833,500	871,000	937,900	1,009,300	1,085,700	1,135,400	1,220,900	1,312,300
Production	2,143,314	2,358,579	1,935,200	2,014,100	2,096,800	2,213,200	2,334,700	2,461,000	2,555,700	2,695,300	2,843,200
Distribution	1,215,267	1,332,668	1,383,500	1,436,500	1,491,600	1,575,500	1,670,900	1,772,000	1,848,500	1,960,400	2,079,100
Debt Service											
2010 Wtr Rev Refund COPs	2,190,550	2,196,200	2,184,300	2,183,600	2,186,400	2,183,200	2,182,900	2,177,900	2,180,400	2,182,500	2,177,100
2019 Debt Issue						455,000	459,800	459,000	463,000	461,500	459,800
Transfers											
Capital Replac. Reserve	538,700	1,600,000	1,000,000	1,500,000	2,000,000	2,500,000	2,750,000	3,000,000	3,500,000	4,000,000	4,250,000
Membrane Replac. Reserve	200,000	200,000	200,000	200,000	200,000	200,000	250,000	250,000	250,000	250,000	250,000
WTP Replacement Reserve							250,000	250,000	250,000	250,000	250,000
OPEB Reserve Trust Account		-	440,000	444,000	448,000	452,000	457,000	462,000	467,000	472,000	477,000
Total Expen. & Trans.	9,329,998	10,637,057	10,313,900	11,078,600	11,858,300	13,235,400	14,246,600	14,973,200	15,829,600	16,865,000	17,675,400
Ending Balance	**3,821,880**	**2,679,718**	**2,753,200**	**3,313,800**	**4,097,300**	**4,382,900**	**4,538,500**	**4,864,900**	**5,277,200**	**5,655,600**	**6,285,400**
Oper. Rsrv. (33% of O&M, incl. DS)	1,600,000	2,916,000	2,862,000	2,948,000	3,039,000	3,177,000	3,326,000	3,482,000	3,597,000	3,772,000	3,956,000
Rate Stabilization Reserve Fund	-	-	-	-	-	250,000	500,000	750,000	1,000,000	1,250,000	1,500,000
Available Oper. Fund Balance (1)	**2,221,880**	**(236,282)**	**(108,800)**	**365,800**	**1,058,300**	**955,900**	**712,500**	**632,900**	**680,200**	**633,600**	**829,400**
DS Coverage (1.20 min.) (2)	1.26	1.22	1.74	2.20	2.54	2.18	2.36	2.53	2.74	2.93	3.13

Notes:
(1) A negative amount in the Available Operating Fund Balance indicates the amount in which the Operating Fund is below the target Operating Reserve minimum balance.
(2) The debt service coverage calculation includes estimated amounts for the annual increase in the current outstanding unfunded OPEB liability as an operating expense.

Exhibit II-5 -- Continued
Carmichael Water District
2015 - 2024 Strategic Business Plan -- 35% Demand Reduction in 2015 and No GSWC Agreement

	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
CAPITAL FUND											
Beginning Balance	417,000	632,700	648,500	676,700	1,310,600	2,179,200	7,556,100	5,540,000	3,712,200	4,653,400	5,032,900
Revenues & Transfers											
Facilities Fees	15,700	85,200	175,600	181,200	187,000	193,000	201,100	209,600	218,400	227,600	237,200
GSWC WTP Capacity Charge			-	-	-	-					
GSWC WTP Cap. Replac. Charge			-	-	-	-	-	-	-	-	-
Interest Earnings	-	1,600	1,600	1,700	6,600	10,900	37,800	41,600	27,800	34,900	37,700
2019 Debt Proceeds						6,327,000					
Transfers from Operating Fund											
Capital Replac. Reserve	538,700	1,600,000	1,000,000	1,500,000	2,000,000	2,500,000	2,750,000	3,000,000	3,500,000	4,000,000	4,250,000
Membrane Replac. Reserve	200,000	200,000	200,000	200,000	200,000	200,000	250,000	250,000	250,000	250,000	250,000
WTP Replacement Reserve	-	-	-	-	-	-	250,000	250,000	250,000	250,000	250,000
Total Revenues & Transfers	754,400	1,886,800	1,377,200	1,882,900	2,393,600	9,230,900	3,488,900	3,751,200	4,246,200	4,762,500	5,024,900
Expenses											
Fixed Asset Additions	-										
PSM Additions	538,700										
Meters and Services		760,000	344,000	32,000	11,000	55,000	13,000	-	9,000	7,000	21,000
Pipeline Bundle - Replacement		373,000	528,000	555,000	572,000	589,000	1,311,000	1,473,000	1,347,000	1,368,000	2,551,000
Distrib. Sys. - Veh, Equip, & Bldgs		163,000	79,000	142,000	269,000	290,000	618,000	117,000	347,000	78,000	187,000
Existing Wells		8,000	57,000	11,000	33,000	101,000	77,000	13,000	13,000	40,000	14,000
New Wells		-	-	-	-	228,000	-	426,000	-	2,514,000	-
Groundwater Treatment		-	-	-	-	-	-	-	-	-	2,739,000
Surface Water Intakes (Ranney)		-	77,000	-	382,000	-	-	61,000	-	-	-
Surface Water Treatment Plant (1)		180,000	185,000	303,000	121,000	227,000	352,000	256,000	266,000	277,000	288,000
River Crossing		300,000	-	-	-	-	-	-	-	-	-
Reservoir Storage and Bstr Pumps		55,000	19,000	19,000	20,000	2,266,000	3,074,000	3,197,000	950,000	24,000	25,000
Water Prod. - Veh, Equip, & Bldgs		-	6,000	113,000	51,000	12,000	-	-	10,000	1,000	50,000
Admin. - Vehicles, Equip, & Bldgs		32,000	54,000	74,000	66,000	86,000	60,000	36,000	46,000	74,000	159,000
Tech. Serv. - Reports and Planning		-	-	-	-	-	-	-	317,000	-	-
Total Expen. & Trans.	538,700	1,871,000	1,349,000	1,249,000	1,525,000	3,854,000	5,505,000	5,579,000	3,305,000	4,383,000	6,034,000
Ending Balance	**632,700**	**648,500**	**676,700**	**1,310,600**	**2,179,200**	**7,556,100**	**5,540,000**	**3,712,200**	**4,653,400**	**5,032,900**	**4,023,800**
Capital Replacement Reserve	59,435	53,500	65,700	800,600	1,587,200	2,927,100	3,814,000	2,743,200	3,442,400	3,589,900	2,357,800
2018 Project Fund				-	-	4,061,000	1,007,000	-	-	-	-
Membrane Replac. Reserve	573,265	595,000	611,000	510,000	592,000	568,000	469,000	467,000	455,000	431,000	396,000
WTP Replacement Reserve	-	-	-	-	-	-	250,000	502,000	756,000	1,012,000	1,270,000
FUNDS HELD IN TRUST											
2010 Debt Service Reserve	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000	2,215,000
2019 Debt Service Reserve						463,000	463,000	463,000	463,000	463,000	463,000
OPEB Reserve Trust Account			440,000	884,000	1,332,000	1,784,000	2,241,000	2,703,000	3,170,000	3,642,000	4,119,000
Total Held in Trust	2,215,000	2,215,000	2,655,000	3,099,000	3,547,000	4,462,000	4,919,000	5,381,000	5,848,000	6,320,000	6,797,000
Aggregate Year-End Balance	6,669,580	5,543,218	6,084,900	7,723,400	9,823,500	16,401,000	14,997,500	13,958,100	15,778,600	17,008,500	17,106,200

Notes:
(1) Includes membrane replacements, which are funded from the Membrane Replacement Reserve.

Exhibit II-6
Carmichael Water District
Alternative Business Plan Scenarios (1)

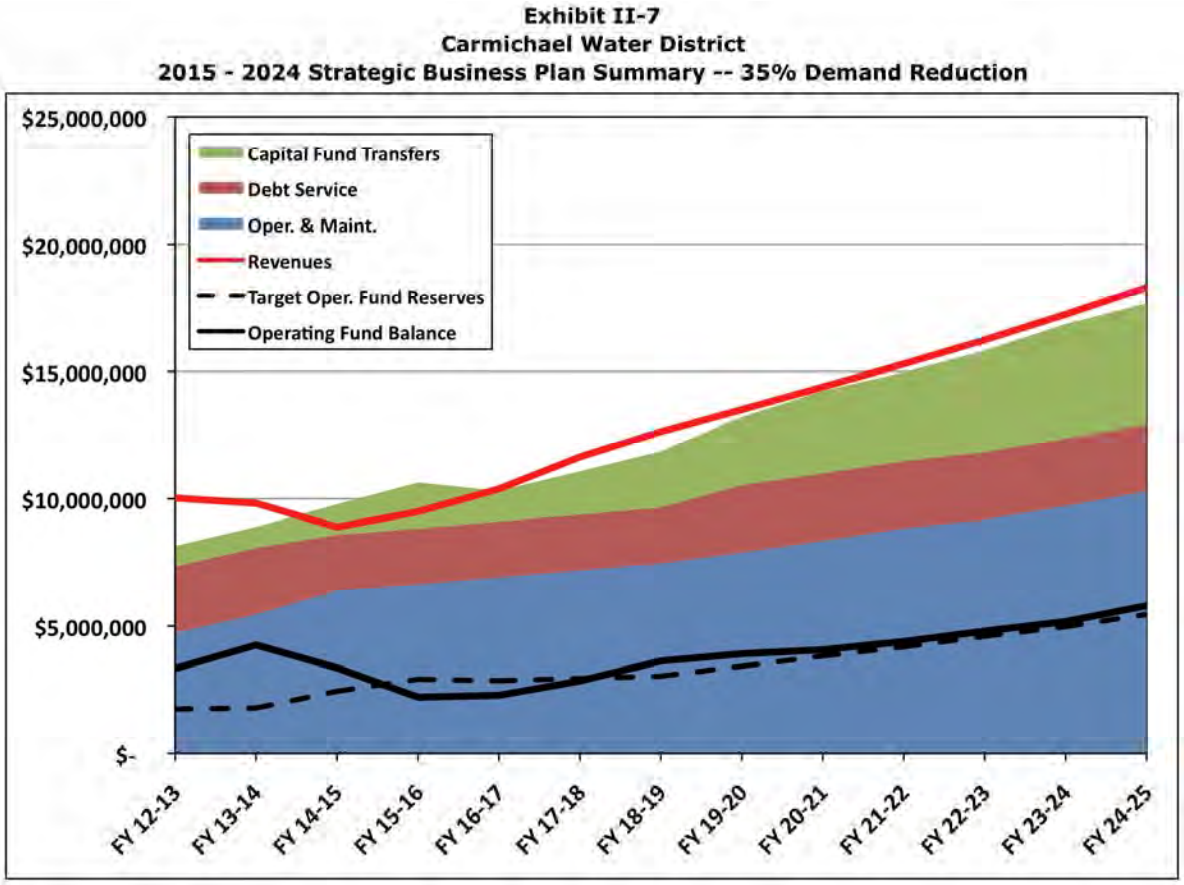
Scenario	Overall Water Rate Increases											Com-pounded	10-Yr Rate Revenue (millions)
	July 2015	Jan. 2016	Jan. 2017	Jan. 2018	Jan. 2019	Jan. 2020	Jan. 2021	Jan. 2022	Jan. 2023	Jan. 2024	Jan. 2025		
1	12%		5%	5%	5%	5%	6%	6%	6%	6%	6%	82%	$ 130.5
2	12%		6%	6%	5%	5%	5%	5%	5%	5%	5%	77%	$ 130.7
3	14%		5%	5%	5%	5%	5%	5%	5%	5%	5%	77%	$ 131.0
No GSWC	12%		12%	5%	5%	5%	6%	6%	6%	6%	6%	94%	$ 138.2
	July 2015	July 2016	July 2017	July 2018	July 2019	July 2020	July 2021	July 2022	July 2023	July 2024			
4	12%	5%	5%	5%	5%	5%	5%	4%	4%	4%		69%	$ 131.0

Notes:

(1) Scenarios 1 through 4 differ only in the timing and amount of water rate increases. All scenarios include $29.2 million (in current dollars) in capital improvements over a ten-year period, assume water deliveries to GSWC will commense in FY 16-17 at 5,000 AF per year, and no new debt will be issued. Other assumptions reflected in the business plan analyses are described in the narrative of the report.

(2) The "No GSWC" scenario requires a $7.0 million debt issue in 2019, with no change in the CIP. The "No GSWC" is presented in more detail in Exhibit II-5.

Once estimates of future operating and maintenance costs, debt service obligations, and capital program needs are developed and reflected in the business plan model several different "toggles" are used to complete the analysis. The primary toggles are the timing and amount of annual water rate increases, and the timing and amount of annual transfers from the General Operating Fund to the Capital Fund in support of capital program needs. During the initial development of the business plan, model scenarios were developed that reflected (1) larger capital improvement programs, (2) issuance of long-term debt to help fund the capital improvement program, (3) alternative Operating Reserve targets, (4) alternative timing for the funding of the Rate Stabilization Reserve Fund, (5) alternative timing for the addition of new staff, and (6) scenarios that excluded water sales to GSWC. Sensitivity analyses were also performed around factors such as the rebound of water demand following the drought, the timing of capital improvement projects, and level of annual funding for the Membrane Replacement Reserve and the WTP Replacement Reserve.



