December 27, 2023

MEETING NOTICE
SANTA CLARA VALLEY WATER DISTRICT

JOINT WATER RESOURCES COMMITTEE WITH CITIES OF GILROY AND MORGAN HILL

Members of the Joint Water Resources Committee:

District 1 Director John Varela - Committee Chair
Hon. Marie Blankley, Mayor, City of Gilroy - Committee Vice Chair
District 3 Director Richard Santos
Hon. Dion Bracco, Mayor Pro Tempore, City of Gilroy
Hon. Yvonne Martinez-Beltran, Councilmember, City of Morgan Hill
Hon. Rene Spring, Councilmember, City of Morgan Hill
Hon. Gino Borgioli, Councilmember City of Morgan Hill (Alternate)
Hon. Marilyn Librers, Councilmember, City of Morgan Hill (Alternate)

Valley Water Staff Support of the Joint Water Resources Committee:

Rick Callender, Chief Executive Officer
Melanie Richardson, Asst. Chief Executive Officer
Aaron Baker, Chief Operating Officer, Water Utility
Chris Hakes, Chief Operating Officer, Watersheds
Rachael Gibson, Chief of External Affairs
Carlos Orellana, District Counsel
Michele King, Clerk, Board of Directors
Brian Hopper, Senior Assistant District Counsel
Don Rocha, Assistant Officer, External Affairs
Vincent Gin, Deputy Operating Officer, Water Supply Division
Bhavani Yerrapotu, Deputy Operating Officer, Watersheds Design & Construction
Emmanuel Aryee, Deputy Operating Officer, Water Utility Capital
Sam Bogale, Deputy Operating Officer, Treated Water Division
Greg Williams, Deputy Operating Officer, Raw Water Division
Kirsten Struve, Assistant Officer, Water Supply Division
Hossein Ashktorab, Recycled & Purified Water Manager
Girlie Jacobson, Senior Engineer – Treatment Plant Design
David Tucker, Associate Engineer - Civil
Elise Latedjou-Durand, Senior Environmental Planner
Neeta Bijoor – Associate Water Resource Specialist
James Randol, Security Manager
Nicole Merritt, Assistant Deputy Clerk II

A Santa Clara Valley Water District regular Joint Water Resources Committee meeting has been scheduled to begin at 9:00 a.m. on Wednesday, January 3, 2024, at the South County Regional Wastewater Authority 1500 Southside Drive, Gilroy, CA 95020

This meeting is in-person only.

The meeting agenda and corresponding materials are located on our website:
https://www.valleywater.org/how-we-operate/committees/board-committees

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Santa Clara Valley Water District
Joint Water Resources Committee with Cities of Gilroy and Morgan Hill

South County Regional Wastewater Authority
1500 Southside Drive
Gilroy, CA 95020

<u>This meeting is in-person only</u>.

REGULAR MEETING
AGENDA

Wednesday, January 3, 2024
9:00 AM

District Mission: Provide Silicon Valley safe, clean water for a healthy life, environment and economy.

COMMITTEE MEMBERS:

Hon. John Varela, Director District 1, Chair
Hon. Marie Blankley, Mayor, Gilroy, Vice Chair
Hon. Richard Santos, Director District 3
Hon. Dion Bracco, Council Member, Gilroy
Hon. Yvonne Martinez, Council Member, Morgan Hill
Hon. Rene Spring, Council Member, Morgan Hill

All public records relating to an item on this agenda, which are not exempt from disclosure pursuant to the California Public Records Act, that are distributed to a majority of the legislative body will be available for public inspection at the Office of the Clerk of the Board at the Santa Clara Valley Water District Headquarters Building, 5700 Almaden Expressway, San Jose, CA 95118, at the same time that the public records are distributed or made available to the legislative body. Santa Clara Valley Water District will make reasonable efforts to accommodate persons with disabilities wishing to attend Board of Directors' meeting. Please advise the Clerk of the Board Office of any special needs by calling (408) 265-2600

COMMITTEE LIAISON:
Kirsten Struve

COMMITTEE CLERK:
Nicole Merritt
Assistant Deputy Clerk II
408-630-3262
nmerritt@valleywater.org
www.valleywater.org

Note: The finalized Board Agenda, exception items and supplemental items will be posted prior to the meeting in accordance with the Brown Act.

Santa Clara Valley Water District Joint Water Resources Committee with Cities of Gilroy and Morgan Hill
REGULAR MEETING AGENDA

Wednesday, January 3, 2024	9:00 AM	South County Regional Wastewater Authority 1500 Southside Drive Gilroy, CA 95020

1. CALL TO ORDER:

1.1. Roll Call.

2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON THE AGENDA.

Speakers comments should be limited to three minutes or as set by the Chair. The law does not permit Committee action on, or extended discussion of, any item not on the agenda except under special circumstances. If Committee action is requested, the matter may be placed on a future agenda. All comments that require a response will be referred to staff for a reply in writing. The Committee may take action on any item of business appearing on the posted agenda.

2.1. Election of 2024 Committee Chair and Vice-Chair. 24-0016

Recommendation: Elect the 2024 Chair and Vice-Chair.
Manager: Candice Kwok-Smith 408-630-3193
Est. Staff Time: 5 Minutes

3. APPROVAL OF MINUTES:

3.1. Approval of October 4, 2023 Joint Water Resources Committee Meeting Minutes. 24-0017

Recommendation: Approve the minutes.
Manager: Candice Kwok-Smith, 408-630-3193
Attachments: Attachment 1: 100423 JWRC Minutes
Est. Staff Time: 5 Minutes

4. REGULAR AGENDA:

4.1. Receive Water Supply Master Plan (WSMP) 2050 and South County Opportunities Update and Provide Feedback. 24-0003

Recommendation: Receive update and provide feedback on the development of Valley Water's WSMP 2050.

Manager: Kirsten Struve, 408-630-3138

Attachments: Attachment 1: Demand Projection
Attachment 2: Project Descriptions
Attachment 3: PowerPoint

Est. Staff Time: 10 Minutes

4.2. Receive South County Water Reuse Collaboration and Implementation Update and Provide Feedback. 24-0002

Recommendation: Receive update and provide feedback on Technical Working Group discussions related to South County Water Reuse Collaborations.

Manager: Kirsten Struve, 408-630-3138

Attachments: Attachment 1: PowerPoint

Est. Staff Time: 20 Minutes

4.3. Review and Accept the Joint Water Resources Committee 2024 Proposed Work Plan, and Confirm the Next Meeting Date. 24-0018

Recommendation:
A. Review and Accept the Joint Water Resources Committee 2024 Proposed Work Plan; and
B. Confirm the next meeting date.

Manager: Candice Kwok-Smith, 408-630-3193

Attachments: Attachment 1: 2024 Proposed JWRC Work Plan

Est. Staff Time: 5 Minutes

5. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS.

This is an opportunity for the Clerk to review and obtain clarification on any formally moved, seconded, and approved requests and recommendations made by the Committee during the meeting.

6. ADJOURN:

6.1. Adjourn to Regular Meeting at 9:00 a.m on April 3, 2024.

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File No.: 24-0016 **Agenda Date:** 1/3/2024
Item No.: 2.1.

COMMITTEE AGENDA MEMORANDUM
Joint WRC with Cities of Gilroy/Morgan Hill/SCRWA

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Election of 2024 Committee Chair and Vice-Chair.

RECOMMENDATION:
Elect the 2024 Chair and Vice-Chair.

SUMMARY:
Per the Board Resolution, the duties of the Chair and Vice-Chair are as follows:
The officers of each Committee shall be a Chairperson and Vice-Chairperson, both of whom shall be members of that Committee. The Chairperson and Vice-Chairperson shall be elected by the Committee, each for a term of one year commencing on January 1 and ending on December 31 and for no more than two consecutive terms. The Committee shall elect its officers at the first meeting of the calendar year. All officers shall hold over in their respective offices after their term of office has expired until their successors have been elected and have assumed office.

The Chairperson shall preside at all meetings of the Committee, and he or she shall perform other such duties as the Committee may prescribe consistent with the purpose of the Committee.

The Vice-Chairperson shall perform the duties of the Chairperson in the absence or incapacity of the Chairperson. In case of the unexpected vacancy of the Chairperson, the Vice-Chairperson shall perform such duties as are imposed upon the Chairperson until such time as a new Chairperson is elected by the Committee.

Should the office of Chairperson or Vice-Chairperson become vacant during the term of such office, the Committee shall elect a successor from its membership at the earliest meeting at which such election would be practicable, and such election shall be for the unexpired term of such office.

Should the Chairperson and Vice-Chairperson know in advance that they will both be absent from a meeting, the Chair may appoint a Chairperson Pro-tempore to preside over that meeting. In the event of an unanticipated absence of both the Chairperson and Vice-Chairperson, the Committee may elect a Chairperson Pro-tempore to preside over the meeting in their absence.

BACKGROUND:

The District Act provides for the creation of advisory boards, committees, or commissions by resolution to serve at the pleasure of the Board.

Accordingly, the Board has established Advisory Committees, which bring respective expertise and community interest, to advise the Board, when requested, in a capacity as defined: prepare Board policy alternatives and provide comment on activities in the implementation of the District's mission for Board consideration. In keeping with the Board's broader focus, Advisory Committees will not direct the implementation of District programs and projects, other than to receive information and provide comment.

Further, in accordance with Governance Process Policy-3, when requested by the Board, the Advisory Committees may help the Board produce the link between the District and the public through information sharing to the communities they represent.

The Board may also establish Ad-hoc Committees to serve in a capacity as defined by the Board and will be used sparingly.

ENVIRONMENTAL JUSTICE IMPACT:
There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:
None.

UNCLASSIFIED MANAGER:
Candice Kwok-Smith 408-630-3193

Santa Clara Valley Water District

File No.: 24-0017

Agenda Date: 1/3/2024
Item No.: 3.1.

COMMITTEE AGENDA MEMORANDUM
Joint WRC with Cities of Gilroy/Morgan Hill/SCRWA

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Approval of October 4, 2023 Joint Water Resources Committee Meeting Minutes.

RECOMMENDATION:
Approve the minutes.

SUMMARY:
In accordance with the Ralph M. Brown Act, a summary of Committee discussions, and details of all actions taken by the Committee, during all open and public Committee meetings, is transcribed and submitted to the Committee for review and approval.

Upon Committee approval, minutes transcripts are finalized and entered into the District's historical record archives and serve as historical record of the Committee's meeting.

ENVIRONMENTAL JUSTICE IMPACT:
There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:
Attachment 1: 100423 JWRC Minutes

UNCLASSIFIED MANAGER:
Candice Kwok-Smith, 408-630-3193

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JOINT WATER RESOURCES COMMITTEE
(CITY OF GILROY, CITY OF MORGAN HILL AND VALLEY WATER)

DRAFT MINUTES

REGULAR MEETING SESSION
WEDNESDAY, OCTOBER 4, 2023
8:30 AM

(Paragraph numbers coincide with agenda item numbers)

1. CALL TO ORDER

A regular meeting of the Joint Water Resources Committee (City of Gilroy, City of Morgan Hill, and Valley Water) (Committee) was called to order at 8:30 a.m. at the South County Regional Wastewater Authority (SCRWA), 1500 Southside Drive, Gilroy, CA 95020.

1.1. ROLL CALL

Committee Members in attendance were: City of Gilroy Mayor and Vice Chairperson Marie Blankley and City of Gilroy Mayor Pro Tempore Dion Bracco; City of Morgan Hill Council Members Yvonne Martinez-Beltran and Rene Spring; Valley Water District 3 Director Richard Santos and Valley Water District 1 Director John L. Varela, Chairperson presiding, constituting a quorum of the Committee.

Valley Water staff in attendance: Hossein Ashktorab, Aaron Baker, Walter Gonzales, Nicole Merritt, and Kirsten Struve.

SCRWA staff in Attendance were: Jimmy Forbis, City of Gilroy City Administrator & SCRWA Manager and Saeid Vaziry, SCRWA Environmental Programs Manager.

Public in Attendance was: None.

2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON THE AGENDA.

Chairperson Varela declared time open for public comment on any item not on the agenda. There was no one present who wished to speak.

3. APPROVAL OF MINUTES:

3.1. Approval of April 20, 2023 Joint Water Resources Committee Meeting Minutes.

Recommendation: Approve the minutes.

The Committee considered the attached minutes of the April 20, 2023 Committee meeting.

Public Comments:
None.

It was moved by Director Santos and seconded by Council Member Martinez-Beltran and unanimously carried that the minutes be approved.

4. REGULAR AGENDA:

4.1 Receive South County Water Reuse Collaboration and Implementation Update and Provide Feedback.

Recommendation: Receive update and provide feedback on Technical Working Group discussions related to South County Water Reuse Collaborations.