In April 2015, the business plan analysis was modified to (1) focus on the "No GSWC" scenario selected by the Board of Directors for inclusion in the Public Notice for proposed new/increased water rates, and (2) reflect increased water conservation consistent with the state-mandated 35 percent water use reduction goal for 2015.

RESERVE POLICY RECOMMENDATIONS

Appendix A, at the end of this report, contains suggested reserve policy changes to be considered by the District. The business plan incorporates all of the recommended reserve policies. The recommendations retain some current policies, modify others, and add new reserves. The policy recommendations are intended to help the District mitigate and manage financial risk while meeting service and financial obligations. The suggested reserve policy contained in Appendix A can be summarized as follows.

- ***General Operating Fund Reserves*** – These reserves reside within the General Operating Fund and each make up a part of the overall Operating Fund balance.
    - *Operating Reserve* – The target fiscal year-end Operating Reserve should be increased to 33 percent of annual operating and maintenance expenses, including debt service costs. This reserve should be actively used at staff's discretion during the year to meet working capital needs and manage cash flow. In particular, a portion of this reserve will be needed prior to November 1 of

each year, when a large debt service payment is due. The recommended level for this reserve was developed based on an analysis of monthly cash flow needs.

- *Rate Stabilization Reserve Fund* – The Rate Stabilization Reserve Fund should be maintained and used primarily to meet debt service coverage requirements, consistent with bond contract documents. The Rate Stabilization Reserve Fund should be used with Board approval, when necessary to meet debt service coverage requirements. A secondary purpose of the Rate Stabilization Reserve Fund should be to serve as a drought/emergency reserve. Based on the water shortage financial analysis presented toward the end of this Section, the Rate Stabilization Reserve Fund should be gradually funded up to a level of $3.0 million with funding beginning as soon as financial conditions permit (at the conclusion of drought conditions) with contributions of $250,000 per year. The reserve fund would be available to help mitigate the financial impacts of water shortage and reduced water sales, or other significant events that disrupt normal revenues and cash flows. This reserve should only be used with Board approval.

- ***Capital Fund Reserves*** – Capital Fund reserves reside within the Capital Fund and each make up a part of the overall Capital Fund balance.
  - *Membrane Replacement Reserve* – While not included in the District's current reserve policy, this reserve is currently funded at $200,000 per year to provide funds for the periodic replacement of membrane filters at the water treatment plant. This reserve should continue with the annual funding increasing to $250,000 per year in FY 20-21.
  - *WTP Replacement Reserve* – The WTP Replacement Reserve should be established and accumulate funds for the long-term replacement needs of the water treatment plant equipment and structures. If the District secures an agreement with GSWC, then initial funding should come from a portion of the capacity charge paid by GSWC for treatment capacity. After that time (or no later than FY 20-21 without an agreement with GSWC), the District should begin funding this reserve at a level of $250,000 per year.
  - *Capital Replacement Reserve* – The District should establish and gradually increase annual transfers of a portion of water rate revenue from the General Operating Fund to the Capital Replacement Reserve in support of the ongoing and long-term capital replacement needs of the District. Annual transfers to this reserve will provide consistent funding for the capital program, and will also help to limit and smooth annual water rate increases. The amount to be transferred should gradually increase and exceed $4 million annually by the end of the planning period.

BUSINESS PLAN FINDINGS AND CONCLUSIONS

The preceding portion of this section describes the basic framework, assumptions, analyses, and reserve policy recommendations underlying the business plan. Specific

findings and conclusions pertaining to the District's business plan are presented below, beginning with a description of the current situation.

- Water rates have not been adjusted since January 2012, and are insufficient to meet the District's current and future needs, particularly in light of reduced water sales stemming from the current drought.
- Because of drought-related reduced water sales the District's ability to meet its current financial obligations is at risk. In particular, the District will need to use all or part of the available Rate Stabilization Reserve Fund in FY 14-15 in order to meet debt service coverage requirements. In addition, revenues are inadequate to fund all planned capital improvement project or begin to address the District's OPEB liability.
- The District's debt covenants require the District to establish rates and charges sufficient to make debt service payments and meet other obligations. The District is therefore contractually obligated to increase water rates at this time.
- An immediate 12 percent increase in water rates is warranted and justified at this time, based on existing financial and service obligations.
- While the District is optimistic it will reach an agreement with GSWC to treat and wheel water, that effort has not been completed.
- Temporary drought-related water rate surcharges alone are not sufficient to meet the District's obligations, and should not be implemented at this time, unless conditions change[2].

The ten-year business plan identifies a number of factors that contribute to the need for additional annual water rate increases. These factors include:

- Even with an end to drought following FY 15-16, it will likely take several years for water demands to rebound, and water demands may never reach historic level. Nevertheless, the District must have sufficient revenues to meet its service and financial obligations.
- At present, the District can support less than $1 million per year in capital improvement expenditures. The ten-year capital improvement plan reflected in the business plan totals $28.8 million (in current dollars), for an annual average of $2.88 million. The District will need to gradually ramp up capital program support through the water rates, and annual support (in the form of transfers from the Operating Fund to the Capital Replacement Reserve) will need to increase to more than $4 million annually by the end of the planning period.
- The District has not addressed the long-term funding of its OPEB liability. Delays in addressing this need places increasing financial strain on the District, and will adversely affect water rates in the future, as well as increase financial risk.

[2] The later part of this section describes recommendations for water shortage rate surcharges. While it is recommended that the District adopt water shortage rates, they should not be implemented at this time.

- While negotiations with GWSC are ongoing, there are clear advantages for the District for entering into this agreement. If negotiations are successful, new revenues from GSWC would enable the District to increase depleted General Operating Fund reserves, add to Capital Fund reserves, and/or reduce one or more of the estimated future water rate increases during the annual budget process.
- Continuation of the drought and the potential to further reduce water sales may mean that the District will be unable to fully fund the Rate Stabilization Reserve Fund by the end of the ten-year planning period. The business plan analysis presented in Exhibit II-5 indicated that the reserve fund would reach 50 percent of the target $3.0 million by the end of the planning period.

An increase in water rates is urgently needed in order to maintain financial stability, cover ongoing operating and maintenance costs, meet debt service obligations, provide adequate funding capital projects, and establish prudent financial reserves. Since the District's water rates were last increased general inflation has risen about 8 percent. The District has cut its budget and absorbed cost increases as a result of reduced water sales. It is recommended that the District increase water rates by at least an overall 12 percent effective in July 2015 to meet financial and service obligations. Any lower rate increase could result in the District not meeting one or more financial objectives. In addition, the District should adopt a multi-year rate plan to ensure its ability to meet future financial and service obligations for up to five years.

The business plan model reflects assumptions and estimates that are believed reasonable at the present time. However, conditions change. It is recommended that the District review its financial condition and reaffirm annual rate adjustments as part of the annual budget process, as well as perform a more comprehensive business plan and water rate update study every 3 to 5 years, unless otherwise needed sooner.

WATER SHORTAGE FINANCIAL ANALYSIS

This business plan development also included an analysis of the financial impacts associated with drought and reduced water sales. Coming on the heel of a very dry year in 2013, continued dry conditions in 2014 resulted in the Governor requesting a 20 percent reduction in water use throughout California and the SWRCB adopting an emergency regulation requiring all urban water suppliers to enforce programs that reduce outdoor water usage. With the drought continuing in 2015, in April 2015 the Governor issued an Executive Order requiring a 25 percent reduction in water use in urban areas statewide. In implementing the Order, the SWRCB has proposed requirements for the District to reduce water use by 35 percent, relative to 2013 water use. The District, like other communities in the state and region, are reacting by asking customers to further reduce water usage and implementing additional restrictions on water use.

The District has defined water shortage conditions as shown below. Each condition also includes various restrictions on water usage; those restrictions increase in severity with the increased severity of the water shortage.

Normal condition	No water use restrictions
Water alert	Water use reduction goal of 1% to 20%

Water warning	Water use reduction goal of 21% to 30%
Water crisis	Water use reduction goal of 31% to 40%
Water emergency	Water use reduction goal of 41% to 50%

The District's finances can be affected in several ways by drought conditions. Changes in operating and maintenance costs and revenues can include:

- Reduced water sales and water sales revenue
- Reduced pumping and other water production and treatment costs
- The need to purchase water and incur water purchase costs
- Increased water conservation program costs.

While the reduction in water sales revenue will be partially offset by reduced production and treatment costs, revenue will decline more than costs creating a financial deficit. Increased water conservation program costs, and the potential need to purchase water, add to the financial deficit created by water shortage.

In response to water shortage, and the financial deficit created, the District has the ability to take several actions. The analysis presented herein focuses on three potential courses of action, including:

- Using money available in the Rate Stabilization Reserve Fund
- Supplementing water rate revenues through imposition of water shortage rate surcharges when certain conditions exist
- In the more severe conditions of shortage, reducing the annual transfer from the General Operating Fund to the Capital Fund to preserve cash for operations.

The District could and should also reduce operating and maintenance costs, where possible, defer capital projects, or seek outside funding (e.g., state water conservation grants) to help bridge a financial deficit.

Using the business plan model, an analysis of the potential financial impacts of water shortages has been developed. The analysis includes estimating the magnitude of reduced revenue, reduced costs, and increased costs that may be associated with various water shortage conditions. The top portion of **Exhibit II-8** summarizes how estimated FY 14-15 operating revenues and expenses under *normalized* water supply conditions and under various water shortage conditions, as defined in the District's Water Shortage Contingency Plan would be affected.

The shortage analysis starts with normal conditions whereby revenues and expenses are effectively in balance (normalized). Under water shortage conditions, a financial deficit is likely to emerge and increase with increasing severity of drought conditions. In a Water Emergency an annual financial deficit of about $3.5 million could emerge.

To bridge the financial deficit created by water shortage conditions a three-pronged financial strategy is recommended. This strategy includes:

- Using a portion of money available in the Rate Stabilization Reserve Fund in all water shortage conditions
- Implementing Water Shortage Surcharges to supplement water rate revenue when the Board of Directors declares conditions requiring mandatory water conservation
- Reducing the annual transfer from the General Operating Fund to the Capital Replacement Reserve in order to preserve operating cash, in the most severe water shortage conditions.

Exhibit II-8
Carmichael Water District
Estimated Financial Impact Created by Water Shortages (FY 14-15)

	Normal Supply (1)	Water Alert	Water Warning	Water Crisis	Water Emergency
Use Reduction Goals -->	None	1% to 20%	21% to 30%	31% to 40%	41% to 50%
Est. Financial Impact from Water Shortage					
Reduced Water Sales Revenue		$ (919,000)	$ (1,379,000)	$ (1,839,000)	$ (2,298,000)
Reduced Power and Chemical Costs		$ 149,000	$ 224,000	$ 298,000	$ 373,000
Increased Water Conservation Costs		$ (35,000)	$ (85,000)	$ (135,000)	$ (185,000)
Increased Water Purchase Costs		$ -	$ (1,400,000)	$ (1,400,000)	$ (1,400,000)
Est. Total Financial Deficit	$ -	$ (805,000)	$ (2,640,000)	$ (3,076,000)	$ (3,510,000)
Multi-Pronged Corrective Strategy					
Use of Rate Stab. Reserve Fund (2)		$ 805,000	$ 1,175,000	$ 1,223,000	$ 1,361,000
Reduce Capital Program Transfer (3)		$ -	$ 500,000	$ 750,000	$ 1,000,000
Impose Water Shortage Surcharges (4)		$ -	$ 965,000	$ 1,103,000	$ 1,149,000
Total Corrective Actions	**$ -**	**$ 805,000**	**$ 2,640,000**	**$ 3,076,000**	**$ 3,510,000**
Water Shortage Charge -->			30%	40%	50%

Notes:
(1) The FY 14-15 budget and related revenue and expense estimates were adjusted to reflect a normal water supply year.
(2) Amounts shown are the reduction in Rate Stabilization Reserve Fund due to water shortage.
(3) The reduced transfer to the Capital Replacement Reserve not likely have a direct impact on capital project funding.
(4) Water shortage charges would apply only to the water usage rate (not fixed service charges), and would represent approximately 10.3%, 12.2%, and 13.3% of total annual water rate revenue in Stages 2, 3, and 4, respectively.

The bottom portion of Exhibit II-8 shows how each of these actions would contribute to bridging the financial deficit under various water shortage conditions.

Exhibit II-9 provides further details on the estimates for revenues and expenses during various water shortage conditions. These estimates are illustrative of the expected magnitude of changes, and are not intended to be precise. Exhibit II-9 also illustrates both water shortage surcharges and reductions in capital program transfers would reduce the financial deficit. The Rate Stabilization Reserve Fund would cover the remaining deficit, shown at the bottom of Exhibit II-9. **Exhibit II-10** graphically illustrates how the three pronged water shortage financial strategy would bridge the deficit gap created by reduced water sales during shortages conditions.