Kirsten Struve reviewed the information on this item per the attached Committee agenda memo and per the information contained in Attachment 1.

Kirsten Struve was available to answer questions.

Public Comments:
None.

The Committee received the information, took no formal action, and noted the following:

- The Committee noted the South County water reuse agreements updates are pending until further notice when all parties can equally participate in the review process.
- The Committee expressed support for the South County Pipeline Project and the award of the $300,000 United States Bureau of Reclamation Grant received per the continued collaboration of staff from Gilroy, Morgan Hill, SCRWA, and Valley Water.

4.2. Review and Discuss the Joint Water Resources Committee 2023 Proposed Work Plan, and Next Meeting Date/Location.

Recommendation: Receive information on the Joint Water Resources Committee 2023 Proposed Work Plan; and provide feedback on upcoming discussion items and next meeting date/location.

The Committee considered this Item without a staff presentation.

Public Comments:
None.

The Committee expressed interest in reviewing the upcoming agenda items for the 2024 JWRC Work Plan and support for having the next meeting after the SCRWA meeting in January 2024.

5. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS.

This is an opportunity for the Clerk to review and obtain clarification on any formally moved, seconded, and approved requests and recommendations made by the Committee during the meeting.

None.

6. ADJOURN:

6.1. Adjourn to Regular Meeting at 9:00 a.m. on January 3, 2024 or TBD per the Committee.

Chairperson Varela adjourned the meeting at 8:47 a.m. to the regular meeting at 9:00 a.m. on January 3, 2024.

Approved:

Nicole Merritt Assistant
Deputy Clerk II

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Valley Water

File No.: 24-0003 **Agenda Date:** 1/3/2024
Item No.: 4.1.

COMMITTEE AGENDA MEMORANDUM
Joint WRC with Cities of Gilroy/Morgan Hill/SCRWA

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Receive Water Supply Master Plan (WSMP) 2050 and South County Opportunities Update and Provide Feedback.

RECOMMENDATION:
Receive update and provide feedback on the development of Valley Water's WSMP 2050.

SUMMARY:
The Water Supply Master Plan (WSMP) is the Santa Clara Valley Water District's (Valley Water) guiding document for long-term water supply investments to ensure water supply reliability for Santa Clara County. Updated about every five years, this long-range plan assesses future countywide demands and evaluates and recommends water supply and infrastructure projects to meet those demands to achieve Valley Water's level of service (LOS) goal through the planning horizon. Valley Water's LOS goal is "Meet 100 percent of annual water demand during non-drought years and at least 80 percent demand in drought years."

The most recent plan, Water Supply Master Plan 2040, was adopted by the Valley Water Board of Directors (Board) in 2019. In 2023, Valley Water embarked on an effort to update the WSMP. This memorandum presents the framework of and progress on the development of the WSMP 2050 and a timeline for completing the plan.

Planning Goals
The WSMP 2050 establishes planning goals to guide what Valley Water intends to achieve. Valley Water's mission is to provide a safe and reliable water supply now and in the future. To that end and consistent with Board Ends Policies, the proposed planning goals of the WSMP 2050 are to:

- Ensure reliability and sustainability of the existing water supply system
- Diversify water supplies to meet the Level of Service goal
- Minimize the risk of shortage and disruption
- Maintain affordable water rates through cost-effective water supply investments and management

Planning Approach
The WSMP 2050 extends the planning horizon to 2050, which strikes a balance between data availability and the uncertainty related to future conditions. This longer timeframe will enable more benefits of large infrastructure projects to be captured, as they often take several decades to be fully implemented and functioning.

To account for uncertainty in forecasted future supply and demand and provide further flexibility in decision-making, a scenario planning approach is used to analyze four alternative futures based on the combination of demand projections and forecasted imported water supplies:

- Stable demand and moderately impacted imported supplies
- Stable demand and severely impacted imported supplies
- High demand and moderately impacted imported supplies
- High demand and severely impacted imported supplies

The demand projections were developed from Valley Water's demand model as described in Attachment 1. The stable demand, representing low end, assumes demands stay flat at 2025 levels through 2050, in part owing to the success in making water conservation a way of life and mitigating the impacts of growth on water use. The high demand assumes significant impacts from growth and severe climate change. The forecasted countywide 2050 stable and high demands are approximately 330,000 acre feet per year (AFY) and 370,000 AFY, respectively. Both demands assume Valley Water achieves its long-term conservation goals. Staff is currently developing proposals for 2050 conservation targets as part of the WSMP 2050 development.

The imported water baseline supply scenarios were selected from Department of Water Resources (DWR) modeling. The modeling assumes existing regulatory conditions and State Water Project (SWP) and Central Valley Project (CVP) infrastructure and takes into account climate change impacts. The moderately impacted imports scenario represents SWP and CVP deliveries with small impact from climate change, while the severely impacted imports scenario represents significantly impacted deliveries, particularly during droughts.

Baseline Needs Assessment Under Alternative Futures
Under each of the four futures, water supply needs under baseline condition were assessed using modeling analysis. The baseline condition assumes no new investment but completion of local dam seismic retrofits by 2035, achieving long-term water conservation goals, maintaining Valley Water assets, and maintaining 18,000 AFY of recycled water use.

Under all four futures, Valley Water will experience water shortages if relying only on existing supplies and infrastructure, and the biggest challenge for meeting water supply needs will be multiple-year droughts. The shortages will start as early as 2030 in the future scenario of stable demand and severely impacted imported supplies. With Semitropic in place, the average shortages over a six-year drought in 2050 could range from 4,000 AFY to 76,000 AFY, and the shortages increase as demand increases and imported supplies decrease. Without Semitropic, the shortages could get worse, with a range from 30,000 AFY to 82,000 AFY, underscoring the importance of securing and diversifying groundwater banking. Valley Water's current system can handle the first two years of a multi-year drought, with shortage starting the third year. The projected shortages represent the targets that future water supply investment aim to meet to achieve Valley Water's LOS.

Projects Under Consideration
The WSMP 2050 will evaluate a total of 18 projects for meeting future needs/goals. For organizational purposes, these projects are grouped as shown in Table 1. More detailed description of each project is provided in Attachment 2.

Valley Water's past and future water supply investments are designed to provide water supply benefits to the whole county. As such, major projects evaluated in the WSMP 2050 will provide benefit to the county as a whole. For instance, the purified water projects will provide new potable water to meet some of the demand, thereby freeing up imported water supplies to be used at recharge facilities throughout the county. The storage projects, including Pacheco expansion and seismic retrofit of serval local reservoirs, will allow Valley Water to store more surplus water during wet years and increase the flexibility to use those supplies more effectively during water shortages, such as droughts. To address water supply vulnerability in the South County, several projects in the South County are being evaluated, including San Pedro Ponds Improvement Project and Agricultural Land Recharge (FloodMar), to improve water supply reliability for that area and its agriculture community.

Table 1 Projects Under Consideration

Project Type	**Project**
Alternative Supply	Potable Reuse - Palo Alto
	Potable Reuse - San Jose
	Refinery Recycled Project
	Local seawater desalination project
Surface Supply	Delta Conveyance Project
	Sites Reservoir
	Stormwater - Agricultural Land Recharge (FloodMar)
	Stormwater capture
Storage	Pacheco Reservoir Expansion
	Los Vaqueros Expansion
	Groundwater Banking
	B.F. Sisk Dam Raise
Recharge & Pipelines	Coyote Valley Recharge Pond
	Lexington Pipeline
	Lexington-Montevina Water Treatment Plant Connection
	Butterfield Channel Managed Aquifer Recharge
	Madrone Channel Expansion
	San Pedro Ponds Improvement Project

Project Evaluation and Portfolio Analysis

Project evaluation is a critical step in the WSMP 2050 development to identify the portfolios for recommendation. A list of 14 criteria (Table 2) was developed to evaluate and compare projects. Among the proposed criteria, the water supply benefit and cost will be the most important and therefore the first criteria to be used to evaluate projects and portfolios. Following that, the remaining criteria will be used to further differentiate among options. The project evaluation framework is intended to present a systematic and holistic approach to evaluate and ultimately recommend projects for selection within the context of the WSMP and financial constraints.

Table 2 Project Evaluation Criteria

Evaluation Criteria	Description
Water Supply Benefit	Quantifiable water supply benefits of the project
Cost/Rate Impact	Construction, planning/design, O&M, and other cost
Timing	The year the project will be in service
Technical Feasibility	Technical ability to implement the project
Operation	How the project operates, specifically how it connects to existing system and moves water around
Reliability	Reliability of the project in providing its primary benefits during periods of dry year need
Readiness/Likelihood of Success	The readiness of project implementation and chance of success
Flexibility	Operation/implementation across a wide range of conditions and whether it can enhance overall system flexibility
Jurisdiction/Partnership	Primary jurisdiction and partners of the project
Permitting/Legal Issues	Permits required and any legal Issues/concerns
Environmental Impacts/Justice	Anticipated positive or negative impacts on the natural environment and environmental justice
Public Acceptance	Public opinion and political support for the project
Inter-dependence	Whether the project will need other projects to be functioning or can magnify other projects
Risk/Challenges	Any significant risks/challenges that could potentially derail the project

Valley Water is currently working on the portfolio development and evaluation, to identify cost-effective solutions to address future water supply needs. On January 9th, 2024, staff will present a few example portfolios to the Board. Following the meeting, staff will continue to refine and develop portfolios for the next few months and plans to bring another update to the Board in Spring 2024.

WSMP Update Timeline

The timeline for the plan development is as follows.

- **2023**
  - Establishment of overall framework and procedures
  - Project/portfolio analysis and evaluation
  - Stakeholder engagement

- **2024**
  - Portfolio analysis and recommendation
  - Plan development
  - Stakeholder outreach
  - Plan adoption

ENVIRONMENTAL JUSTICE IMPACT:
There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:
Attachment 1: Demand Projection
Attachment 2: Project Descriptions
Attachment 3: PowerPoint

UNCLASSIFIED MANAGER:
Kirsten Struve, 408-630-3138

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Santa Clara Valley Water District

File No.: 23-0806

Agenda Date: 8/28/2023
Item No.: 4.4.

COMMITTEE AGENDA MEMORANDUM
Water Conservation and Demand Management Committee

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Valley Water Demand Model and Forecast.

RECOMMENDATION:
Receive and discuss Valley Water demand model and forecast.

SUMMARY:
As part of the Water Supply Planning program, Valley Water developed and maintains an econometric-based demand model. A reliable water demand forecast is needed to determine the level of investment necessary to meet Santa Clara County's future water supply needs. This memorandum summarizes Valley Water's demand modeling approach and provides the demand forecasts Valley Water proposes to use in its Water Supply Master Plan 2050.

Demand Model Approach
Valley Water's demand modeling integrates the understanding of historic water use trends, housing and economic growth, climate change, and post-drought water use rebound. The model was developed, calibrated, and validated using historic datasets, including sectoral water use provided by the retailers (e.g., residential, commercial, etc.), independent well owner pumping, weather, economic parameters, and housing information (Attachment 1).

The demand model is segmented by billing group (e.g., individual retailers, independent pumpers grouped by groundwater management zone, and agricultural users grouped by management zone). Each retailer is then further segmented into single family, multi-family, and commercial, industrial, and institution (CII) sectors. An econometric equation developed using historic datasets was created for each model segment. The model combines the segment-level equations with projected growth, climate, economic, and drought rebound parameters to forecast Santa Clara County demands. Given the uncertainty in each of the projected parameters, Valley Water is proposing to use a demand range for its Water Supply Master Plan 2050 analyses.

Forecasted Water Use

Valley Water used forecast information on housing and economic growth from the Association of Bay Area Governments (ABAG) Plan Bay Area 2040 and city general plans. Water rate forecasts were provided by the Valley Water Protection and Augmentation of Water Supplies (PAWS) analyses. Climate change data from global climate models were downscaled for Santa Clara County. Valley Water also included a drought rebound assumption that considered the muted rebound seen during the 2012-2016 drought and the Board of Directors (Board) June 2023 resolution to make water conservation a way of life.

Forecasted county-wide 2050 demands for Valley Water range from approximately 330,000-425,000 acre-feet per year (AFY) if Valley Water does not achieve its long-term water conservation goal of 110,000 AFY by 2040. If Valley Water achieves its conservation goal by 2040, then forecasted demands range from approximately 330,000 AFY-390,000 AFY. The lower bound, which is the same with and without conservation forecasts, assumes demands stay constant at 2025 levels through 2050, in part owing to the success in making water conservation a way of life and mitigating the impacts of growth on water use. From a historical perspective, water use dropped 25% in the last 5 years (from 148 gallons per person per day in 2017 to 111 gallons per person per day in 2022). In addition, the county population increased by 25% over the past 30 years, while water demand has decreased by about 8% in that time (1990-2020). The higher bound demand is significantly impacted by severe climate change and growth. As part of the Water Supply Master Plan update, Valley Water is developing a 2050 conservation target and will bring it to the committee for review when ready; thus, no conservation is accounted for between 2040-2050 in the reported forecasts.

Next Steps

Valley Water will continue to track growth, economic, and climatic factors that can impact demands and update forecasts as needed. Valley Water plans to use the demand forecast data in water supply modeling that will inform Water Supply Master Plan 2050 investment recommendations.

ENVIRONMENTAL JUSTICE IMPACT:

There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:

Attachment 1: Demand Model Development
Attachment 2: PowerPoint Presentation

UNCLASSIFIED MANAGER:

Kirsten Struve, 408-630-3138

March 2, 2020

To: Samantha Greene, Ph.D.

From: Luke Wang
Jack Kiefer
Kinsey Hoffman
Leah Bensching

cc: Jing Wu, Metra Richert, Jessica Lovering

Technical Memorandum 3

Modeling Approach and Development

Introduction

Santa Clara Valley Water District (Valley Water) has developed a new model to forecast total water demand in Santa Clara County. Demand projections from the model will be used to support several planning initiatives and documents including:

- The 2021 Urban Water Management Plan (UWMP);
- Monitoring of and updates to the Water Supply Master Plan;
- Inputs to Valley Water's water supply planning model; and
- Evaluation of conservation programs and capital projects.

Valley Water manages a diverse portfolio of water supplies to provide water to Santa Clara County's 13 water supply retailers and non-retailer groundwater pumpers.[1] The majority of water users in Santa Clara County are customers of the water supply retailers. As a result, each retailer typically develops their own water demand forecasts. These forecasts are useful and have been used to inform Valley Water's prior UWMPs. However, Valley Water is responsible for County-wide water resource planning activities (e.g., groundwater management, treated water production, potable reuse development, surface water infrastructure management and development, and active conservation program implementation); collectively, these activities are better served by a consistent modeling approach and planning assumptions across the service area.

The purpose of this Technical Memorandum (TM 3) is to document the modeling approach selected to develop Valley Water's updated demand model. Major characteristics of the modeling approach include a statistical/econometric analytical framework, differentiation of rates of water use from drivers of growth, and model segmentation based on geography (e.g., retail agency), time of year, and water use sector. TM 3 also includes a summary of the statistical model fits and performance compared to historical

[1] Non-retail groundwater pumpers include private well owners that are outside of retailers' service areas.

observations of water consumption. Discussions of model fits and performance are organized based on water use sector segmentation and includes the following sectors:

- Single family;
- Multifamily;
- Commercial, Industrial, and Institutional (CII); and
- Non-retailer groundwater pumpers.

The model sectors are designed to establish baseline demand projections without considering additional future water conservation. Projections of future conservation savings are generated separately by Valley Water's water conservation model and then deducted from the baseline projections generated for the model sectors described herein.

Table of Contents

1. Modeling Approach

Valley Water's demand model is organized following the demand forecasting typology identified in TM 1.[2] This section provides a general overview of this approach to establish context for detailed discussions on model development in Sections 2 – 5 of this TM.

1.1 Model Segmentation

The demand model was segmented based on type of provider, i.e., retail agency or non-retail groundwater pumper. Within each provider type, the model was further segmented by geography, sector/billing classification, and time of year. For retail provided water, model geographies were based on each retail agency's service area within Santa Clara County. Billing classifications often differed among retail agencies necessitating standardization of billing classifications into common sectors (e.g., single family, multifamily, commercial, industrial, and institutional). Appendix A provides a detailed summary of the billing classifications for each retail agency, and the standardized sectors used for modeling; Valley Water directly solicited the retail agencies for input in standardizing billing classifications, particularly for classes that have the potential to span across multiple water use sectors (e.g., landscape irrigation and recycled water). Non-retail groundwater pumpers were organized geographically by groundwater basin charge zone, including W2 (representing the Santa Clara Plain sub-basin management area) and W5 (representing the Llagas sub-basin and Coyote Valley sub-basin management area). Water use classifications for non-retail groundwater pumpers are consistent across each charge zone and include agricultural, municipal, and domestic water use types. These water use classifications were ultimately organized into two model sectors, Municipal and Industrial (M&I) and Agricultural (Ag).

The retail agency demands were modeled using a monthly timestep, and non-retail groundwater pumper demands were modeled using an annual timestep. Non-retail groundwater pumper annual demands were then post-processed to monthly demands using a monthly distribution. Figure 1-1 further details the hierarchical structure of model segmentation.

[2] Technical Memorandum 1: Benchmark Analysis of Regional Demand Projection Models.

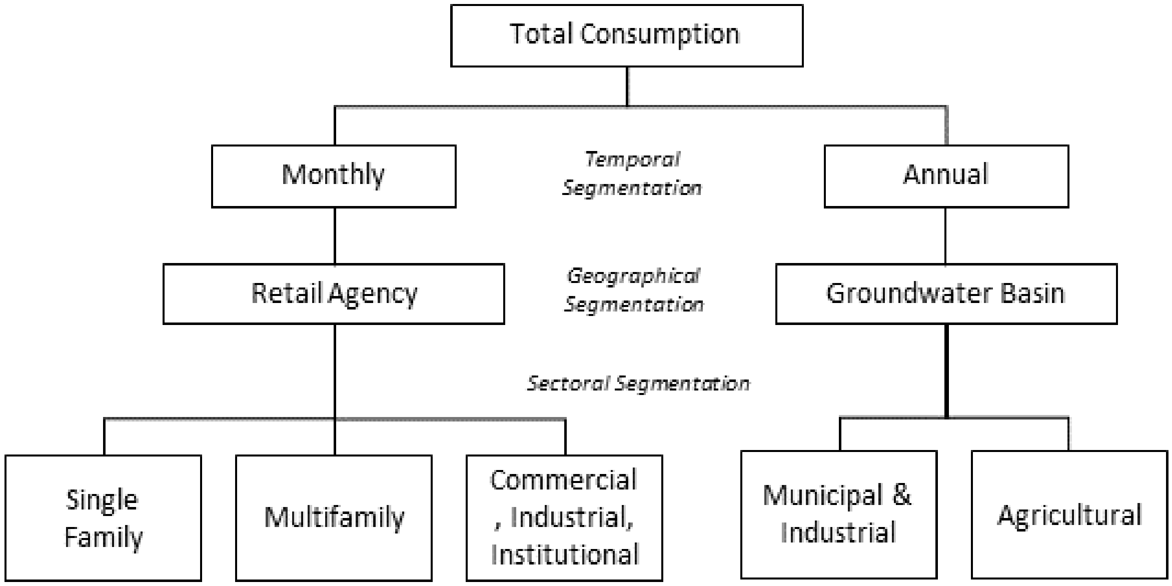


Figure 1-1: Hierarchy of Model Segmentation

1.2 Rate of Use Differentiation

Rate of use differentiation (i.e., characterizing consumption to reflect water using intensity) was applied in developing the retailer models. Rates of use were calculated given Equation (1) below, where for any given model sector Q reflects volumetric consumption, N is the count of driver units, and q is the rate of water use per driver unit.

$$Q \equiv N * \frac{Q}{N} \equiv N * q \qquad \textbf{(1)}$$

Rate of use differentiation requires a reliable and consistent historical driver unit dataset for model development and a corresponding future dataset representing projected driver unit counts. Consistent and reliable driver unit datasets for the retailer models were developed using data from the California Department of Finance (CADOF; historical data) and the Association of Bay Area Governments (ABAG; future projected data).[3] Corresponding driver units were not available for the non-retailer groundwater pumpers, so models were developed on a volumetric basis. Table 1-1 documents the driver units and corresponding rate of use for each retail model sector.

Table 1-1: Driver Units and Rate of Use for Each Retail Model Sector

Model Sector	Driver Unit (N)	Corresponding Rate of Use (q)
Single Family Multifamily	Housing units	Consumption per housing unit
CII	Employees	Consumption per employee
CII (Stanford)	Population	Consumption per capita

[3] Refer to Technical Memorandum 2: Data Collection and Review (TM 2).

1.3 Method / Statistical Approach

Valley Water collected historical consumption data from its retail agencies,[3] which generally spanned the period 2000-2018.[4] This dataset was sufficient from temporal, geographical, and sectoral perspectives (following sectoral standardization) to explore fitting customized statistical / econometric models identified in TM 1.[2] Development of historical econometric models provide a strong analytical benefit in forecasting demand, as they allow for the estimation of cause-effect relationships between weather, price, socioeconomic, and other factors that lead to variability in water demand. Quantifying these causal relationships allows for analysis of "what-if" scenarios that are uncertain, but important to consider for planning (e.g., climate change, development patterns, drought recovery).

Development of statistical / econometric models is an iterative process. Figure 1-2 and Table 1-2 outline the process used to fit the econometric models.

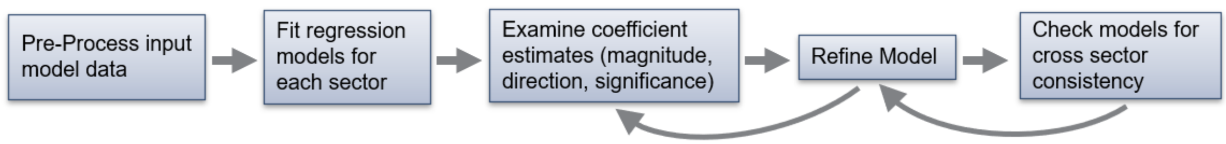


Figure 1-2: Process for Developing Statistical / Econometric Models

Table 1-2: Description of Model Fitting Procedures

Model Fitting Procedure	Description
Pre-process model input data[(a)]	Conduct necessary pre-processing calculations prior to model fitting, e.g.: • Geographical processing of driver units. • Calculate per-unit use. • Calculate natural logarithms of per-unit use and appropriate predictors. • Calculate departures from normal conditions for appropriate predictors (i.e., economic trend and weather). • Calculate any index, "dummy", or interacted parameters (e.g., seasonal cycle, geography, drought severity). • Smoothing monthly and bimonthly data to adjust for irregular billing cycles.
Fit regression models for each sector	Use statistical estimation software (e.g., R, SAS, EViews) to fit linear regression equations to per unit use with the initially selected predictor variables.
Examine coefficient estimates and measure of fit	Check measures of fit (e.g., R^2) and coefficient estimates for reasonable magnitude, direction/sign, and significance.
Refine model to improve measures of fit and coefficient estimates	If the model fit is poor or if coefficient estimates are illogical or insignificant, several actions can be taken, including but not limited to: • Identifying and removing outlier data points that have significant leverage on coefficient estimates. • Remove predictors with insignificant or illogical coefficient estimates from the regression equation. • Testing alternate specifications of predictor variables.
Check models for cross-sector consistency	Model fits and predictors are compared across sectors to judge estimates relative to prior expectations; e.g., testing if the relative effects of price and socioeconomic variables vary by sector in a logical way based on past experience.
[(a)] Model data pre-processing is detailed in TM 2.	

[4] Retail agencies submitted historical billing records of varying lengths. Sufficient retailers submitted records from 2000-2018 to establish model fits over the time period.

1.4 Summary of Model Predictors

Several model predictors were used to develop Valley Water's demand model. To be considered for use, potential predictors needed to pass the following conceptual criteria:

- Logical connection to explaining changes in water consumption;
- Historical record consistent with the time series of observed water consumption; and
- Availability of future projections consistent with the desired forecast horizon (i.e., 2020-2045) or a reasonable basis for assuming or generating projected values.

Initial selection of model predictors is discussed in detail in TM 2. However, during the model fitting process, derivatives of initial variables were also developed and included in subsequent model equations. One example is time lags on weather variables; supplementary variables were created from the temperature and precipitation time series at one to three-month lags. These lagged weather variables aimed to capture a delayed or persistent response in water use. A second example is an extended drought effect variable. The initial drought variables were directly calculated from historic water use restrictions. A supplemental drought variable was created that extended the last historic occurrence of mandatory water restrictions (2017) through the end of the historic dataset (2019); this "extended drought effect" variable was considered to represent inertia in behavioral changes in water use after the water use restrictions were no longer in place (i.e., delayed drought rebound). Table 1-3 details the predictors used to develop the demand models and identifies the expected sign and magnitude of the coefficient estimates resulting from the linear regression.