To effectuate this proposed water shortage financial strategy, it is recommended that the District significantly increase money available in the Rate Stabilization Reserve Fund. The business plan model presented in Exhibit II-5, which reflects the "No GSWC" scenario and 35 percent mandatory water use reduction, shows this reserve being funded initially at $250,000 per year, beginning in FY 19-20, and reaching $1.5 million (one-half of the target

level of $3.0 million) by the end of FY 24-25. The second element of the three-prong strategy is the water shortage surcharge. The rationale and justification for rate surcharges,

Exhibit II-9
Carmichael Water District
Estimated Financial Impact of Water Shortage with Mitigation Responses (FY 14-15)

	Normal Supply (1)	Water Alert	Water Warning	Water Crisis	Water Emergency
Use Reduction Goals -->	None	1% to 20%	21% to 30%	31% to 40%	41% to 50%
Revenues					
Service Charge Revenue	$ 5,172,000	$ 5,172,000	$ 5,172,000	$ 5,172,000	$ 5,172,000
Water Usage Charge Revenue (2)	$ 4,596,000	$ 3,677,000	$ 3,217,000	$ 2,757,000	$ 2,298,000
Water Shortage Surcharge Rev. (3)			$ 965,000	$ 1,103,000	$ 1,149,000
Other Operating Revenue	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ 65,000
Interest Earnings	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Total Revenues	$ 9,838,000	$ 8,919,000	$ 9,424,000	$ 9,102,000	$ 8,689,000
(% of normal)		91%	96%	93%	88%
Expenditures and Transfers					
Administrative Services	$ 2,257,000	$ 2,257,000	$ 2,257,000	$ 2,257,000	$ 2,257,000
Outreach & Water Conservation (4)	$ 65,000	$ 100,000	$ 150,000	$ 200,000	$ 250,000
Financial Services	$ 720,000	$ 720,000	$ 720,000	$ 720,000	$ 720,000
Production	$ 1,059,000	$ 1,059,000	$ 1,059,000	$ 1,059,000	$ 1,059,000
Power and Chemical Costs (5)	$ 994,000	$ 845,000	$ 770,000	$ 696,000	$ 621,000
Curtailment Water Purchases (6)	$ -	$ -	$ 1,400,000	$ 1,400,000	$ 1,400,000
Distribution	$ 1,215,000	$ 1,215,000	$ 1,215,000	$ 1,215,000	$ 1,215,000
Debt Service 2010 COPs	$ 2,191,000	$ 2,191,000	$ 2,191,000	$ 2,191,000	$ 2,191,000
Transfers to Capital Fund					
Capital Replac. Reserve (7)	$ 1,000,000	$ 1,000,000	$ 500,000	$ 250,000	$ -
Membrane Replac. Reserve	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
Planned Oper. Reserve Contrib. (8)	$ 137,000	$ 137,000	$ 137,000	$ 137,000	$ 137,000
Total Uses of Funds	$ 9,838,000	$ 9,724,000	$ 10,599,000	$ 10,325,000	$ 10,050,000
(% of normal)		99%	108%	105%	102%
Surplus/(Deficit) Due to Shortage	**$ -**	**$ (805,000)**	**$ (1,175,000)**	**$ (1,223,000)**	**$ (1,361,000)**

Notes:
(1) The FY 14-15 budget and related revenue and expense estimates were adjusted to reflect a normal water supply year.
(2) Water usage charge revenue will decline in proportion to water sales volume.
(3) Water shortage surcharges would be imposed in Stages 2, 3, and 4 to limit the financial impact of shortage.
(4) Water conservation program costs would increase with increased severity of drought conditions.
(5) Decreases in proportion with the reduction in water sales.
(6) Assumes 3,500 AF of supplemental water purchased at $400 per AF.
(7) Transfers to the Capital Replacement Reserve would be reduced in Stages 3 and 4. This would likely not have a direct impact on capital program activity.
(8) Plug figure to illustrate balanced revenue and expenses under normal supply condition.

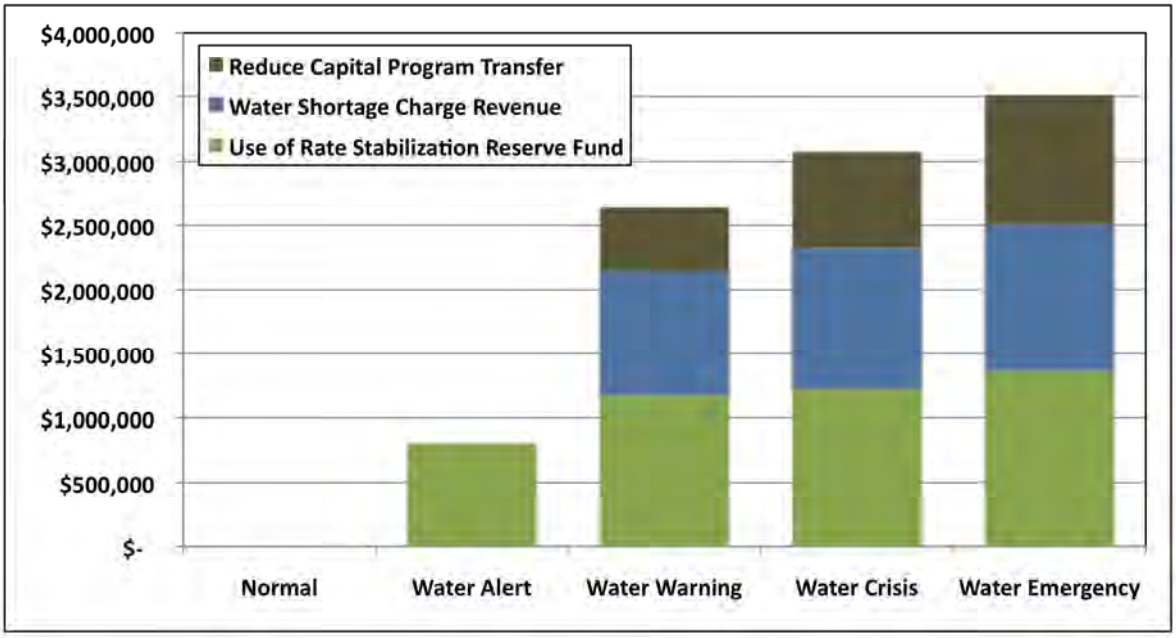
and recommendations for adopting these rate surcharges is described below.

WATER SHORTAGE SURCHARGES

Section III of this report describes a recommended water rate structure to become effective in July 2015. This section presents recommendations for water shortage surcharges, which would be overlaid on top of the then-existing water usage rates in effect at the time that a future water shortage is declared by the District. Because of current financial condition, the need to permanently increase revenues to meet service and financial obligations, and the very limited availability of a Rate Stabilization Reserve Fund at this time, a permanent water rate increase is needed in FY 15-16. It is recommended, however, that the District *adopt* the proposed surcharges (as has been included in the Public Notice regarding new/increased water rates), so they will be available for

implementation when needed in the future. As of March 2015, the Board of Directors does not plan to *implement* the water shortage rate surcharges in 2015.

Exhibit II-10
Carmichael Water District
Bridging the Deficit Gap With Reserves and New Revenues



The proposed water shortage surcharges would affect the water usage rates, but not the District's fixed bimonthly service charges. The surcharges have been designed to help encourage water conservation and to help close the financial deficit created by a water shortage, as previously described. The surcharges are a tool the District would use to reduce the severe financial impacts associated with reduced water sales and would generate revenue to help cover operating costs. The water shortage surcharge would be an increments increase in the normal water usage rates. Even though the water shortage surcharges represent a temporary increase in the water rates, total water rate revenue would still decline with reduced water sales relative to normal conditions. The multi-pronged approach suggested for addressing the financial deficit includes relying on the Rate Stabilization Reserve Fund to help bridge the financial deficit. This planned use of reserves enabled surcharge design such that customers achieving required water use reduction goals would have lower water bills than they would have with normal water rates and normal water usage. Customers that do not meet water use reduction goals may see higher water bills.

Under the proposed strategy, water shortage surcharges would be needed under Water Warning, Water Crisis, or Water Emergency conditions. **Exhibit II-11** presents the proposed normal water rate usage rate schedule proposed for FY 15-16, with the water shortage surcharges laid over the normal rates in each of these conditions. As an example, the proposed normal two-tier residential rate structure includes a Tier 1 water rate of $1.19 per CCF (for the first 12 CCF of bimonthly water use) and a Tier 2 water rate of $1.47 per

CCF (for usage in excess of 12 CCF). When a Water Warning exists, a water shortage surcharge equal to 30 percent of the normal water usage rates would bring the two-tier rates to $1.55 per CCF and $1.91 per CCF, respectively.

Exhibit II-11
Carmichael Water District
Water Shortage Surcharge Rate Structure

	Normal Supply	Water Alert	Water Warning	Water Crisis	Water Emergency
Use Reduction Goals -->	None	1% to 20%	21% to 30%	31% to 40%	41% to 50%
Water Shortage Surcharge (1)	**None**	**None**	**30%**	**40%**	**50%**
Water Usage Rates, with Surcharge Applied (2)					
Single Family Customers					
Tier 1 (0 to 12 CCF/2-mo.)	$ 1.19	$ 1.19	$ 1.55	$ 1.67	$ 1.79
Tier 2 (> 12 CCF/2-mo.)	$ 1.47	$ 1.47	$ 1.91	$ 2.06	$ 2.21
Condominimums, Multi-Family and Non-Resid. Customers (3)					
All Water Usage	$ 1.40	$ 1.40	$ 1.82	$ 1.96	$ 2.10
Bimonthly Service Charges (4)					
All Meter Sizes	Varies	No Change to Service Charges			

Notes:
(1) Water shortage surcharges are incremental increases in normal water usage rates applied during Water Warning, Water Crisis, and Water Emergency conditions declared by the Board of Directors.
(2) This section shows water shortage surcharges applied to proposed FY 15-16 water rates, for illustrative purposes. The percentages shown would be applied to any then-current water rates in future years.
(3) Multi-family includes duplexes, triplexes, fourplexes, and apartment complexes. Non-residential includes commercial, parks, schools, and dedicated irrigation service connections.
(4) No changes to the fixed bimonthly service charges are proposed during water shortages.

Because the water shortage surcharges would apply to only the water usage rates, and not to the fixed bimonthly service charges, the water shortage surcharges would result in rate revenue increases of about 10.3 percent, 12.2 percent, and 13.3 percent water rate revenue increases under Water Warning, Water Crisis, and Water Emergency conditions, respectively. These are relatively modest revenue increases for dealing with significant water supply shortages. **Exhibit II-12** graphically illustrates how water shortage surcharge revenue would affect overall water rate revenue during each shortage condition.

Water shortage surcharges have been specifically designed such that customers achieving required water use reduction goals will have lower water bills than they would have with normal water rates and normal water usage. Customers that do not meet water use reduction goals may have higher water bills. Because the water shortage surcharges apply to all water usage, all customers will participate in bridging the financial gap created by water shortage. Of course, those customers that use the least amount of water or conserve the most will pay less through the water shortage surcharges. In other words, the amount of the surcharge on each water bill will be proportionate to a customer's water usage. Because the water shortage surcharges do not affect the fixed bimonthly service charges, the impact of the water shortage surcharges on the total water bill is mitigated, particularly at the low end of the water use spectrum.

Exhibit II-12
Carmichael Water District
Water Rate Revenues During Water Shortage Conditions

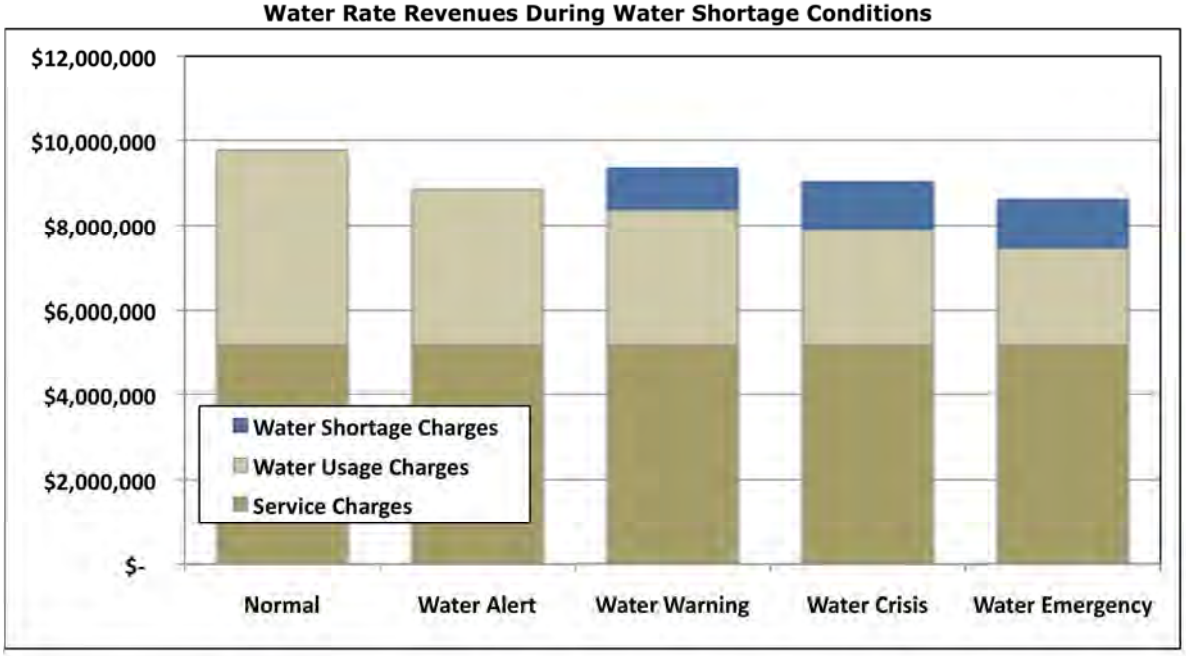


Exhibit II-13 illustrates how three different single family customers would be affected by the water shortage surcharges across various shortage conditions. Bimonthly water bills are shown for customers that, under normal conditions, use 35 CCF (median), 20 CCF (typical in winter), and 80 CCF (typical in summer) of water in two-month billing cycles. Water bills are calculated for customers meeting requested water use reduction goals, and customers that do not conserve at all.