Table 1-3: Description of Demand Model Predictors

Predictor Variable	Log Transformed?	Expectations about Coefficient Estimates	Description
Departure from normal temperature[a]	Yes	Positive sign	Represents difference from long-term temperature. Higher than normal temperatures are associated with higher demands.
Departure from normal precipitation[a]	Yes	Negative sign	Represents difference from long-term precipitation. Higher than normal rainfall is associated with lower demands.
Seasonal index	No	Larger absolute magnitudes for agencies with greater seasonal peaking	Reflects the cyclical pattern in water use where demands a generally higher in the summer and lower in the winter. Represented in the model as a sine / cosine pair of variables.[b]
Price	Yes	Negative sign with absolute value between 0 and 1	Economic theory suggests negative correlation with demand.
Economic index	Yes	Positive sign	Several economic indices were explored as potential predictors[c] with the detrended Economic Cycles Research Institute (ECRI) selected as the index that produced the most reasonable coefficient estimates across model sectors. Water demand is positively correlated with economic fluctuations of the business cycle. The index is modeled in form of departures from long-term trend.
Housing density	Yes	Negative sign (commonly with absolute value between 0 and 1)	Housing density is negatively correlated with demand; on average, residences with more units per acre (or smaller parcel sizes) tend to use less water on outdoor uses.
Median income	Yes	Positive sign (commonly with absolute value between 0 and 1)	Economic theory suggests positive correlation of income with demand; generally geographical areas with higher median incomes tend to use more water.
Persons per household	Yes	Positive sign (commonly with absolute value between 0 and 1)	Positively correlated with demand; generally, residences with more people tend to use larger amounts of water.
Mix of Industries / economic activity[d]	Yes	N/A	The representation of industries / economic activity with a geographical area is related to the amount of water used within the CII sector. Fitted parameters for these variables are generally unique by utility, thus there is no generally accepted range of coefficient estimates.
Drought Severity	No	Negative sign	Reflects the effect of drought restrictions from the most recent drought (2014-2017, with extended restrictions though 2019) on water demand.[e] Defined as the presence of drought restrictions (represented as a binary) multiplied by the requested cutback (e.g. 0-30%).

[a] Lagged values of temperature and precipitation were also evaluated and included as model predictors as the influence of weather on water demand can persist several months.

[b] Most sectors have a single sine/cosine pair representing the seasonal cycle, except for Stanford. Stanford has two sine/cosine pairs to capture seasonal effects associated with the academic calendar. See Section 4.3 for additional discussion.

[c] Other economic indices explored as potential predictors are documented in TM 3.

[d] Detail on the derivation of specific predictors representing mix of industries / economic activity is documented in TM 3.

[e] A unique prediction variable was also evaluated for the 2008-2011 drought but was dropped during the model development process as the coefficient estimate was not statistically significant. The 2008-2011 drought overlapped with the severe economic downturn of the Great Recession which likely mutes its statistical significance.

2. Single Family Regression Development

This section reviews the development of the statistical regression for the single family residential sector.

2.1 Model Predictors and Fitted Coefficients

The fit for the final single family regression is presented in Table 2-1. Coefficient estimates are within the expected range for all explanatory variables.

Table 2-1: Single-Family Regression Predictors and Coefficients

Variable	Coefficient	Standard Error	t-Statistic	Probability
Intercept	3.821	0.324	11.776	<0.05
Seasonal index 1[(a)]	-0.283 (avg) -0.045 to -0.185	0.013 (avg) 0.008 to 0.026	-24.086 (avg) -7.379 to -24.086	<0.05
Seasonal index 2[(a)]	-0.262 (avg) -0.616 to -0.064	0.013 (avg) 0.008 to 0.026	-23.026 (avg) -44.960 to -3.786	<0.05
Departure from normal temperature	1.008	0.135	7.464	<0.05
Departure from normal temperature, 1-month lag	0.824	0.137	5.997	<0.05
Departure from normal temperature, 2-month lag	0.354	0.137	2.583	<0.05
Departure from normal temperature, 3-month lag	0.306	0.127	2.413	<0.05
Departure from normal precipitation	-0.008	0.003	-3.01	<0.05
Departure from normal precipitation, 1-month lag	-0.009	0.003	-3.649	<0.05
Departure from normal precipitation, 2-month lag	-0.004	0.003	-1.582	0.114
Price	-0.085	0.009	-9.942	<0.05
Economic index	0.945	0.101	9.316	<0.05
Housing density	-0.406	0.007	-60.745	<0.05
Median income	0.195	0.025	7.778	<0.05
Persons per household	0.473	0.04	11.907	<0.05
Drought severity, extended	-1.506	0.048	-31.109	<0.05
[(a)] Seasonal indices are unique to each retail agency.				

Variables with an increasing effect on water use (i.e., a positive coefficient) included temperature, economic index, median income, and persons per household. Variables with a decreasing effect on water use (i.e., a negative coefficient) included precipitation, price, housing density, and the extended drought effect.

2.2 Historical Model Performance

Figure 2-1 shows the observed and predicted per-unit use for the single family sector in gallons per unit per day (gpud) calculated as a unit-weighted average across all retail agencies. Performance of the single family regression is summarized in Table 2-2 which shows performance metrics for unit-weighted average County-wide demand. Visual inspection of the time series plot and review of the model fit parameters showed good performance at the County-wide level, including strong agreement with the observed seasonal cycle and ability to reproduce declining consumption during the Great Recession, recovery between the Great Recession and the recent drought, and the sharp decline and muted recovery following the most recent drought.

Historical performance of the single family regression was also strong at the retail agency-level. Model fit statistics calculated at the retail agency-level generally mirrored County-wide performance. Model fit statistics and time series plots for each retailer are presented in Appendix B.

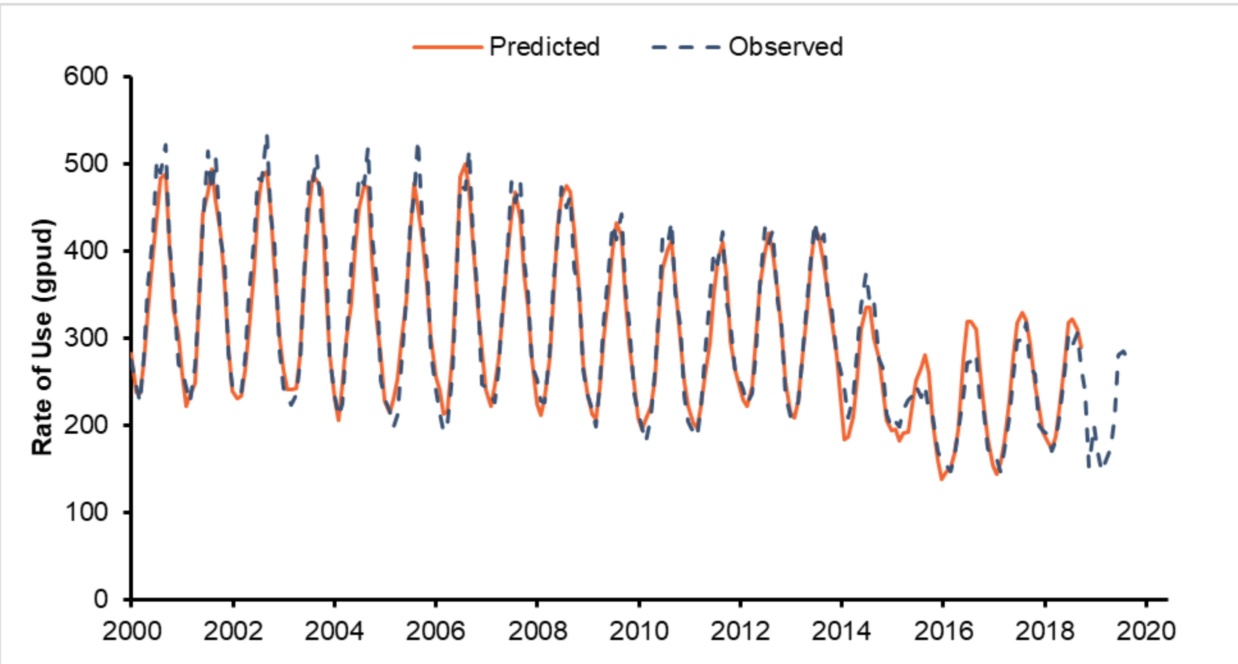


Figure 2-1: County-Wide Single-Family Observed and Predicted Per Unit Rate of Use

Table 2-2: County-Wide Single-Family Regression Performance Metrics

Regression Statistic[a]	Value
R-squared	0.95
Average Observed Value (gpud)	305.71
Mean Absolute Percentage Error	5.82%
Mean Bias	-1.13%
[a] Statistics calculated using County-wide unit-weighted average observations and predicted values from the regression fits.	

3. Multifamily Regression Development

This section reviews the development of the statistical regression model for the multifamily residential sector.

3.1 Model Predictors and Fitted Coefficients

The fit for the final multifamily regression is presented in Table 3-1. Though most predictors are the same as the single family sector, several predictors (e.g., median income and 2-month lagged departure from precipitation) were dropped and certain predictors (e.g., the intercept term and drought severity) were allowed to vary by retail agency. These modifications to the model design resulted in stronger measures of fit and more reasonable coefficient estimates. Final coefficient estimates presented in Table 3-1 are within the expected range for all explanatory variables.

Table 3-1: Multifamily Regression Predictors and Coefficients

Variable	Coefficient	Standard Error	t-Statistic	Probability
Intercept	5.209	0.074	70.141	<0.05
Agency-specific intercepts[(a)]	-0.223 (avg) -0.719 to 0.280	0.013 (avg) 0.007 to 0.023	-31.555 (avg) -104.09 to 15.203	<0.05
Seasonal index 1[(b)]	-0.161 (avg) -0.372 to -0.056	0.012 (avg) 0.006 to 0.031	-16.311 (avg) -35.651 to -3.872	<0.05
Seasonal index 2[(b)]	-0.138 (avg) -0.255 to -0.056	0.012 (avg) 0.006 to	-13.943 (avg) -29.588 to -13.943	<0.05
Departure from normal temperature	0.488	0.098	4.974	<0.05
Departure from normal temperature, 1-month lag	0.514	0.100	5.155	<0.05
Departure from normal temperature, 2-month lag	0.397	0.094	4.226	<0.05
Departure from normal temperature, 3-month lag	0.194	0.092	2.101	<0.05
Departure from normal precipitation	-0.002	0.002	-1.127	0.260
Departure from normal precipitation, 1-month lag	-0.006	0.002	-2.954	<0.05
Price	-0.055	0.013	-4.347	<0.05
Economic index	1.568	0.091	17.226	<0.05
Housing density	-0.205	0.011	-18.105	<0.05
Persons per household	0.900	0.057	15.788	<0.05
Drought severity, extended[(c)]	-0.718	0.044	-16.294	<0.05

[(a)] Several agencies including San Jose Water Company, San Jose Municipal Water, Great Oaks Water Company, City of Gilroy, California Water Service, and the City of Sunnyvale were fitted with agency-specific intercept terms in order to optimize historical model performance.

[(b)] Seasonal indices are unique to each retail agency.

[(c)] Recorded drought severity coefficient estimate is for all agencies except San Jose Water Company, which was fitted an agency-specific drought severity coefficient.

Variables with an increasing effect on water use (i.e., a positive coefficient) included temperature, economic index, and persons per household. Variables with a decreasing effect on water use (i.e., a negative coefficient) included precipitation, price, housing density, and the extended drought effect.

3.2 Historical Model Performance

Figure 3-1 shows the observed and predicted per-unit use for the multifamily sector in gpud calculated as a unit-weighted average across all retail agencies.[5] Performance of the multifamily regression is summarized in Table 3-2 which shows performance metrics for unit-weighted average County-wide demand. Visual inspection of the time series plot and review of the model fit parameters showed good model performance at the County-wide level, including strong agreement with the observed seasonal cycle and ability to reproduce declining consumption during the Great Recession, recovery between the Great Recession and the recent drought, and the sharp decline and muted recovery following the most recent drought.

Historical performance of the multifamily regression was also strong at the retail agency-level. Model fit statistics calculated at the retail agency-level generally mirrored County-wide performance. Model fit statistics and time series plots for each retailer are presented in Appendix C.