The District recognizes that some customers, under normal conditions, use very little water and have already implemented conservation measures and practices. The District appreciates these efforts. The water shortage rate structure is not intended to penalize low-water-using customers. As an example, a single family customer using only 12 CCF bimonthly (about 150 gpd) in a Water Emergency would have a bimonthly water bill of $88.81 of which $7.14 is from the water shortage surcharge. This additional amount is not intended to be punitive, but represents a proportionate share of the extra costs of providing water service under severe water shortage conditions.

Exhbit II-13
Carmichael Water District
Sample Single Family Residential Water Bills with Water Shortage Surcharges in FY 15-16

Water Shortage Stage	Water Use Reduction Goal	Bimonthly Water Use (CCF)	Service Charge	Usage Charge	Water Shortage Charge	Total Water Bill	% Change from Normal Bill
Median Single Family Customer Meeting Reduction Goals							
Normal Supply	None	35	$ 67.39	$ 48.09	$ -	$ 115.48	
Water Alert	1% to 20%	28	$ 67.39	$ 37.80	$ -	$ 105.19	-8.9%
Water Warning	21% to 30%	25	$ 67.39	$ 32.66	$ 9.80	$ 109.84	-4.9%
Water Crisis	31% to 40%	21	$ 67.39	$ 27.51	$ 11.00	$ 105.90	-8.3%
Water Emergency	41% to 50%	18	$ 67.39	$ 22.37	$ 11.18	$ 100.94	-12.6%
Median Single Family Customer With No Water Use Reduction							
Normal Supply	None	35	$ 67.39	$ 48.09	$ -	$ 115.48	
Water Alert	1% to 20%	35	$ 67.39	$ 48.09	$ -	$ 115.48	0.0%
Water Warning	21% to 30%	35	$ 67.39	$ 48.09	$ 14.43	$ 129.91	12.5%
Water Crisis	31% to 40%	35	$ 67.39	$ 48.09	$ 19.24	$ 134.72	16.7%
Water Emergency	41% to 50%	35	$ 67.39	$ 48.09	$ 24.05	$ 139.53	20.8%
Low Water-Using Single Family Customer Meeting Reduction Goals							
Normal Supply	None	20	$ 67.39	$ 26.04	$ -	$ 93.43	
Water Alert	1% to 20%	16	$ 67.39	$ 20.16	$ -	$ 87.55	-6.3%
Water Warning	21% to 30%	14	$ 67.39	$ 17.22	$ 5.17	$ 89.78	-3.9%
Water Crisis	31% to 40%	12	$ 67.39	$ 14.28	$ 5.71	$ 87.38	-6.5%
Water Emergency	41% to 50%	10	$ 67.39	$ 11.90	$ 5.95	$ 85.24	-8.8%
Low Water-Using Single Family Customer With No Water Use Reduction							
Normal Supply	None	20	$ 67.39	$ 26.04	$ -	$ 93.43	
Water Alert	1% to 20%	20	$ 67.39	$ 26.04	$ -	$ 93.43	0.0%
Water Warning	21% to 30%	20	$ 67.39	$ 26.04	$ 7.81	$ 101.24	8.4%
Water Crisis	31% to 40%	20	$ 67.39	$ 26.04	$ 10.42	$ 103.85	11.1%
Water Emergency	41% to 50%	20	$ 67.39	$ 26.04	$ 13.02	$ 106.45	13.9%
High Water-Using Single Family Customer Meeting Reduction Goals							
Normal Supply	None	80	$ 67.39	$ 114.24	$ -	$ 181.63	
Water Alert	1% to 20%	64	$ 67.39	$ 90.72	$ -	$ 158.11	-12.9%
Water Warning	21% to 30%	56	$ 67.39	$ 78.96	$ 23.69	$ 170.04	-6.4%
Water Crisis	31% to 40%	48	$ 67.39	$ 67.20	$ 26.88	$ 161.47	-11.1%
Water Emergency	41% to 50%	40	$ 67.39	$ 55.44	$ 27.72	$ 150.55	-17.1%
High Water-Using Single Family Customer With No Water Use Reduction							
Normal Supply	None	80	$ 67.39	$ 114.24	$ -	$ 181.63	
Water Alert	1% to 20%	80	$ 67.39	$ 114.24	$ -	$ 181.63	0.0%
Water Warning	21% to 30%	80	$ 67.39	$ 114.24	$ 34.27	$ 215.90	18.9%
Water Crisis	31% to 40%	80	$ 67.39	$ 114.24	$ 45.70	$ 227.33	25.2%
Water Emergency	41% to 50%	80	$ 67.39	$ 114.24	$ 57.12	$ 238.75	31.4%

SECTION III. WATER RATE STUDY

The Water Rate Study provides the cost of service analysis and design of water rates intended to meet the District's service and financial obligations for FY 15-16 and beyond. The study was conducted with the assistance of a Water Rate Structure Committee (WRSC). This section of the report presents information, deliberations, and analyses leading to the development of water rate structure recommendations for FY 15-16. Proposed water rates are intended to meet the District's financial needs, satisfy legal requirements, improve equity across all customers and customer classes, and achieve other rate-setting objectives. The water rate study and related recommendations addressed each of the following:

- Identification of water rate-setting objectives
- Evaluation of customer account and water usage data
- A cost of service analysis used to allocate costs to each customer and customer class in proportion with service demands
- Design of a water rate structure to meet revenue needs, satisfy legal requirements, and achieve rate-setting objectives in a fair and reasonable manner.

WATER RATE STRUCTURE COMMITTEE

To assist in the development of the water rate study, the District's Board of Directors formed a WRSC comprised of five community members and two Board members. The committee met on four separate occasions over a three-month period. The District's rate consultant facilitated all meetings and performed all technical analyses of the rate study. The following ***mission statement*** guided the WRSC:

> "The mission of the WRSC is to provide input and guidance on the development of water rate structures to achieve fairness and equity across the District's customer base within the constraints of legal requirements and the District's revenue needs."

The rate setting process was further guided by three primary considerations:

1. *Legal Requirements* – Based on the California Constitution and relevant case law that water rates not exceed the cost of providing service, and that rates reflect a proportionate share of costs attributable to each parcel.
2. *Conservation Requirements* – Based on required Urban Water Management Plan (UWMP) demand management measures, as well as the water conservation Best Management Practice for rate setting, as required by the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding.
3. *Rate Setting Objectives* – As developed with the WRSC and used to guide the selection and development of a water rate structure appropriate for the District.

During its four meetings, the WRSC was presented information and guided through the rate setting process. Committee members asked questions, suggested additional

analyses, and helped formulate the recommendations presented herein. The four meetings of the WRSC generally covered the following topics and issues:

Meeting #1

- Introductions and organization
- Background and context of study
- Overview of rate-setting process
- Current water rates
- Rate-setting objectives

Meeting #2

- Business plan preliminary recommendations
- Potential revenue requirements for rate calculations
- Rate-setting objectives
- Customer account and water usage data
- Rate structure options

Meeting #3

- Customer account and water usage data
- Cost of service analysis
- Preliminary rate structure calculations
- Water shortage financial analysis and rate strategy

Meeting #4

- Revised water rate calculations
- Bill impacts and rate structure sensitivity analysis
- Discussion of draft water rate study report
- Proposition 218 and rate adoption requirements

RATE SETTING OBJECTIVES

Water rate-setting objectives were identified through discussions with the WRSC and used to help guide the rate-setting process. In some respects, rate-setting objectives individually can lead to rate decisions that conflict with one another (e.g., encourage water conservation vs. provide stable revenues), and part of the task of designing water rates is to strike a balance between conflicting objectives.

Rate-setting objectives identified through committee deliberations included the following:

- Water rates should generate sufficient revenues to meet the District's service and financial obligations including covering operating and maintenance costs, meeting debt service obligations, and rehabilitating and upgrading the water system
- Water rates should meet legal requirements to:
  - Not exceed the cost of service
  - Proportionately allocate costs to customers
- Water rates should encourage water conservation and discourage waste

- Water rates should strike an appropriate balance between fixed and usage-based charges, with consideration of
  - Revenue stability
  - Conservation incentive
  - Affordability for basic usage
  - Customer bill impacts of rate structure changes
- Water rate should be simple, understandable, and easy to administer.

CURRENT WATER RATES

The District's current water rates were last adjusted in January 2012 and are summarized in **Exhibit III-1**. Current water rates include a bimonthly service charge for all metered service connections with a uniform water rate applicable to all metered water usage. Only a few unmetered flat rate accounts remain, and they will be transitioned to metered rates after main replacement projects are completed. Additionally, bimonthly fire service charges apply to dedicated private fire service connections (related to fire suppression requirements).

The bimonthly service charges vary by customer class. Single family residential accounts, as well as condominiums and multi-family accounts with up to 6 dwelling units, pay a service charge based on number of dwelling units, with an adjustment for meter size. Large apartment complexes (more than six dwelling units), as well as commercial, park, school, and dedicated irrigation services each pay a service charge for each connection by customer class, with an adjustment for meter size. This structure creates some very different rates for customers that may have the same meter size and usage characteristics.

Under normal demand patterns, about 54 percent of water rate revenue is generated from fixed service charges and about 46 percent from water usage charges. However, due to reductions in water demand stemming from drought conditions about 60 percent of current water rate revenue is from fixed service charges and about 40 percent from water usage charges.

The current uniform water usage rate is intended to discourage excessive water use and encourage customers to conserve water. The water conservation best management practice (BMP 1.4) promulgated by the California Urban Water Conservation Council (CUWCC) suggests that at least 70 percent of water rate revenue should come from water usage charges. However, that standard often places water utilities at undue financial risk, as most water system costs are fixed. This is indeed the case with the District, as about 88 percent of the District's costs are fixed costs, and not directly influenced by changes in water demand. The WRSC discussed and understood, however, that a portion of fixed costs can be recovered through usage charges. The crux of the challenge for the District is to strike the right balance between revenue stability and water conservation, while meeting requirements for apportioning costs in a reasonable and sound manner.

Exhibit III-1
Carmichael Water District
Current Water Rates -- Effective Jan. 1, 2012 to Dec. 31, 2015 (1)

Bimonthly Metered Water Rates		
Bimonthly Service Charges		
Residential (per connection)	$	62.32
Multi-Family (per unit)	$	51.05
Condominium (per unit)	$	30.88
Apartment (per connection)	$	292.26
Commercial (per connection)	$	130.50
Park (per connection - 4" & above)	$	1,097.20
School (per connection - 4" & above)	$	894.46
Irrigation (per connection)	$	160.58
Bimonthly Adjustment - Due to Size		
3/4" meter	$	(2.28)
1" meter	$	-
1 1/2" meter	$	8.68
2" meter	$	17.47
3" meter	$	32.63
4" meter	$	48.55
6" meter	$	68.44
8" meter	$	124.11
Commodity Rate (Per CCF)		
CCF = 100 cubic feet = 748 gallons	$	1.13
Bimonthly Transitional Flat Rates (2)		
Single Family 1", <0.5 acre (SF11)	$	124.02
Single Family 1 1/2", <1.0 acre (SF52)	$	222.26
Bimonthly Fire Service Charges		
Per 1-Inch of Diameter	$	28.79

Notes:
(1) Approved on January 23, 2012.
(2) Flat rates will be phased out once all customers are transitioned to metered rates.

CUSTOMER ACCOUNT DATA AND WATER USE ESTIMATES

The District provides water service to about 11,668 customer accounts through about 11,538 water service connections[3], including nearly 9,800 single family residences, about 1,250 condominium and multi-family connections, and about 500 non-residential service connections[4].

[3] The terms customer and water service connection have slightly different meanings. For example, a customer can have more than one service connection. Also, in the case of a few condominium complexes, a single meter may serve multiple customer accounts.

[4] Under proposed definitions multi-family includes duplexes, triplexes, fourplexes, and larger apartment complexes, and non-residential includes commercial, parks, schools, and dedicated irrigation service connections.

Exhibit III-2 summarizes customer account and water usage data used in water rate calculations for FY 15-16. Account information is based on the utility billing data as of December 2014, with adjustments for estimated growth to FY 15-16[5]. Annual water use estimates are based on actual FY 12-13 water usage, adjusted for estimated use in FY 15-16. FY 13-14 water usage data was not used due to the significant demand shifts that have occurred as a result of the drought. The WRSC discussed at length whether and how quickly demand might return to previous levels, when the drought ends. Maintaining financial stability for the District is necessary regardless of future water demand.

Exhibit III-2
Carmichael Water District
Summary of Metered Water Service Connections and Water Usage

	No. of Connections by Meter Size (1)								Total	Ann. Wtr.
Customer Class	**3/4"**	**1"**	**1 1/2"**	**2"**	**3"**	**4"**	**6"**	**8"**	**Accounts**	**Use (CCF) (2)**
No. of Accounts										
Single Family	185	9,424	127	37					9,773	2,140,000
Condominiums (3)	10	265	31				2		308	28,000
Multi-Family (4)	19	651	81	117	7	53	11	4	943	528,000
Non-Residential (5)	7	294	79	95	7	21	10	1	514	388,000
Total Accounts	221	10,634	318	249	14	74	23	5	**11,538**	**3,084,000**
Hydr. Capac. Factor	0.6	1.0	2.0	3.2	6.0	10.0	20.0	32.0		
No. of 1" Equiv. (6)	451	10,283	636	797	84	740	460	160	**13,611**	

Notes:
(1) Based on customer account data as of December 2014 adjusted for estimated customer growth in FY 15-16, for rate calculation purposes.
(2) Based on FY 12-13 usage data adjusted to reflect estimated usage in FY 15-16, for rate calculation purposes.
(3) Includes 455 condominium living units. Four complexes have consolidated billing arrangements due to meters serving multiple dwellings.
(4) Includes 105 individually metered multi-family living units.
(5) Non-residential includes commercial, schools, parks, and dedicated irrigation services.
(6) Condominium living units and multi-family living units with separate meters are considered 0.6 equivalent 1" meters, all other accounts based on meter size.

Water rate calculations are based on a number of factors related to the District's customer base. Factors include the number of customers, customer classes, meter size, and actual water usage. The District provides water service through 11,538 water service connections (customer accounts). Single family customers comprise about 85 percent of the customer accounts and about 71 percent of annual water usage. Multi-family customer accounts make up about 11 percent of the customer accounts and 17 percent of annual water usage. Non-residential customer accounts make up about 4 percent of the customers and 12 percent of annual water usage.

[5] Water rate calculations were performed prior to the Governor's Executive Order that resulted in an increased water use reduction requirement for the District. Estimated water use for FY 15-16, with increased water use restrictions, is now 2,810,000 CCF. This changes does not invalidate the water rate calculations, however, the proposed water rates for July 2015 will now likely generate less revenue than reflected in the rate calculation presented in this section.

While there are extremes on both the low and high ends, average bimonthly single family water usage is about 49 CCF (about 600 gallons per day). Single family customers also exhibit a wide variation in water usage throughout the year. Bimonthly winter water usage for single family homes averages about 19 CCF (about 233 gpd). Bimonthly summer usage varies dramatically depending on landscape irrigation and other factors, and averages about 85 CCF (1,042 gpd). Water usage for condominium units and multi-family dwellings is lower than for single family residences for a variety of reasons including fewer people per household and limited landscape irrigation (or irrigation that is separately metered). Non-residential water usage can vary dramatically, and non-residential customers are served by meters of varying sizes to accommodate the differences in water demands.

Service connections with different meter sizes can place different demands on the water system. For example, much more water can be delivered through a 4" water meter than through a 1" meter. To relate the potential demands on the water system from customers with different sized water meters, the WRSC recommends that hydraulic capacity factors be used to determine the number of equivalent meters represented by the total customer base with variable meter sizes. **Exhibit III-3** presents the rated flow capacity of various meter sizes and how these are used to develop hydraulic capacity factors. For purposes of rate analysis, a 1" meter is assigned a hydraulic capacity factor of 1.0. The ratios of rated flow capacities of the various meter sizes to the capacity of a 1" meter are used to determine the capacity factors for other meter sizes. This capacity relationship across meter sizes is used to allocate capacity-related fixed costs to various customers. This is also a common rate-setting practice used in the water industry.

The WRSC had considerable discussion about the hydraulic capacity factors (and underlying instantaneous flow rates) and the relationship with bimonthly and total water demands across customer classes and meter sizes. Actual water use data from single family, multi-family, and non-residential customer classes (as well as data aggregated across customer classes) were analyzed across meter sizes, and the relative use relationships were compared with the hydraulic capacity factors. While actual averages varied, in the end it was determined and agreed that hydraulic capacity factors would provide objectivity and stability in the allocation of capacity costs.

Exhibit III-3
Carmichael Water District
Hydraulic Capacity Factors for Various Meter Sizes

Meter Size	Rated Flow Capacity (gpm) (1)	Hydraulic Capacity Factor
3/4"	30	0.6
1"	50	1.0
1 1/2"	100	2.0
2"	160	3.2
3"	300	6.0
4"	500	10.0
6"	1,000	20.0
8"	1,600	32.0

Notes:
(1) AWWA Manual M6 - Water Meters, 3rd Edition, 1986.

WATER RATE CALCULATIONS

There are three steps to determining water rates. These are:

- Determine annual water rate revenue requirements
- Analyze the cost of providing service and proportionately allocate costs to each customer class and customer
- Design water rates to recover costs from each customer class and customer.

Water Rate Revenue Requirements

The ten-year business plan was used to identify the water rate revenue required to meet financial obligations for each fiscal year of the planning period. The water rate calculations presented herein are based on the revenue to be generated in FY 15-16, and reflects the proposed 12 percent overall rate increase based on a potential rate plan to be incorporated in the District's business plan. The annual water rate revenue requirement with this rate adjustment is $9,701,000, based on the estimated water usage used prior to the recent Governor's Executive Order to further reduce water use.

Cost of Service Analysis

Once the annual water rate revenue requirement was determined using the business plan model, the next step in the rate-setting process was to evaluate the cost of providing service. Water rate calculations contained herein are intended to generate water rate revenue equal to the revenue requirement from the District's water service customers. The manner in which each customer is responsible for the water utility's costs is the determining factor in the cost of service analysis.

The District incurs certain types of costs associated with making water service available to customers. Other costs are incurred directly or partially as a result of customer water

usage. A cost of service analysis is intended to allocate the costs of providing water service to customers in proportion to the extent to which each customer contributes to the District's incursion of costs. There are many approaches to cost of service analysis; some are more complex than others. The approach developed with the WRSC and used herein is commensurate with the available data, the distinctions made between various types of customers, and the requirement to fairly and reasonably reflect differences in service provisions to differently situated customers.

The cost allocation methodology used herein begins by assigning all costs to one of three categories. The cost allocation process is performed with data available in the District's detailed budget and other documents. The three categories include:

- Customer costs, such as meter reading and billing, are fixed costs that tend to vary as a function of the number of customers being served. Customer costs are allocated to customers based on the number of accounts. That is, every customer will pay an equal share of customer-related costs.
- Capacity costs are also fixed costs; however, these tend to vary in relation to the capacity of the water system and the ability to serve the demands of active customers. Customers that place greater or lesser burdens on the capacity of the water system should bear greater or lesser shares of these costs. The sizing of the water system is based on the potential demand that each customer could place on the water system. Capacity costs are allocated to customers based on the hydraulic capacity of the water meter. The hydraulic capacity reflects the potential demand that a customer could place on the water system at any given time, and is a general indicator of total system demands. A customer with a large meter size will be assigned a large share of fixed capacity-related costs than one with a smaller meter. Capacity costs include costs associated with the water system's capacity including contributions to the capital program, debt service, maintenance, and certain fixed operating costs.
- Commodity costs are variable costs that vary entirely or substantially in response to the amount of actual water use, or are reasonable allocated on the basis of water use. Water treatment costs and energy costs are two typical examples. However, in an effort to encourage water conservation, some fixed costs are frequently included in commodity components such that a larger portion of cost is recovered on the basis of usage. Even though some commodity costs are fixed, rather than variable, it is reasonable to allocate these costs to customers on the basis of usage, rather than the capacity relationship expressed by meter size and hydraulic capacity. A significant portion of the water utility's fixed costs is currently recovered through water usage charges. Proposed water rates continue this practice to a similar degree.

Exhibit III-4 illustrates how the FY 15-16 revenue requirement of $9,701,000 is comprised of various functional categories of operating and maintenance costs, debt service obligations, and the capital program transfers with offsetting revenues and the application of available reserves. It also illustrates how the functional cost categories that make up the revenue requirement are each assigned to one or more of the three cost components, previously described.

The costs within each of the functional categories were derived from the line-item detailed draft budget for FY 15-16, as prepared by staff. Once functional cost categories are allocated to the components the total for each component is divided by the number of units to arrive at a total unit costs for each component. The units of demand include the number of customer accounts (service connections), number of 1" equivalent meters, and annual water sales for the customer, capacity, and commodity components, respectively.

In meetings with the WRSC, several variations of the allocation of costs between customer, capacity, and commodity components were considered. Allocations to the customer component ranged from 4 percent to 12 percent of the revenue requirement, allocations to the capacity component ranged from 35 percent to 61 percent of the revenue requirement, and allocations to the commodity component ranged from 37 percent to 53 percent of the revenue requirement.

Exhibit III-4
Carmichael Water District
FY 15-16 Unit Costs of Service

	Total Water Rate Rev. Rqmt.	Customer Costs	Capacity Costs	Commodity Costs
Units of Service -->		**11,538** Accounts	**13,611** 1" Eq. Mtrs.	**3,084,000** CCF
Administrative Services				
Total	$ 1,774,625	$ -	$ 1,774,625	$ -
Unit Cost		$ -	$ 130.38	$ -
Board Expenses				
Total	$ 258,800	$ 258,800	$ -	$ -
Unit Cost		$ 22.43	$ -	$ -
Water Conserv./Outreach				
Total	$ 152,800	$ -	$ -	$ 152,800
Unit Cost		$ -	$ -	$ 0.05
Financial Services				
Total	$ 388,885	$ -	$ 388,885	$ -
Unit Cost		$ -	$ 28.57	$ -
Billing/Cust. Service				
Total	$ 374,500	$ 374,500	$ -	$ -
Unit Cost		$ 32.46	$ -	$ -
Production				
Total	$ 897,109	$ -	$ -	$ 897,109
Unit Cost		$ -	$ -	$ 0.29
Water Purchases				
Total	$ 499,970	$ -	$ -	$ 499,970
Unit Cost		$ -	$ -	$ 0.16
Power/Chemicals				
Total	$ 961,500	$ -	$ -	$ 961,500
Unit Cost		$ -	$ -	$ 0.31
Distribution				
Total	$ 1,332,668	$ -	$ 1,332,668	$ -
Unit Cost		$ -	$ 97.91	$ -
OPEB Liability				
Total	$ -	$ -	$ -	$ -
Unit Cost		$ -	$ -	$ -
Debt Service				
Total	$ 2,196,200	$ -	$ 2,196,200	$ -
Unit Cost		$ -	$ 161.35	$ -
Capital Program Transfer				
Total	$ 1,800,000	$ -	$ -	$ 1,800,000
Unit Cost		$ -	$ -	$ 0.58
Reserve Allocation				
Total	$ (673,162)	$ -	$ (673,162)	$ -
Unit Cost		$ -	$ (49.46)	$ -
Other Revenue				
Total	$ (262,895)	$ -	$ (262,895)	$ -
Unit Cost		$ -	$ (19.31)	$ -
Total and Unit Costs of Service	**$9,701,000**	**$ 54.89** per Account	**$ 349.45** per Eq. Mtr.	**$ 1.40** per CCF

In the end, an allocation that resulted in 6.5 percent of costs assigned to the customer component, 49.0 percent to the capacity component, and 44.5 percent to the commodity component was selected. One of the deciding factors that led to this allocation was a

sensitivity analysis of bill impacts that would be created by the resulting water rates. While not a primary rate-setting objective, after other rate-setting objectives had been addressed, the potential impacts to customer water bills of the changes in the water rate structure became a consideration, and the resulting allocation of costs served to help mitigate some of these impacts.

Unit costs presented in Exhibit III-4 are then used to distribute the costs of providing service to each customer class, as presented in **Exhibit III-5**. Customer classes include single family residential, multi-family residential, and non-residential. For each customer class, unit costs for each cost component are multiplied by the units of demand. The resulting allocation of the total water rate revenue requirement to each customer class is shown on the right side of Exhibit III-5. This indicates that 72.0 percent of costs are allocated to single family customers, 17.6 percent to multi-family customers, and 10.4 percent to non-residential customers. The allocation of costs to the customer, capacity, and commodity components is shown to be 6.5 percent, 49.0 percent, and 44.5 percent, respectively at the bottom of Exhibit III-5.