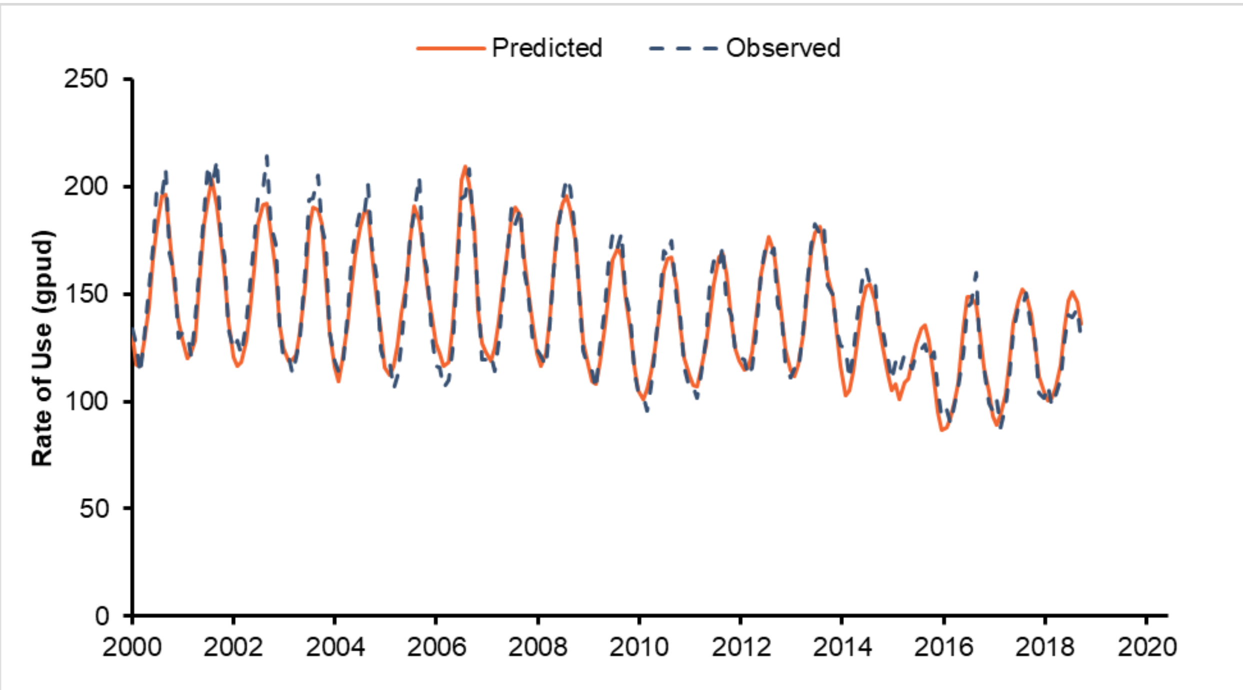


Figure 3-1: County-Wide Multifamily Observed and Predicted Per Unit Rate of Use

[5] Figure 3-1 excludes an outlier monthly observed datapoint for a single retail agency.

Table 3-2: County-Wide Multifamily Regression Performance Metrics

Regression Statistic[a]	Value
R-squared	0.94
Average Observed Value (gpud)	142.26
Mean Absolute Percentage Error	4.53%
Mean Bias	-0.87%
[a] Statistics calculated using County-wide unit-weighted average observations and predicted values from the regression fits.	

4. CII Regression Development

This section reviews the development of the statistical regression for the CII sector. Distinct regressions representing the commercial, industrial, and institutional water use sectors[6] were initially considered. However, different billing classification schemes among retail agencies introduced definitional uncertainty in sectoral water use and driver units. For example, certain agencies lacked a distinct industrial billing classification while others combined commercial and institutional categories. Additional verification of water use at the account-level was not possible given the data constraints for this project.[7] In response to these constraints and uncertainties, total use within the commercial, industrial, and institutional sectors was consolidated into a single composite CII regression. The benefit of combining these sectors is a more parsimonious representation with respect to number of sectors, while providing a means to use the mix of industries to explain CII water use variability across retail agencies.

4.1 Model Predictors and Fitted Coefficients

Model predictors for the final CII regression equation along with their statistics are in Table 4-1. Note that understanding/quantifying the types of economic activity occurring within the County are important to understanding changes in CII consumption over time. Since individual regressions for the commercial, industrial, and institutional sectors were not developed, predictor variables representing the relative proportion of employment among different industry groupings was used in the CII regression. Proportional employment based on industry grouping is meant to reflect the relative mix of industries / economic activity within each retail agencies' service area. Most CII model predictors are similar to those used for the single family and multifamily sectors, however certain variables (e.g., 3-month lagged departure from normal temperature) were excluded during the regression refinement process. Final coefficient estimates presented in Table 4-1 are within the expected range for all explanatory variables.

[6] Refer to Appendix A for a summary of standardized sectors by retail agency.

[7] The finest spatial resolution of all consumption data was at the retail agency-level.

Table 4-1: CII Regression Predictors and Coefficients

Variable	Coefficient	Standard Error	t-Statistic	Probability
Intercept	-0.186	0.268	-0.695	0.49
Seasonal index 1[(a)]	-0.29 (avg) -0.41 to -0.17	0.02 (avg) 0.01 to 0.03	-20.79 (avg) -33.3 to -9.2	<0.05
Seasonal index 2[(a)]	-0.34 (avg) -0.53 to -0.10	0.02 (avg) 0.01 to 0.03	-23.34 (avg) -39.2 to -3.5	<0.05
Departure from normal temperature	1.037	0.158	6.580	<0.05
Departure from normal temperature, 1-month lag	0.912	0.161	5.657	<0.05
Departure from normal temperature, 2-month lag	0.370	0.158	2.340	<0.05
Departure from normal precipitation	-0.003	0.003	-0.997	0.32
Departure from normal precipitation, 1-month lag	-0.007	0.003	-2.312	<0.05
Departure from normal precipitation, 2-month lag	-0.002	0.003	-0.692	0.49
Price	-0.062	0.025	-2.453	<0.05
Economic index	0.963	0.140	6.881	<0.05
Proportion of total Employment (Retail)	0.142	0.032	4.430	<0.05
Proportion of total Employment (Professional Services)	0.499	0.031	16.065	<0.05
Proportion of total Employment (Information, Government, and Construction)	0.093	0.026	3.508	<0.05
Proportion of total Employment (Industrial)	0.351	0.026	13.249	<0.05
Proportion of total Employment (Health Education, and Recreational Services)	0.466	0.059	7.923	<0.05
Drought severity, extended	-1.424	0.070	-20.232	<0.05
[(a)] Coefficients vary by retailer.				

Variables with an increasing effect on water use (i.e., a positive coefficient) included temperature, economic index, and the mix of industries/economic activity ratios. Variables with a decreasing effect on water use (i.e., a negative coefficient) included precipitation, price, and the extended drought effect.

4.2 Historical Model Performance

Figure 4-1 shows the observed and predicted per-unit use for the CII sector in gallons per employee per day (gped) calculated as a unit-weighted average for across all retail agencies. Performance of the CII model is summarized in Table 4-2 which shows regression performance metrics for county wide demand. Visual inspection and performance metrics showed good model performance including the same seasonal cycle and quantities. The CII regression was also able to reproduce declining consumption during the Great Recession, recovery between the Great Recession and the recent drought, and the sharp decline and muted recovery following the most recent drought.

Historical performance of the CII regression was also strong at the retail agency-level. Model fit statistics calculated at the retail agency-level generally mirrored County-wide performance. Model fit statistics and time series plots for each retailer are presented in Appendix D.

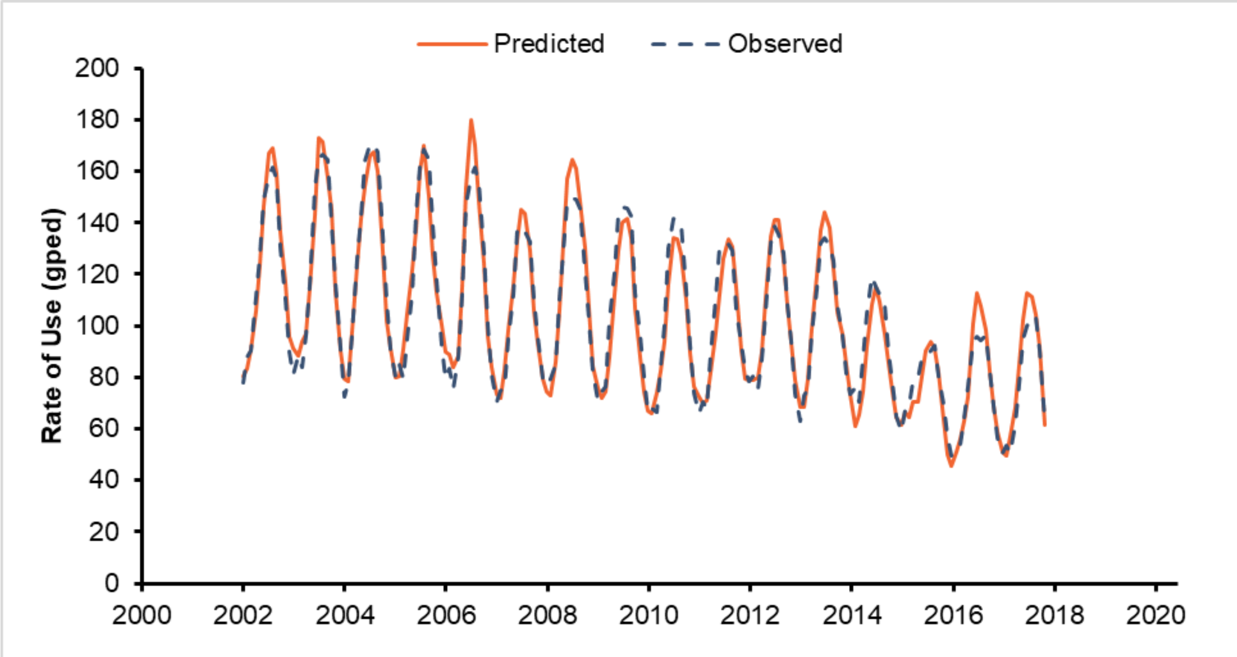


Figure 4-1: CII Observed and Predicted Rate of Use

Table 4-2: County-Wide CII Regression Performance Metrics

Regression Statistic[a]	Value
R-squared	0.96
Average Observed Value (gped)	103.89
Mean Absolute Percentage Error	5.08%
Mean Bias	-0.06%
[a] Statistics calculated using County-wide unit-weighted average observations and predicted values from the regression fits.	

4.3 Stanford University Regression Development

As an academic institution, Stanford University (Stanford) is considered part of the CII sector. However, an independent regression for Stanford was developed given its unique characteristics among retailers. Unlike other retail agencies, Stanford does not have accounts in the traditional sense as individual users are not billed. Additionally, employee water use as the sole driver unit (consistent with the CII sector for other retailers) is not appropriate for Stanford as students account for a significant portion of water use. This distinction informed the decision to use population (understood to be total faculty, staff, and students) as the driver unit for Stanford. Since the driver unit for the Stanford CII model was population, rather than jobs like the rest of the retailers' CII use, rate of use must be modeled separately. It is expected that the significant variables and/or magnitudes of coefficients would be different for Stanford than the other retailers' CII sectors due to the difference in driver units. A discussion of Stanford's regression predictors and fitted coefficients is presented in Appendix E. A summary of the Stanford's historical model performance is included in Appendix D.

5. Non-Retail Groundwater Pumper Regression Development

Historic water use for non-retail groundwater pumpers includes groundwater use by private well owners that are outside of retailers' service areas. Historic groundwater use was reported by groundwater basin and billing classification. The groundwater basins include Santa Clara Plain (referred to as charge zone "W2") as well as Coyote Valley sub-basin management area and the Llagas sub-basin and (referred to as charge zone "W5"). Water use was classified as either agricultural or municipal/industrial (M&I). M&I can include residential domestic water use.

Historical regression fits for non-retail groundwater pumpers were performed on annual water use. Agricultural water use was typically reported annually or semi-annually. M&I use was reported monthly or semi-annually. As a result, a monthly resolution for model fitting was not possible.

Further, historical model fits for non-retail groundwater pumpers were performed on a volumetric basis. Typical driver units for groundwater use, such as number of wells, did not support the "rate of use times driver" approach that was used for single family, multifamily, and CII model development.

Fitted models were only finalized for the M&I sector for the two groundwater basins. Agricultural use was often reported semi-annually (in January and July) and was estimated by a "table of averages" approach based on crop type, resulting in a lack of variability that could be modeled by predictor variables. Initial exploration of statistical/econometric model development showed that agricultural water use has been generally constant over the last twenty years and was not well-characterized by typical predictor variables.

5.1 Model Predictors and Fitted Coefficients

Model predictors for the non-retail groundwater pumpers M&I regression models along with their statistics are in Table 5-1. The two groundwater zones were modeled separately; a combined regression provided no improvement in the statistical significance of coefficients.

Table 5-1: Predictors for Non-Retail Groundwater Pumpers M&I Regression.

Basin	Variable	Coefficient	Std. Error	t-Statistic	Prob.
W2	Intercept	-0.59	4.08	-0.14	0.89
	Drought	-0.70	0.20	-3.54	<0.05
	Price	-0.81	0.06	-13.31	<0.05
	Temperature[a]	1.83	0.93	1.98	0.07
W5	Intercept	1.43	0.47	3.04	<0.05
	Number of Wells	0.19	0.04	5.56	<0.05
	Drought	-0.31	0.15	-2.09	0.06
	Price	-0.12	0.05	-2.41	<0.05
	Precipitation[a]	-0.09	0.02	-3.62	<0.05

[a] Temperature and precipitation for non-retail groundwater pumper models were in absolute terms, not departures from normal.

Variables with an increasing effect on water use (i.e., positive coefficient) included maximum temperature (used in the W2 model only) and number of wells (used in the W5 model only). Variables with a decreasing effect on water use (i.e., negative coefficient) included the extended drought effect, price, and precipitation (used in the W5 model only). Economic indices, density, and median income were not found to be statistically significant for the groundwater M&I regressions. Note that temperature was found to be statistically significant for the W2 charge zone but not for the W5 charge zone regression, while precipitation was found to be statistically significant for W5 but not W2.

5.2 Historical Model Performance

Performance of the groundwater M&I regressions is summarized in Table 5-2. Figure 5-1 and Figure 5-2 show the observed and predicted demand for the M&I sector for groundwater charge zone W2 and W5, respectively. The M&I W5 regression had a lower correlation coefficient than all other model fits described in this TM, likely due to the relatively constant annual average water use over the available period.

Table 5-2: Regression Performance Metrics for Groundwater M&I Models

Regression Performance Metric	M&I, W2	M&I, W5
R-squared	0.96	0.81
Average Observed Value (mgd)	7.81	7.68
Mean Absolute Percent Error	4.32%	3.54%
Mean Bias	-0.22%	-0.09%

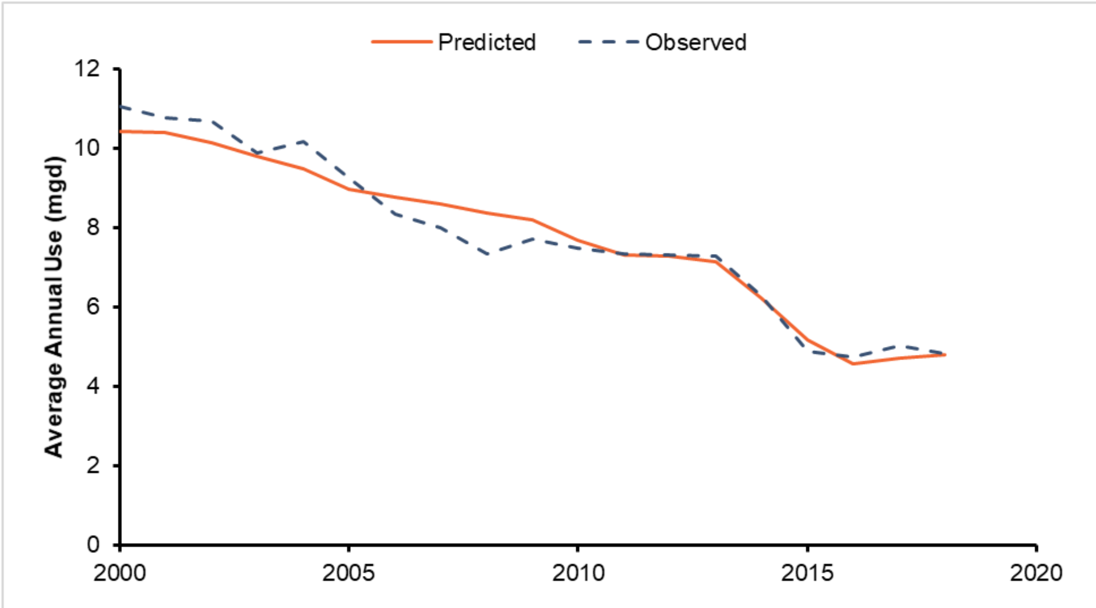


Figure 5-1: Observed and Predicted M&I Demand for Groundwater Basin W2

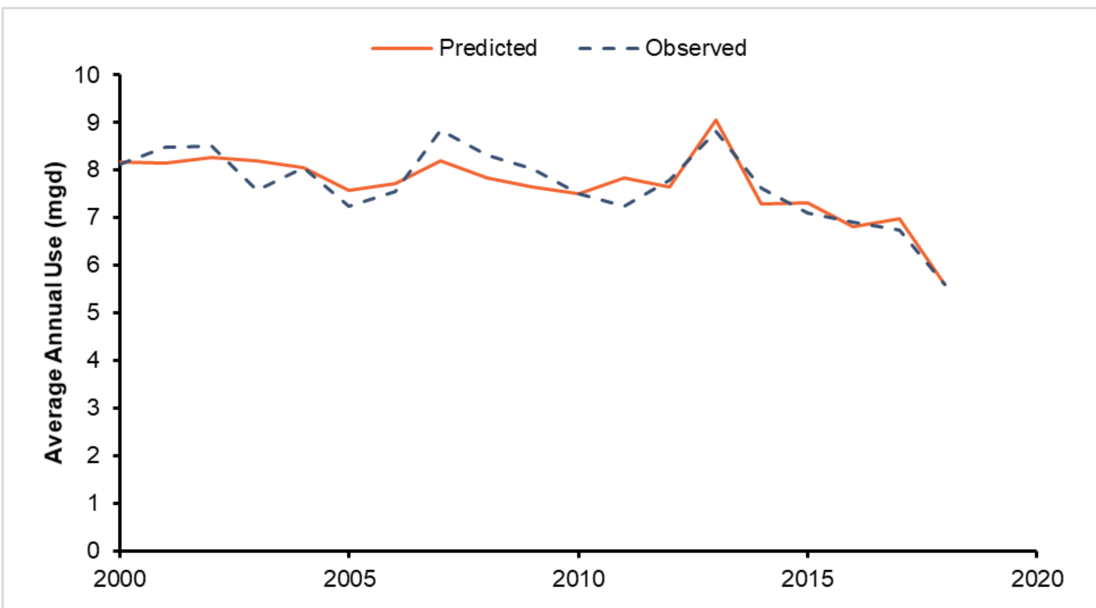
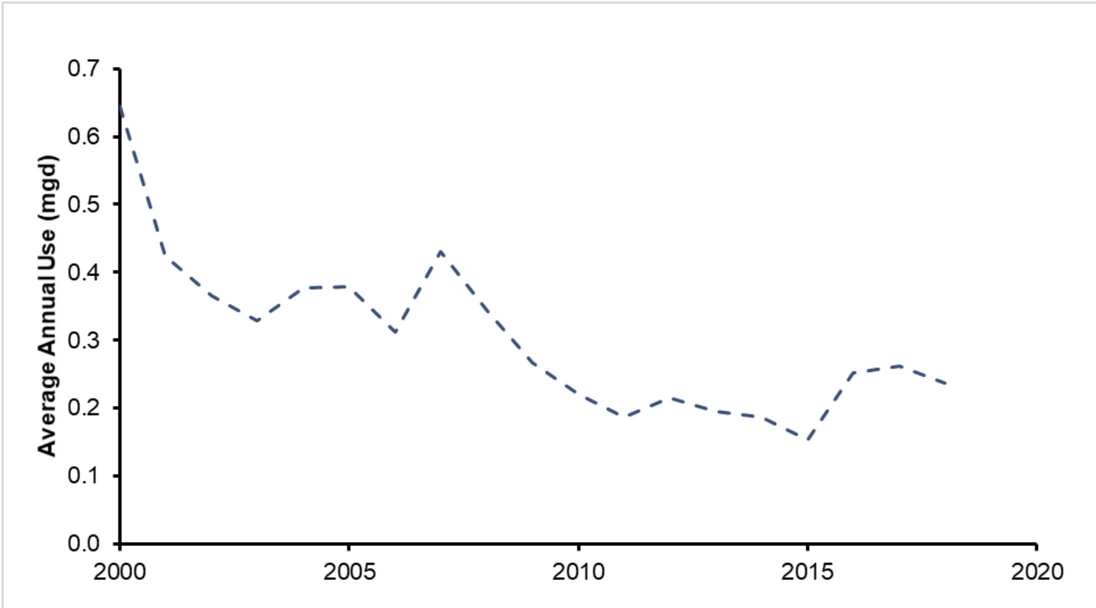


Figure 5-2: Observed and Predicted M&I Demand for Groundwater Basin W5

Figure 5-3 shows historic agricultural water use for the W2 and W5 charge zones. Agricultural water use in the W2 charge zone is less than 1 mgd and has been slightly declining over the last twenty years. Agricultural water use in the W5 charge zone has been generally constant over the last twenty years at approximately 23 mgd. Initial exploration of statistical/econometric model development showed that agricultural water use was not well-characterized by typical predictor variables. Agricultural water use in both charge zones would be well-represented by an average water use from a historical reference period that is then held constant into the future.



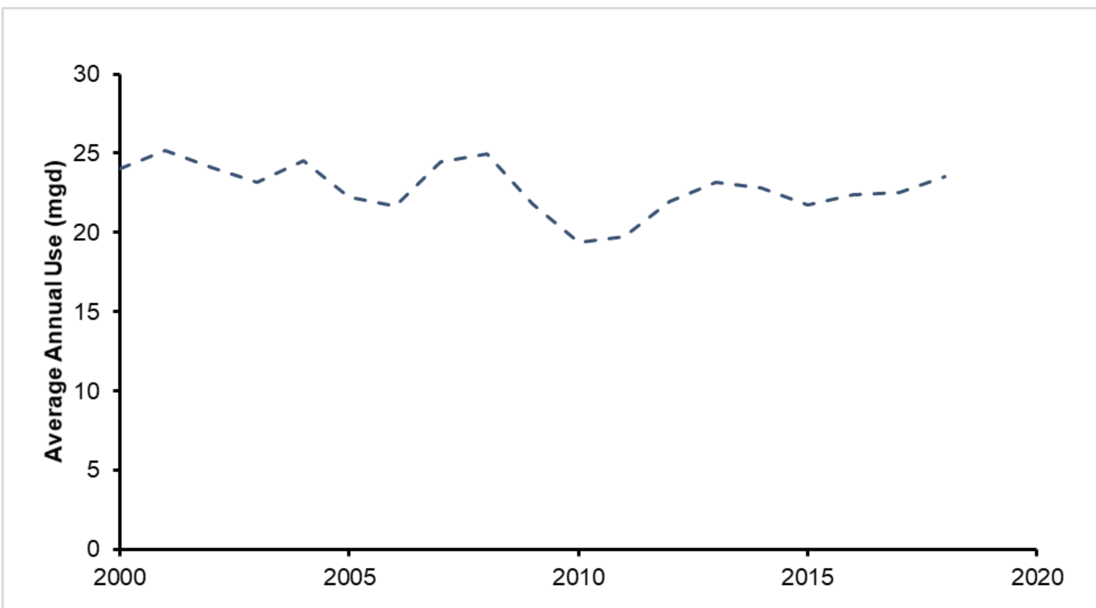


Figure 5-3: Observed Agricultural Demand for Groundwater Basin W2 (top) and W5 (bottom)

6. Summary / Conclusions

In summary, the statistical/econometric regressions presented in TM 2/4 show strong performance is explaining historical patterns of consumption over the last 20 years, including two major droughts and the Great Recession. All regressions had R-squared values of 0.81 or greater. The retailer-specific regressions, which represent the majority of water use in the County, had R-squared values of 0.94 or greater. None of the regressions demonstrated a large consistent bias. Based on this analysis, the regression reflect a suitable basis for forecasting.

The overall model approach allows for demand forecast scenario analysis based on varying assumptions of future conditions. Several forecast scenarios may be explored, including climate change-adjusted weather, alternate assumptions around the timing and magnitude of drought recovery, alternate assumptions around urban development, and/or different assumptions around future economic conditions. For any of these future scenarios, the model coefficients developed in this TM should be maintained as they reflect the best fitted estimates of causal relationships between external socioeconomic conditions and historical water demand given the available modeling data. Model scenarios can also be developed to address uncertainties in future predictor variables, such as housing / job growth and density. Future inputs in these scenarios could be conducted as a sensitivity analysis or be driven by alternate growth projections.

On a regular basis, overall model performance should be evaluated. Annually, forecasted consumption and input assumptions (e.g., driver unit counts, economic conditions, water rates, etc.) can be compared with observed conditions as data becomes available to monitor predictive performance. Less frequently (around every 5 years) model predictors should be revaluated using the process outlined in Figure 1-2. Major events, such as another drought or a severe economic recession may necessitate reexamination and/or refitting model coefficients and may cause changes in longer term expectations over the forecast period. As more data becomes available on the impacts of COVID-19 on County demographics and water use (e.g., potential shifts in CII to residential demand), reexamination of the underlying sectoral rates of water use as well as model coefficients should be conducted.