Exhibit III-5
Carmichael Water District
Cost Distribution to Customer Classes

	Customer Costs	Capacity Costs	Commodity Costs	Cost of Service	
Unit Costs of Service -->	**$ 54.89** per Account	**$ 349.45** per Eq. Mtr.	**$ 1.40** per CCF		
Customer Classes					
Single Family					
Units of Service	9,773	9,907	2,140,000		
Alloc. of Cost of Service	$ 536,422	$ 3,462,110	$ 2,991,683	**$6,990,215**	72.0%
Condominiums and Multi-Family					
Units of Service	1,251	2,459	556,000		
Alloc. of Cost of Service	$ 68,665	$ 859,430	$ 777,278	**$1,705,373**	17.6%
Non-Residential					
Units of Service	514	1,244	388,000		
Alloc. of Cost of Service	$ 28,213	$ 434,782	$ 542,417	**$1,005,412**	10.4%
Total Costs	**$ 633,300** 6.5%	**$4,756,321** 49.0%	**$4,311,379** 44.5%	**$9,701,000** 100%	100%

The water conservation best management practice for retail water rates (BMP 1.4), as promulgated by the CUWCC, specifies that at least 70 percent of water rate revenue be generated through usage charges. The District's current water rates generate about 46 percent of revenue from usage charges (under normal demand conditions). Proposed water rates will nearly maintain this revenue mix, and continue to provide an important water conservation incentive. The CUWCC offers, and the District should utilize, a second method for demonstrating compliance with BMP 1.4 using an alternative rate model. Using the alternative model the District will be able to demonstrate compliance with BMP 1.4, even with the proposed allocation of costs that will result in usage-based revenue equal to about 43.4 percent of total annual water rate revenue.

Water Rate Design

The third step in the rate setting process is the design of water rates to recover costs from each customer class and generate the revenue needed for the utility. **Exhibit III-6** summarizes the basic elements of the water rate structure for each customer class. Costs that have been distributed to each customer class under each rate component are then divided by the units of demand within each class to arrive at basic rate components.

Exhibit III-6
Carmichael Water District
FY 15-16 Water Rate Calculations

	Single Family	Condos & Multi-Family	Non-Residential	Totals	
Allocated Costs -->	**$6,990,215**	**$1,705,373**	**$1,005,412**	**$9,701,000**	
Rate Component Calculations					
Customer Costs	$ 536,422	$ 68,665	$ 28,213	$ 633,300	6.5%
No. of Accounts	9,773	1,251	514		
Bimonthly Customer Cost -->	**$ 9.15**	**$ 9.15**	**$ 9.15**		
Capacity Costs	$ 3,462,110	$ 859,430	$ 434,782	$ 4,756,321	49.0%
No. of 1" Equiv. Mtrs.	9,907	2,459	1,244		
Bimonthly Capacity Cost -->	**$ 58.24**	**$ 58.24**	**$ 58.24**		
Commodity Costs	$ 2,991,683	$ 777,278	$ 542,417	$ 4,311,379	44.4%
Ann. Water Use (CCF)	2,140,000	556,000	388,000		
Water Rate ($/CCF) -->	**$ 1.40**	**$ 1.40**	**$ 1.40**		

The WRSC considered several types of water rate structures on a qualitative basis. These structures all included fixed service charges supplemented with water usage rates of differing structures. Alternative usage-based structures included continuing with a uniform commodity rate, as well as consideration of two- and three-tier structures for single family residential customers, and seasonal rates. While the District's costs vary with seasonal variations in water demand, an analysis of the variability of these costs indicate that variable costs do not exhibit significant peaking characteristics. That is, it was found that the average variable cost per unit of water demand did not change significantly in the peak summer season relative to the low demand winter season. As a result, a detail analysis of a seasonal rate structure was not performed.

Similarly, the WRSC considered the various factors and decisions that go into designing either a two-tier or a three-tier rate structure. The WRSC learned that tiered water rates are effective when water usage profiles are uniform, as is the case with single family residential customers. However, a tiered structure is less effective, and may be viewed as punitive or counter-productive, when applied across broad-spectrum water usage profiles. For this and other reasons, tiered rates were not explored for the District's multi-family and non-residential customers. Following a discussion of the advantages and disadvantages of various tier structure approaches, it was decided to explore a two-tier structure for single family customers with limited water use included in the first tier. One of the WRSC's goals in exploring this structure was to help maintain the affordability of water service for basic health and safety needs.

Service Charges

Exhibit III-7 presents the calculation of bimonthly service charges for the water rates proposed for FY 15-16. Service charges are intended to recover the customer and capacity costs identified through the cost of service analysis. Service charges apply to all customer water bills, regardless of the amount of water actually used. Customers that use no water during a month should still be required to pay the service charge, as service is immediately available to them. In calculating service charges customer costs are allocated equally to all customers and capacity costs are allocated based on meter size in relation to the hydraulic capacity associated with the various meter sizes.

The proposed bimonthly service charge for a 1" meter (typical for a single family home) is $67.39. Service charges for other meter sizes vary from $44.09 to $1,872.86, depending on meter sizes ranging from ¾" to 8". All of these charges properly reflect the capacity relationship across meter sizes, as well as the revenue needs of the utility. The variation of service charges through meter sizes reflects the fact that a small portion of water system costs are directly related to the number of customers served. A majority of fixed costs are allocated on a capacity basis as reflected by the meter size. The changes to the service charges across the range of meter sizes more objectively reflect a consistent proportioning of the cost of providing service to customers of varying meter sizes. At present, this capacity relationship is not fully expressed in the rates.

Exhibit III-7
Carmichael Water District
FY 15-16 Water Rate Calculations

Meter Size	Customer Cost	Hydraulic Capacity Factor	Capacity Cost	Bimonthly Service Charge
3/4"	$ 9.15	0.6	$ 34.94	$ 44.09
1"	$ 9.15	1.0	$ 58.24	$ 67.39
1 1/2"	$ 9.15	2.0	$ 116.48	$ 125.63
2"	$ 9.15	3.2	$ 186.37	$ 195.52
3"	$ 9.15	6.0	$ 349.45	$ 358.59
4"	$ 9.15	10.0	$ 582.41	$ 591.56
6"	$ 9.15	20.0	$ 1,164.82	$ 1,173.97
8"	$ 9.15	32.0	$ 1,863.72	$ 1,872.86
Condominium Living Units	$ 9.15	0.6	$ 34.94	$ 44.09
Multi-Family Living Units with Separate Meter	$ 9.15	0.6	$ 34.94	$ 44.09

Water Usage Rates

Current water rates include a uniform usage rate for all customer classes of $1.13 per CCF. Under the proposed water rates for FY 15-16, a uniform water rate would be $1.40 per CCF, as shown at the bottom of Exhibit III-6. This uniform rate could be applied to all water use by all customer classes.

The WRSC also wanted to consider a two-tier structure for single family customers, and in the end a majority of WRSC supported a two-tier structure. Initially, a WRSC member suggested that the first tier apply to 10 CCF in each bimonthly billing cycle (about 125 gpd), and preliminary rate calculations were developed using this tier break point. Design of the tier structure must also include determining the appropriate tier rates. An

analysis was performed of the District's marginal costs of water supply, with the intent of using this information to provide a cost-of-service justification for the tier rates. In FY 14-15, and again in FY 15-16, the District is and will be purchasing water from Aerojet at $85 per acre-foot to supplement limited water available in the American River. In addition, the District invests in water conservation programs intended to help the District stretch available supplies, during both normal and water shortage periods. Costs associated with supplemental water purchases, as well as water conservation programs, were used to develop a tier rate differential. In effect, within the single family customer class, supplemental water supply and conservation program costs are incorporated in the second tier rate, but not in the first tier rate. As a result, customers that use higher amounts of water will bear these additional costs, while those costs are excluded from water use in the first tier.

During one of the WRSC meetings, a committee member suggested that it might be convenient if the rate for the first tier could be set equal to the current uniform rate of $1.13 per CCF. Refinement of the tier rate calculations led to a recommendation that the first tier be expanded to 12 CCF (about 150 gpd) for each bimonthly billing cycle. At 12 CCF, the second tier represents single family customers' use of supplemental water. This change initially enabled a rate calculation such that the first tier is $1.13 per CCF and the second tier is $1.41 per CCF. The difference between the tier rates of $0.28 per CCF reflects single family customers' share of the cost of planned supplemental water and conservation program costs, which would be recovered through the water usage in the second tier and not in the first tier. The $0.28 rate differential is comprised $0.21 of supplemental water costs and $0.07 of water conservation program costs. As the District developed its FY 15-16 budget, and the overall revenue needs increased, it became apparent that holding the rate in the first tier to the current uniform rate of $1.13 per CCF would not be possible.

The proposed two-tier single family rate structure includes first and second tier rates of $1.19 per CCF and $1.47 per CCF, respectively. The tier structure provides a maximum benefit to customers of $2.52 in a bimonthly billing cycle, when water usage is 12 CCF. Therefore, the two-tier structure provides a water conservation incentive, as well as helps to protect the affordability of basic water usage. Above 36 CCF bimonthly the two-tier structure results in higher water bills for single family customers (relative to the uniform rate structure. Approximately 50 percent of all single family water bills include usage that is less than or equal to 36 CCF.

Equity is maintained between the two-tier structure for single family customers and the uniform rate for other customer classes. The weighted average cost across the two tiers is equivalent to the uniform rate for other customer classes, thereby maintaining equity across the customer classes.

A majority of the WRSC supports the two-tier structure for single family customers for the following reasons:

- It helps reduce the cost of basic water service required for health and safety

- It helps encourage water conservation and discourage waste by reflecting water conservation program and supplemental water supply costs into the rate for the second tier
- The initial lower first tier rate would apply to all single family customers without discrimination.

A recognized ancillary benefit is that tier structures are generally perceived as conservation-oriented, and the District may gain additional recognition for its conservation efforts solely on the basis of rate structure.

The dissenting voice on the WRSC regarding the tier structure is concerned about fairness, particularly with a wide diversity of parcel sizes, demographics, and water use practices within the District's service area. This WRSC member feels that this diversity makes it difficult to have a fair tier structure.

The tier rates presented and described in meetings with the WRSC reflected an overall 3 percent increase in water rate revenue. When the business plan model was updated to reflect the draft budget for FY 15-16 and related information it was determined that an overall increase of 12 percent is required for FY 15-16. Updating the rate calculations to reflect this new revenue requirement resulted in a larger tier step (the difference between first tier and second tier rates). This in turn reduced the tier rate break-even water usage from 54 CCF to 36 CCF.

Fire Service Charges

The District has established distinct fire service charges for separate private service connections that provide fire suppression capabilities to structures and property (e.g., serving automatic internal sprinkler systems)[6]. In effect, these connections extend the public fire suppression capabilities of the water distribution systems (i.e., provided through public fire hydrants) to private property. Fire flow capacity is built into the water distribution system (in pipelines, distribution storage, and pumping capabilities) as an essential public health and safety benefit to the entire community. The costs of maintaining this fire flow capacity are inextricably embedded in the costs of maintaining the water system, and incorporated in the capacity cost component of water rates generally.

Fire service connections are a unique connection to the water system, and customers having these connections should bear a proportionate share of the cost of associated with serving and maintaining these connections. However, because system-wide fire flow capacity is provided as a community benefit and associated costs of this capacity are inextricably embedded in the general water rates, costs to be recovered through the fire service charges are appropriately limited to the costs associated with maintaining the connection, monitoring usage, and servicing the account. These services normally do not place demand on the water system, except in the event of a fire.

[6] Customers who have private fire service connections also have general water service connections for ongoing water use.

Current fire service charges were previously developed by the District to reflect the estimated costs associated with maintaining the connections and servicing the accounts. The charges also have not been adjusted since 2012, meaning that fire service charges have not kept pace with the changes in the costs to provide the service. It is recommended that the District adjust the bimonthly fire service charges by 12 percent in FY 15-16, consistent with the overall increase in other water rates.

PROPOSED WATER RATE SCHEDULE

Exhibit III-8 summarizes the proposed water rate schedule for water rates to be effective in July 2015. The proposed water rates reflect an overall 12 percent increase in revenue relative to the current water rates (consistent with Scenarios 1, 2, and 4 described previously), as well as the rate structure changes described above. No rate structure changes are proposed beyond those reflected in the rates for July 2015.

Exhibit III-8
Carmichael Water District
Proposed Water Rate Schedule for FY 15-16

	July 1, 2015	
Water Usage Rates		
Single Family Residential Accounts		
Tier 1 (0-12 CCF)	$ 1.19	per CCF
Tier 2 (>12 CCF)	$ 1.47	per CCF
Condominiums, Multi-Family, and Non-Resid. Accounts (1)		
All Water Use	$ 1.40	per CCF
Bimonthly Service Charge		
3/4" meter	$ 44.09	per meter
1" meter	$ 67.39	per meter
1 1/2" meter	$ 125.63	per meter
2" meter	$ 195.52	per meter
3" meter	$ 358.59	per meter
4" meter	$ 591.56	per meter
6" meter	$ 1,173.97	per meter
8" meter	$ 1,872.86	per meter
Condominium Living Units	$ 44.09	per living unit
Multi-Family Living Units w/ Separate Meter	$ 44.09	per living unit
Bimonthly Transitional Flat Water Rates (2)		
Single Family 1", <0.5 acre (SF11)	$ 138.90	
Bimonthly Fire Service Charges		
Per Inch of Diameter	$ 32.24	

Notes:
(1) Multi-family includes duplexes, triplexes, fourplexes, and apartment complexes. Non-residential includes commercial, parks, schools, and dedicated irrigation service connections.
(2) The District will continue to have flat rates until all accounts are transitioned to metered billing.