Attachment 2 Water Supply Master Plan Project Description

Project Type	Project Name	Description
Alternative Supply	**Potable Reuse – Palo Alto**	Construction of an Advanced Water Purification Facility in Palo Alto capable of producing up to 10 MGD of purified water, for groundwater replenishment at the existing percolation ponds within the Los Gatos Recharge System Complex (LGRS). This project is included in the CIP.
	Potable Reuse – San Jose	Constructs an expanded advanced water purification facility in San Jose to increase purified water for potable reuse.
	Refinery Recycled Project	Builds a tertiary recycled water facility in Contra Costa County through a partnership with Central San. Central San would provide the recycled water produced from the facility to two oil refineries in Contra Costa County. Valley Water would then receive Contra Costa Water District's (CCWD) Central Valley Project (CVP) water currently used by the refineries. This project has an existing committee.
	Local Seawater Desalination Project	Proposes a seawater desalination project in Santa Clara County using seawater from the South San Francisco Bay to obtain a reliable local water supply. The project would provide treated water supplies directly to Valley Water's treated water system for distribution to customers but would generate brine effluent that requires management. This project is at the pre-feasibility stage
Surface Water Supply	**Delta Conveyance Project**	Modernizes the State Water Project (SWP) infrastructure by constructing alternative conveyance to divert up to 6,000 CFS from the Sacramento River north of the Delta and deliver it to SWP facilities at the southern end of the Delta. The project helps restore and protect the reliability of SWP water deliveries and, potentially, CVP water supplies south of the Delta.

	Sites Reservoir	By partnering with other agencies, builds an off-stream water supply reservoir north of the Delta to collect flood flows from the Sacramento River. This project would provide dry year yield and would be operated in coordination with the SWP and CVP, which could improve flexibility of the statewide water system.
	Stormwater - Agricultural Land Recharge (FloodMar)	Recharge stormflows on open space during the winter months. Feasibility study under way.
	Stormwater Capture	Constructs a stormwater capture and infiltration system. Site selection is still underway and will most likely require partnerships with other agencies.
Storage	**Pacheco Reservoir Expansion**	Enlarges Pacheco Reservoir from about 5,500 AF to 140,000 AF and connects the reservoir to the Pacheco Conduit. The reservoir plans to be filled with natural inflow and CVP supplies. Potential project benefits include water for downstream fisheries, emergency storage, and managing water quality impacts. This project is in the CIP.
	Los Vaqueros Expansion	Secures an agreement with CCWD and other partners to expand Los Vaqueros Reservoir by 115,000 AF, use CCWD intakes, and constructs a new pipeline (Transfer-Bethany) connecting the reservoir to the South Bay Aqueduct. This would provide storage and deliveries of delta surplus supplies. This project has a JPA.
	Groundwater Banking	Explores options for securing out-of-county storage through the development of new groundwater banks.

	B.F. Sisk Dam Raise	Increases the height of B.F. Sisk Dam and expands the capacity of San Luis Reservoir by 130,000 AF. New capacity would be shared by Reclamation and project participants and would be operationally integrated with the CVP. Benefits are expected to include dedicated storage capacity and supplemental imported water supply.
Recharge & Pipelines	**Coyote Valley Recharge Pond**	Constructs a new percolation pond(s) in Coyote Valley off-stream of Coyote Creek and near the Cross-Valley Pipeline (CVP). This project would require purchasing land and creating a new turn-out and diversion pipeline from the CVP to the pond. This project helps create operational flexibility for managed recharge operations in Coyote Valley, reducing its reliance on Coyote Creek flows and operational constraints.
	Lexington Pipeline	Constructs a pipeline between Lexington Reservoir (or Vasona Reservoir) and the raw water system to allow surface water from Lexington to be put to beneficial use elsewhere in the county. The pipeline may also convey some wet-weather flows to treatment plants or recharge facilities.
	Lexington-Montevina Water Treatment Plant Connection	Sends water from Lexington Reservoir to San Jose Water Company's (SJWC) Montevina WTP to allow for Lexington water to be used in the SJWC service area. The project would require construction of a pump station and intake pipe from Lexington to Montevina.
	Butterfield Channel Managed Aquifer Recharge	Connects Butterfield Channel to Valley Water's raw water conveyance system so imported water can be recharged along Butterfield Channel during the summer months when it is not used for stormwater conveyance.
	Madrone Channel Expansion	Expand managed aquifer recharge in Madrone Channel by adding one or two dams/ponds downstream of the existing Madrone Channel Pond #10. There's a reach approximately 4,600 feet in length between

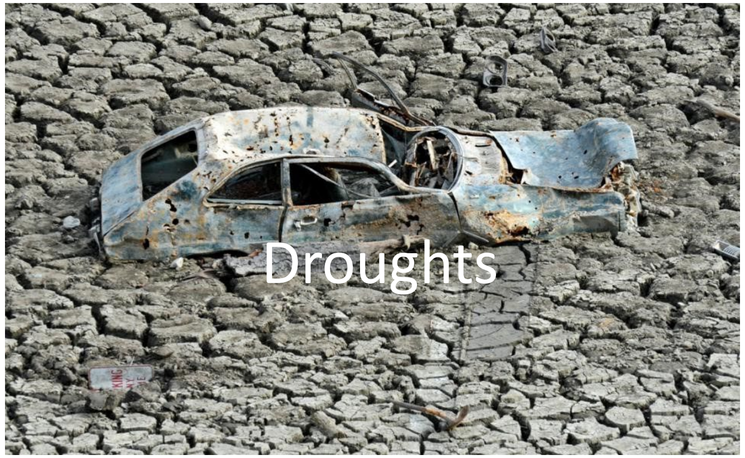
		the dam for pond #10 and the confluence with East Little Llagas Creek, located downstream.
	San Pedro Ponds Improvement Project	Implements a project or program to enable the ponds to be operated at full capacity without interfering with existing septic systems in the vicinity.

Water Supply Master Plan 2050

Joint Water Resources Committee, January 3, 2024

Long-Range Water Supply Planning

- Uncertain future
- Aging infrastructure
- Incomplete information
- Imminent decisions on generational opportunities for investment