The proposed water rates reflect the cost of providing water service to customers. In particular, the proposed water rates reflect a proportionate distribution of costs to all customers and customer classes. The two-tier water rates for residential customers would also help protect the affordability of basic water usage and provide increased incentives for water conservation. In all cases, the proposed water rates better reflect the cost of providing service and will provide additional revenue essential to continuing to provide water service.

BILL IMPACTS OF PROPOSED WATER RATES

The WRSC recognized and was concerned that the current water rates can result in very different water bills for customers that may have the same meter size and the same water usage. As an example, under the current rates a single family home with a 1″ water

meter using 35 CCF of water would have a bill under current rates of about $102. A duplex served by a 1" meter and using 35 CCF of water would have a bill under current rates of $142. Similar disparity exists between other customer classes. The method of apportioning costs between different customers and customer classes for the proposed water rates is intended to address this inequity.

Exhibit III-9 summarizes how the proposed water rates for FY 15-16, with the proposed rate structure changes, would affect a sampling of customers. In some cases, water bills will increase due to the structural changes, and in other cases the bills will decrease. In all cases, however, the charges for water service will be more equitable due to the uniform and consistently applied methodology used to apportion the costs of service to all customers and customer classes. Exhibit III-9 illustrates how customers with the same meter size and same water use will pay the same amount for water service, rather than vastly different amount.

Exhibit III-9
Carmichael Water District
Bill Impacts for a Sampling of Customers

	Meter Size	Wtr. Use (CCF)	Current Bill	Proposed Bill	Change $	Change %
Single Family						
Low Use	1"	16	$ 80.40	$ 89.79	$ 9.39	12%
Median Use	1"	35	$ 101.87	$ 116.39	$ 14.52	14%
High Use	1"	85	$ 158.37	$ 186.39	$ 28.02	18%
Very High Use	1"	150	$ 231.82	$ 277.39	$ 45.57	20%
Condomium Unit	1"	16	$ 48.96	$ 66.49	$ 17.53	36%
Duplex	1"	35	$ 141.65	$ 116.39	$ (25.26)	-18%
Fourplex	1"	60	$ 272.00	$ 151.39	$ (120.61)	-44%
Apartment	1 1/2"	200	$ 526.94	$ 405.63	$ (121.31)	-23%
Apartment	2"	400	$ 761.73	$ 755.52	$ (6.21)	-1%
Apartment	4"	800	$ 1,244.81	$ 1,711.56	$ 466.75	37%
Business	1"	35	$ 170.05	$ 116.39	$ (53.66)	-32%
Business	2"	200	$ 373.97	$ 475.52	$ 101.55	27%
Business	4"	800	$ 1,083.05	$ 1,711.56	$ 628.51	58%
Park	4"	800	$ 2,049.75	$ 1,711.56	$ (338.19)	-16%
School	4"	800	$ 1,847.01	$ 1,711.56	$ (135.45)	-7%
Irrigation	2"	400	$ 630.05	$ 755.52	$ 125.47	20%

OTHER FEES AND CHARGES

While separate from the water rate study process with the WRSC, the study also included recommendations related to the following fees and charges:

- Capital facilities fee
- Charge for water meter size downsizing
- Hydrant meter deposit, rental, and use charges

Capital Facilities Fees

The capital facilities fee is a capacity charge related to capacity in the water system, including supply, treatment, storage, and distribution. Developers usually pay the fee connecting a new service to the water system, although an incremental fee is charged when a service is up-sized. Capital facilities fees are subject to the requirements of Government Code Section 66013, which requires that the fees not exceed the estimated reasonable cost of the service.

The District's current capital facilities fees are shown in **Exhibit III-10**, and were last updated in 2011. In addition to paying the capital facilities fees, new service connections may also be subject to inspection fees.

Exhibit III-10
Carmichael Water District
Current Capital Facilities Fees (1)

Meter Size	Capital Facilities Fees	
3/4" meter	$	1,052
1" meter	$	1,570
1 1/2" meter	$	3,140
2" meter	$	5,024
3" meter	$	9,420
4" meter	$	15,700
6" meter	$	31,400
8" meter	$	50,240
10" meter	$	72,220
12" meter	$	135,020

Notes:
(1) From Resolution 06202011-3.

The District has broad authority to charge users for capital facilities. The limitations of that authority are encompassed by the requirement that capacity charges[7] imposed on new development bear a *reasonable relationship* to the needs created by, and the benefits accruing to that development. California courts have long used that *reasonableness* standard or *nexus* test to evaluate the constitutionality of exactions, including water capacity charges.

Central to the District's authority to impose capacity charges is Government Code Section 66013. Government Code Section 66013 contains requirements specific to water capacity charges, and states: "when a local agency imposes fees for water connections or sewer connections, or imposes capacity charges, those fees or charges shall not exceed the estimated reasonable cost of providing the service for which the fee or charge is imposed."

[7] Capital facilities fee is the District's name for what is referred to as capacity charges in Government Code Section 66013. This report uses the term capacity charge when referring to these charges generally and capital facilities fee when referring specifically to the District's fee.

There are numerous methods to calculate capacity charges. Each method has varying advantages and disadvantages and no method is universally recognized as the best. The methodology appropriate for any particular utility service is dependent on a number of issues including the availability of planning documents and a defined capital improvement program, the extent to which the utility's infrastructure is built out, and availability of capacity within the existing utility systems. Any methodology used for calculating capacity charges should be:

- *Financially Stable* – Capacity charges should reflect the estimated reasonable cost of providing capacity to new development and should be effective in covering the costs of providing such additional capacity.
- *Equitable* – Capital improvement costs should be allocated on a proportional basis that is reasonably related to the needs that are created and the benefits that are received by new development.
- *Administratively Feasible* – Capacity charges should be administratively simple and easily explained and accepted by developers and the public.
- *Legally Justifiable* – Capacity charges must be developed in accordance with California statutes and court decisions.

The District's current capital facilities fee is based on the system buy-in methodology. This is one of the more common methodologies used for calculating capacity charges, as is appropriate for systems that have available capacity for accommodating new service connections and have service areas that are largely built out, as is the case of the District.

The system buy-in method is based on the average investment in the capital facilities by current customers. In short, the system buy-in fee is determined by taking the current value of assets (historical cost escalated to current dollars and adjusted for depreciation) divided by the current number of customers (expressed in 1" equivalent meters). By paying capacity charges calculated on this basis new development essentially *buys into* the existing capital facilities on par with existing users. All customers then share in the responsibility for new investments in capital facilities. The system buy-in methodology has four distinct advantages:

- The system buy-in methodology is a common and generally well-accepted methodology for calculating capacity charges.
- The system buy-in methodology includes only the cost of existing facilities and excludes the costs of future or planned facilities; therefore, it does not require a formal capital improvement program or rely on planning documents.
- While capacity must be available to accommodate new service connections, the system buy-in methodology does not depend on an assessment of existing capacity availability; it therefore does not require the more detailed capacity analyses required to justify capacity charges using other methodologies.
- Capacity charges based on the system buy-in method are a reimbursement for past capital costs. Therefore, the *use* of the fees is to reimburse the utility for prior investments in facilities. Once reimbursed, the utility is able to spend fee

revenue on any capital improvements within the utility. As a result, detailed accounting of capacity charge expenditures is simplified.

The system buy-in method is best applied in areas that are largely buildout and with infrastructure largely already in place. It is also appropriate when the cost of providing additional capacity is believed to be similar to the costs incurred in acquiring existing capacity. At times, new development may be required to install facilities (e.g., extend pipelines into new development area) as a condition of service. This does not preclude or invalidate a system buy-in capacity charge. However, if significant expansion of utility systems is required, and future costs may be significantly different from historical costs, then the system buy-in approach may not be the best approach.

The proposed update to the capital facilities fee is based on continuing to use the system-buy-in methodology. This methodology is appropriate for the District and is consistent with the means by which capacity is provided to new service connections (i.e., new connections rely on existing system capacity).

Capital facilities fee calculations rely on data and information obtained from the District including:

- Fixed asset records providing historical cost, age, and expected life of facilities and long-lived assets
- Existing and past long-term debt used to finance existing facilities
- Financial information identifying reserves specifically set aside for capital improvements
- Data on the number of active customer accounts and meter sizes.

The first step to calculating capital facilities fees is to estimate the value of the existing water system facilities. This is accomplished with the use of the District's fixed asset records. The value of the existing facilities can be determined using a variety of methods. However, the most common, and the one we recommend, is depreciated replacement cost.

The District's fixed asset records provide data for water system assets including historical cost, date of acquisition, and accounting service life. This information is used for determining annual depreciation of utility assets. The depreciated replacement cost of these assets is determined by taking the historical cost of each asset escalating to a current value (replacement cost) using the *Engineering News Record's* 20-Cities Construction Cost Index (20- Cities CCI) and depreciating this value using the age and expected service life. The same result is obtained by escalating the book value of each asset to current value using the 20-Cities CCI. This calculation is performed for each asset item. Costs have been escalated to April 2015 using a 20-Cities CCI value of 9,992.

The District's fixed asset records include more than 1,700 individual water system assets. These include many fully depreciated items that remain in service. Fully depreciated items have no value in the capital facilities fee calculations even though they still have value since they are still in active service. In this way, the proposed capital facilities fee analysis is conservative. Certain assets have also been excluded from the

capital facilities fee calculation. These include vehicles, equipment, office furniture and furnishings, water meters, and service laterals, which are all either short-lived assets or do not contribute to overall system capacity.

Exhibit III-11 summarizes the estimated valuation of existing water system assets as of April, 2015. The valuation summary includes original cost, net book value, replacement cost, and depreciated replacement cost. The last column, depreciated replacement cost, is used in capital facilities fee calculations.

Exhibit III-11
Carmichael Water District
Summary of Fixed Assets and Capital Facilities Fee Calculation

Asset Category (1)	Original Cost	Book Value	Replacement Cost (2)	Replacement Cost Less Deprec. (2)
Pipelines	$ 44,531,401	$ 26,782,747	$ 251,716,072	$ 77,534,784
Pumps and Motors	$ 33,389,540	$ 18,884,892	$ 55,741,246	$ 28,566,540
Facilities Improv. - WTP	$ 2,898,656	$ 2,438,323	$ 3,443,180	$ 2,891,122
Corporation Yard	$ 2,525,479	$ 1,466,743	$ 3,968,995	$ 2,295,388
District Office	$ 1,931,434	$ 1,235,487	$ 2,901,531	$ 1,855,241
Valve Replacements	$ 1,700,193	$ 393,458	$ 11,513,287	$ 540,074
Membranes	$ 1,692,351	$ 408,250	$ 2,110,677	$ 476,503
Fire Hydrants	$ 1,390,044	$ 550,951	$ 8,246,916	$ 754,520
Facilities Improv. - Wells	$ 970,411	$ 515,108	$ 1,545,188	$ 787,208
General Plant	$ 781,700	$ 3,093	$ 1,682,374	$ 5,500
Land and Land Rights	$ 546,488	$ 546,488	$ 1,492,086	$ 1,492,086
Engineering	$ 538,044	$ 98,895	$ 819,738	$ 135,686
Source of Supply	$ 527,287	$ 50,414	$ 1,490,475	$ 142,505
Fixed Asset Totals	$ 93,423,027	$ 53,374,849	$ 346,671,765	$ 117,477,157
Plus Capital Fund Reserve Balances (3)				$ 417,000
Plus Past Interest Costs on Long-Term Debt (4)				$ 6,054,668
Less Outstanding Principal Balances (5)				$ (23,505,000)
Total Water System Valuation				**$100,443,825**
No. of 1" Equivalent Meters				13,611
Capital Facilities Fee for 1" Meter				**$ 7,380**

Notes:
(1) Based on fixed asset records as of April 2015. Excludes vehicles, computer equipment, communications equipment, field equipment, laboratory equipment, water meters, office furniture and equipment, powered equipment, and service lines.
(2) Original costs and book values have been escalated to replacement cost and replacement cost less depreciation, respectively, using the Engineering News Record's 20-Cities Construction Cost Index with a value of 9,992 for April 2015.
(3) As of June 30, 2014.
(4) Sum of past interest payments through FY 14-15.
(5) As of June 30, 2015.

The cost of acquiring and constructing existing facilities should also include the cost of In addition to the value of existing assets, the capital facilities fee calculation includes financial reserves that have been set aside specifically for capital improvements. Capital reserves totaling $417,000 has been added to the system valuation as the amount included in capital replacement reserves as of June 30, 2014.

long-term debt financing. Past interest costs associated with financing capital facilities are legitimate costs of the facilities, and are appropriately included in capital facilities fee calculations. However, outstanding principal on long-term debt is typically deducted from the water system valuation. The water system valuation includes $6,055,000 in past interest costs and deducts about $23.5 million from the valuation as outstanding principal on long-term debt.

After making adjustments for capital reserves and long-term debt, the total water system valuation was determined to be about $100 million. This value is divided by 13,611 in 1" equivalent meters to arrive at a capital facilities fee of $7,380 for a standard 1" meter.

Capital Facilities Fee Schedule

Proposed capital facilities fees are presented in **Exhibit III-12**. Adjusting the capital facilities fees is important to ensure that new development is paying a fair share of the estimated reasonable costs associated with providing water service. Capital facilities fee revenue should accrue to the Capital Replacement Fund in support of the District's capital improvement program.

Exhibit III-12
Carmichael Water District
Proposed Capital Facilities Fees

Meter Size	Capital Facilities Fees
3/4" meter	$ 4,428
1" meter	$ 7,380
1 1/2" meter	$ 14,760
2" meter	$ 23,616
3" meter	$ 44,280
4" meter	$ 73,800
6" meter	$ 147,600
8" meter	$ 236,160

Fee Administration and Future Updates

It is recommended that the District annually adjust water capital facilities fees for the effects of inflation using the 20-Cities CCI. The capital facilities fees presented herein have been indexed to a 20-cities CCI value of 9,992 (April 2015). The 20-cities CCI is a broadly accepted construction cost index that attempts to reflect the monthly changes in general construction costs. Adjusting capital facilities fees annually using this index helps the District maintain fees commensurate with inflationary cost changes between periodic comprehensive updates.

It is recommended that the District formally update capital facilities fee calculations at least once every three to five years. Fixed asset records, debt obligations, capital reserves, and development patterns all evolve over time and periodically updating the calculations will help ensure that new development is paying fair and proportionate share of water system costs.

Finally, annual water capital facilities fee revenues are subject to the fluctuations in the pace of new development. Capital facilities fees are primarily a means of equitably assigning costs of capacity to new development. However, they are often also used as a source of capital improvement revenue. Caution should be exercised when relying upon fee revenue as a predictable revenue source.

Charges for Changing Meter Sizes

When water meters were initially installed in the District's service area customers were given an opportunity to downsize the size of the water meter serving their property. The overwhelming majority of single family residential water meters are 1", as the District's standard. Meters range in size from ¾" to 8" across all customer classes.

The District periodically receives requests from customers to reduce the size of the meter. This may occur when less capacity is needed. For each request, customers should be required to sign an agreement waiving any right to any claims against the District from service problems created by a smaller meter.

If the meter size is reduced, it is appropriate to charge a fee for the costs associated with the change. The charge should reflect the estimated reasonable cost associated with the labor and materials associated with the installation of a new meter, as well as administratively handling the request. **Exhibit III-13** summarizes the District's estimated costs for these services, and it is recommended that the District establish procedures and this fee schedule when updating other miscellaneous fees and charges.

Exhibit III-13
Carmichael Water District
Proposed Charges for Downsizing Water Meters

Meter Size Reduction	Downsize Charge
1" reduced to 3/4"	$ 430
1 1/2" reduced to 1"	$ 620
2" reduced to 1 1/2"	$ 910
3" reduced to 2"	$ 1,550
4" reduced to 3"	$ 5,915
6" reduced to 4"	$ 8,025
8" reduced to 6"	$ 10,830

Hydrant Meter Deposits, Rental, and Use Charges

Occasionally, general contractors or others involved in construction need water for construction purposes, including dust control. It is common to allow temporary uses of water through fire hydrants. However, that usage should be authorized and monitored, and appropriate charges for the service imposed.

The District has determined that a 3" hydrant meter with backflow preventer and appurtenant connectors cost about $1,700. The District should establish an application and permitting process for requesting and using a hydrant meter, including an appropriate

deposit and usage fees. The District should establish this procedure and fee schedule when updating other miscellaneous fees and charges.

APPENDIX A – SUGGESTED FINANCIAL RESERVE POLICY

This appendix presents suggested revisions to the financial reserve policies for the Carmichael Water District. Suggested revisions are intended to establish reserves to: (1) mitigate and manage financial risk, and (2) provide a mechanism to help ensure funding for long-term capital improvement needs. Managing financial risk and providing stable funding to meet the District's long-term replacement and rehabilitation needs will assist the District in minimizing water rates over the long-term, and help ensure continued reliable water service. The adequacy of the target reserves and/or annual contributions should be reviewed annually during the budgeting and rate-setting process.

The key to long-term financial stability is the ability to anticipate and prepare for significant financial obligations, to avoid and/or mitigate financial risk, and to be able to respond responsibly and proactively to changing conditions and circumstances. To achieve these goals, a portion of the District's cash should be held in reserve for specified purposes. The District has certain contractual, legal and other requirements to reserve cash and/or District capital, including debt covenants, to satisfy specific claims on District assets or the District's earning capability.

A. ***General Operating Fund Reserves*** – The following reserves should be established consistent with the 2015 Business Plan, to be included within the District's overall General Operating Fund.

   1. **Operating Reserve:** The purpose of an Operating Reserve is to provide sufficient funds for working capital and cash flow purposes, as well as funds for continued operation in the event of unplanned operating and maintenance expenditures. The District should maintain water rates and other revenues at such levels to maintain, at the end of each fiscal year, a minimum Operating Reserve balance equal to 33 percent of budgeted operating and maintenance costs, including debt service costs. This end-of-year balance is intended to ensure adequate cash is available at the times that debt service payments are due, as well as to meet other ongoing cash flow needs throughout the year.

      The Board of Directors should annually ensure that water rates and other charges are sufficient to meet or exceed the Operating Reserve target minimum balance at the end of each fiscal year. The use of the Operating Reserve should be at staff's discretion for the purpose of meeting the District's financial obligations during the year.

      If at any time, during the course of normal operations, the Operating Reserve falls below 10 percent of budgeted operating and maintenance costs, including debt service, then the District should consider increasing the minimum year-end target amount, as well as prepare cash flow projections to verify that financial obligations will be met in the current year.

      The Operating Reserve could be comprised of moneys in the District's checking and savings accounts, which provide for convenient access. It may also be possible, and

even prudent, to keep a portion of the Operating Reserve in the District's LAIF account or a money market mutual fund.

2. **Emergency Reserve:** The District's current reserve policy includes an Emergency Reserve, although the reserve has never been funded. It is recommended that this reserve be eliminated, and that the Rate Stabilization Reserve Fund also be used for emergency, including drought, purposes.

B. ***Capital Fund Reserves*** **–** The following reserves should be established consistent with the 2015 Business Plan, to be included within the District's overall Capital Fund.

1. **Membrane Replacement Reserve:** A Membrane Replacement Reserve should be established to provide funds for the periodic replacement of membrane filters at the District's water treatment plant. Annual funding of this reserve is intended to reduce the financial impacts of large (concentrated) membrane purchases, and smooth rate increases. At present, the District transfers $200,000 into the Membrane Replacement Reserve each year. The 2015 Business Plan suggests that this amount be increased to $250,000 annually, beginning in FY 20-21.

   Moneys in the Membrane Replacement Reserve should be used, at staff's discretion, only for purchase of new membrane filters at the District's WTP. The Membrane Replacement Reserve could be held within a general checking account, the LAIF account, or a money market mutual fund.

2. **Water Treatment Plant (WTP) Replacement Reserve:** A WTP Replacement Reserve should be established to provide funds for eventual replacement of equipment, facilities, and structures at the District's water treatment plant. Annual funding of this reserve is intended to reduce the financial impacts of future large WTP replacement costs, as well as reduce or eliminate the need for future long-term debt.

   It is recommended that, if an agreement is reached with GSWC, the initial funding of this reserve be established by allocating 25 percent of the WTP capacity charge to be paid to the District by GSWC. After that revenue has been received (or if an agreement with GSWC is not made), the District should begin annual transfers from the Operating Fund into the WTP Replacement Reserve at $250,000 annually.

   Moneys in the WTP Replacement Reserve should be used only for improvements, upgrades, or replacement of equipment, facilities, and structures at the District's WTP, as approved by the Board of Directors. The WTP Replacement Reserve could be held within the District's LAIF account or a money market mutual fund. Significant funds could be accumulated within this reserve in anticipation of larger WTP plant upgrades planned in the future, and potentially reduce or eliminate the need for additional long-term debt.

3. **Capital Replacement Reserve:** A Capital Replacement Reserve should be established to provide funds in support of the District's on-going capital replacement program, and to minimize or avoid the need for future long-term debt. The District recognizes that its capital assets must eventually be replaced.

   The District should seek to maintain an amount in the Capital Replacement Reserve sufficient to cover annual capital replacement program costs, as scheduled, with

consideration of annual contributions to the reserve. Funds in the Capital Replacement Reserves should be used exclusively for capital projects planned and approved by the District.

The District should establish an annual transfer of funds from the General Operating Fund at a level sufficient to achieve the required target amount as identified in long-term financial planning analyses. Water capital facilities fee revenue can also be deposited into the Capital Replacement Reserve, and used for capital projects.

The "No GSWC" scenario in the 2015 Business Plan provided the following estimates for annual transfers from the General Operating Fund to the Capital Replacement Reserve:

FY 15-16	$1,600,000
FY 16-17	$1,000,000
FY 17-18	$1,500,000
FY 18-19	$2,000,000
FY 19-20	$2,500,000
FY 20-21	$2,750,000
FY 21-22	$3,000,000
FY 22-23	$3,500,000
FY 23-24	$4,000,000
FY 24-25	$4,250,000

Actual annual transfers should be determined based on near-term and long-term capital replacement needs, and not solely on immediate capital improvement project requirements. By FY 24-25, annual transfers to the Capital Replacement Reserve should exceed $4 million in order to make progress on meeting the District's long-term capital improvement needs, as identified in the Master Plan.

The Capital Replacement Reserve could be held within the District's LAIF account or a money market mutual fund.

C. ***Debt-Related Funds and Reserves*** – The District recognizes that borrowing long-term funds for the purpose of enhancing, improving or acquiring infrastructure and facilities may be necessary. When the District determines that borrowing is necessary to fund such asset acquisitions, all funds borrowed should be accounted for in accordance with the covenants, terms and conditions as set forth in the bond agreement, Certificate of Participation Official Statement, Installment Sales Agreement or other similar documents. Pursuant to the 2010 Water Revenue Refunding Certificates of Participation the District should for each Fiscal Year yield Net Revenues during such Fiscal Year equal to at least 120 percent of the annual Debt Service in such Fiscal Year (the "Coverage Ratio").

The following District reserve and fund categories are established to meet long-term debt covenants and to assist the District in its long-term debt obligations:

1. **Rate Stabilization Reserve Fund:** A Rate Stabilization Reserve Fund was established and should be maintained to provide funds for meeting the District's debt service coverage requirement. The District may deposit surplus Net Revenues

transferred from the Revenue Fund attributable to a fiscal year, or moneys derived from any other legally available source, into the Rate Stabilization Reserve Fund. The District may, at any time, withdraw moneys from the Rate Stabilization Reserve Fund and deposit such amounts into the Revenue Fund. For purposes of debt service coverage, moneys deposited into the Rate Stabilization Reserve Fund shall be deducted from Net Revenues and moneys withdrawn from the Rate Stabilization Reserve Fund shall be added to Net Revenues.

Use of the Rate Stabilization Reserve Fund may concurrently ensure financial and customer rate stability in responding to conditions including but not limited to:

a. Unforeseen operating and/or capital expenditures.
b. Revenue losses due to water shortages, drought or other conditions.
c. Natural or man-made disasters.
d. Major transmission or distribution main failures.

The 2015 Business Plan includes a water shortage financial analysis and recommends a multi-prong financial strategy, which includes using a portion of money available in the Rate Stabilization Reserve Fund to help mitigate the financial impacts of a water shortage and reduced water sales that create an unplanned financial deficit. The water shortage financial analysis recommended a target balance of $3.0 million for the Rate Stabilization Reserve Fund. Funding of this Rate Stabilization Reserve Fund at $250,000 per year should begin in FY 16-17, until the recommended balance is achieved, unless precluded by continuation of the current drought or other conditions.

As described in the 2015 Business Plan, under water shortage conditions with mandatory water use restrictions, the Rate Stabilization Reserve Fund could be used in conjunction with water shortage rate surcharges.

Funding and usage of the Rate Stabilization Reserve Fund should be by action of the Board of Directors. The Rate Stabilization Reserve Fund could be held within the District's LAIF account or a money market mutual fund.

2. **Debt Service Reserve Fund:** A Debt Service Reserve Fund has been established and is used to maintain the Reserve Requirement, as required by 2010 Installment Sales Agreement and related documents. The Debt Service Reserve Fund is held and maintained by a Trustee for the District. Funding and usage of the Debt Service Reserve Fund should be consistent with debt covenants.

D. ***OPEB Reserve Trust Account*** – The District estimates that at the end of FY 14-15 it will have an outstanding unfunded OPEB liability of about $1,323,000. Each year this liability grows. The District should establish an OPEB Reserve Trust Account, held by an outside trustee, and begin funding this liability. The 2015 Business Plan includes annual funding of this trust account beginning in FY 16-17 at $440,000, increasing by 1 percent each year. It is estimated that this level of annual contributions will provide full funding of the OPEB liability by the end of the ten-year planning period. It is recommended that the District update the actuarial analysis of its OPEB costs and obligations every two years, as conditions and requirements will change over time.

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