valleywater.org

Valley Water

WSMP 2050 Updates

Goals

Planning horizon

Wider range of values

Portfolio approach

Recognition of uncertainty

Planning Goals to Achieve Level of Service

System reliability

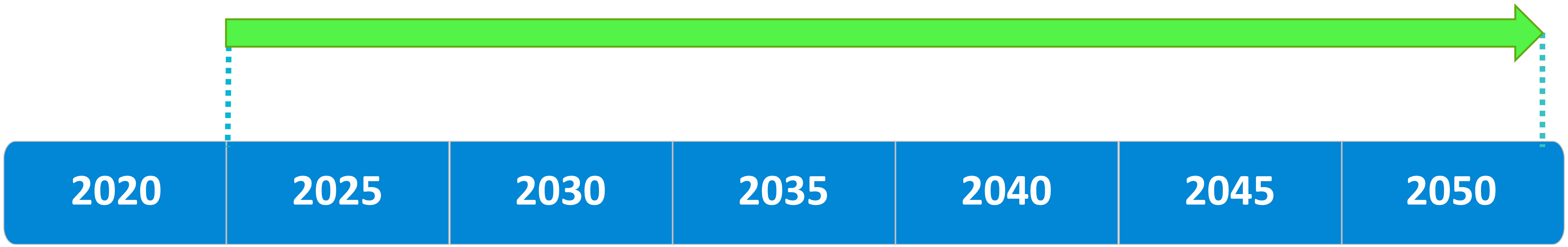
Supply diversification

Reduced shortage risk

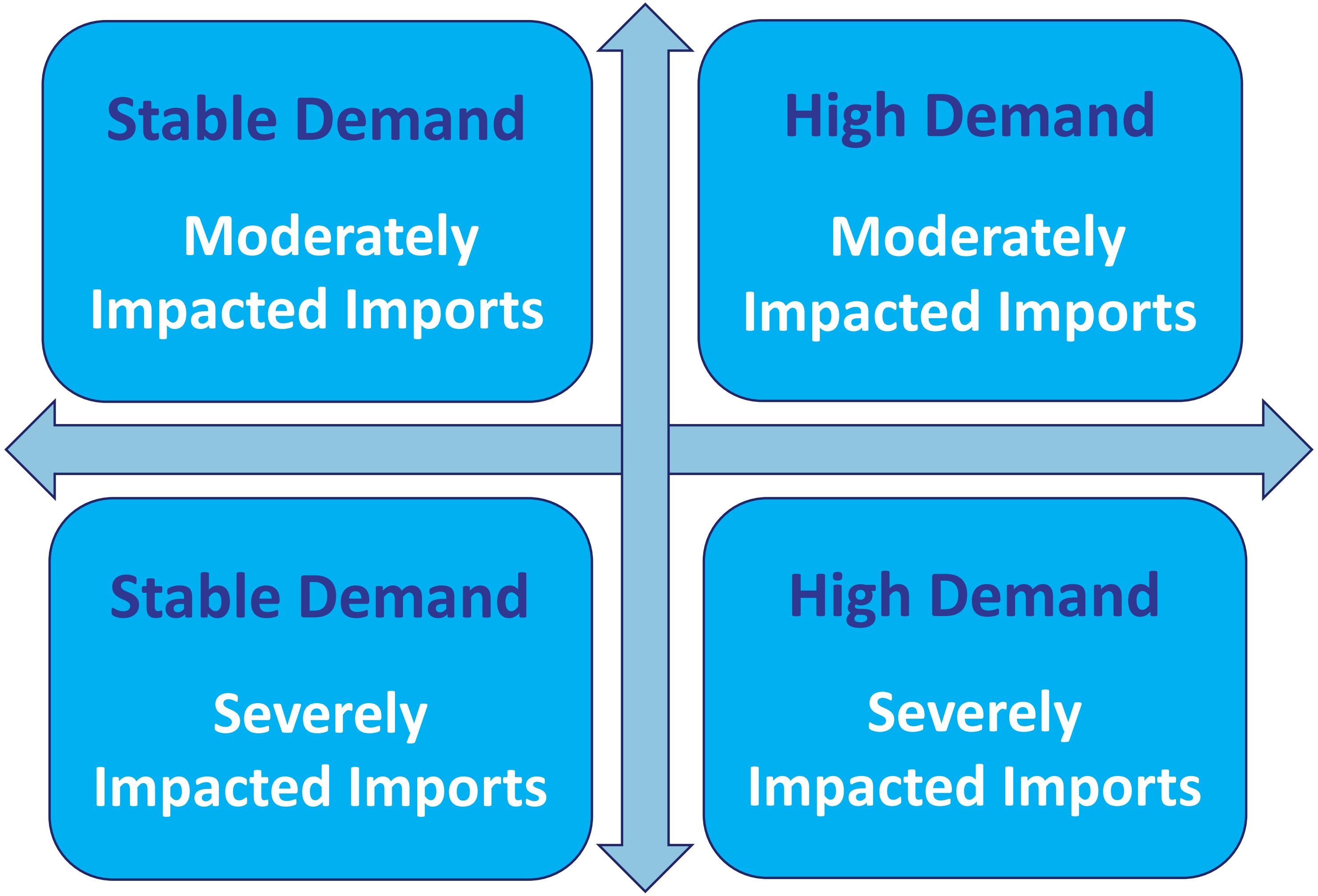
Affordable rates

Planning Horizon

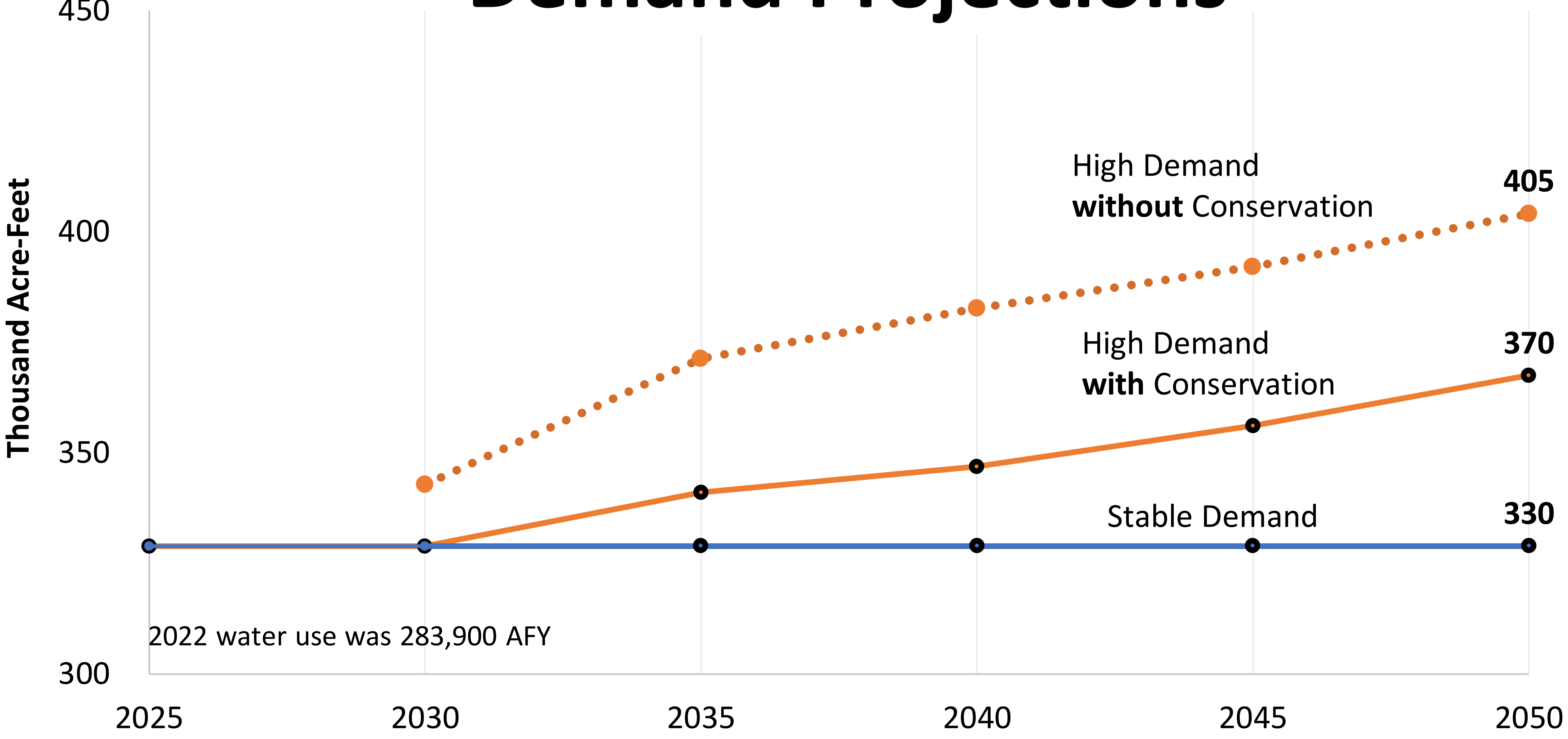
20 years → 30 years



Planning Approach – Scenario Planning



Demand Projections



Demand modeling integrates historic water use trends, housing and economic growth, climate change, and post-drought water use rebound.

Imported Water Supply

Two imported water scenarios

- Moderately impacted imports
- Severely impacted imports

Climate change considered

Baseline Assumptions

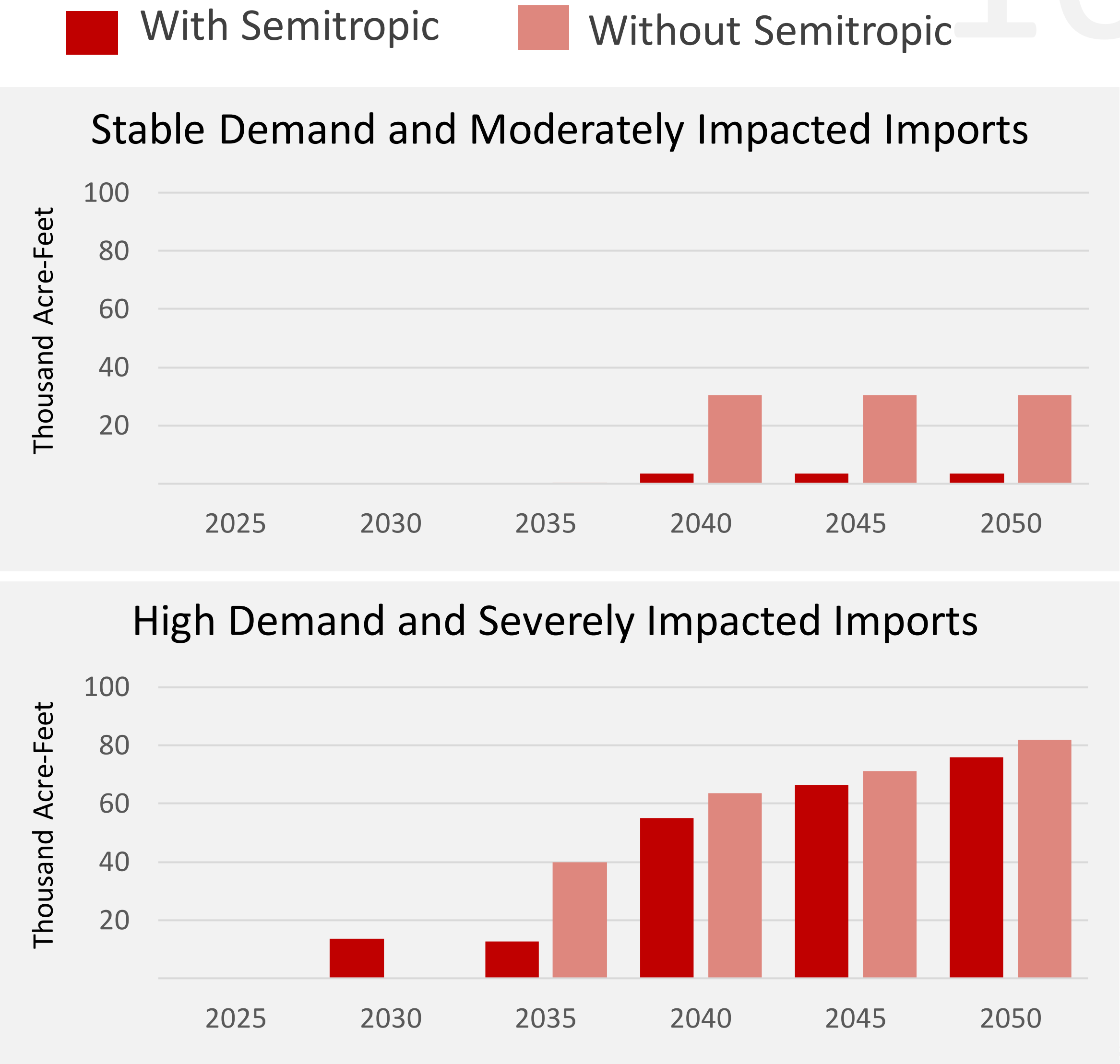
Achieve long-term conservation goals

Complete dam seismic retrofits by 2035

Maintain Valley Water assets

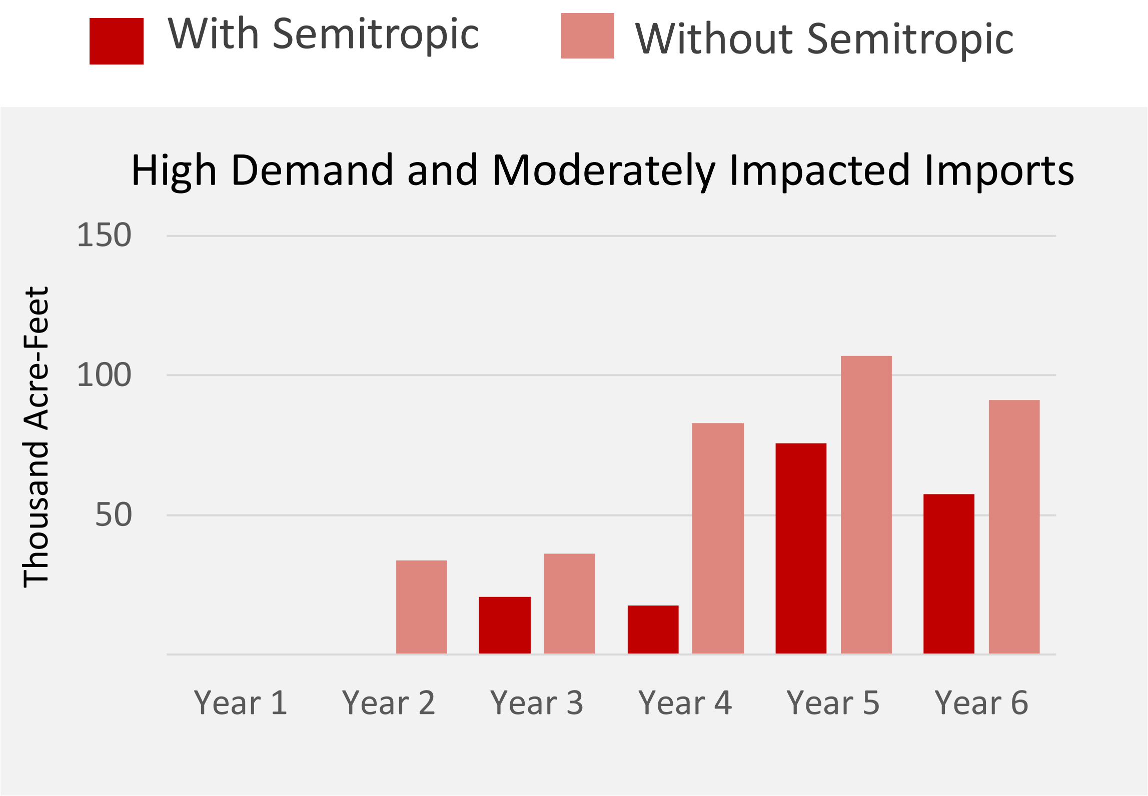
Water Supply Needs – Planning Horizon

- Shortage in all scenarios and as early as 2030
- Average annual shortages 4-76 TAF in 2050
- Out-of-County groundwater storage important



Water Supply Needs – Drought in 2050

- 2-year drought manageable
- Need for investment



Future Investment Options

- Alternative supply - dependable during drought/year round
- Surface supply - increase reliability and resilience
- Storage - capture excess water supply in wet years to be used during drought years
- Recharge ponds and pipeline – increase local supply

Projects Under Consideration

- Conservation (20+)
- Alternative Supply (4)
- Surface Supply (4)
- Storage (4)
- Recharge & Pipelines (6)

South County Water Supply and Use (2010–2019)

Groundwater

94%

WATER USE

SUPPLY

41%
Replenished from local rainfall

37%
Replenished from local reservoirs

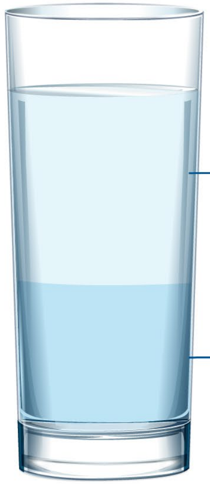
22%
Replenished from imported water

Other local and recycled water

6%

WATER USE

SUPPLY



58%
Recycled water

42%
Local surface water

Projects In South County

- Butterfield Channel Managed Aquifer Recharge
- Coyote Valley Recharge Pond
- Madrone Channel Expansion
- San Pedro Ponds Improvement Project
- Stormwater - Agricultural Land Recharge (FloodMar)

Project Evaluation Criteria

- **Water Supply Benefit**
- **Cost/Rate Impact**

- Timing
- Technical Feasibility
- Operation
- Reliability
- Readiness/Likelihood of Success

- Flexibility
- Jurisdiction/Partnership
- Permitting/Legal issues
- Environmental Impacts/Justice
- Public Acceptance
- Inter-dependence
- Risk/Challenges

Portfolio Analysis and Evaluation

- Evaluate various portfolios to identify cost-effective solutions

- Present example portfolios at January Board meeting

WSMP Update Schedule

2023

- Establish overall framework and procedures
- Project/portfolio analysis and evaluation
- Stakeholder engagement

2024

- Portfolio analysis and recommendations
- Plan development
- Stakeholder outreach
- Plan adoption

Santa Clara Valley Water District

File No.: 24-0002

Agenda Date: 1/3/2024
Item No.: 4.2.

COMMITTEE AGENDA MEMORANDUM
Joint WRC with Cities of Gilroy/Morgan Hill/SCRWA

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Receive South County Water Reuse Collaboration and Implementation Update and Provide Feedback.

RECOMMENDATION:
Receive update and provide feedback on Technical Working Group discussions related to South County Water Reuse Collaborations.

SUMMARY:
The Santa Clara Valley Water District (Valley Water), the City of Gilroy, and the City of Morgan Hill have a long history of collaboration to ensure the utilization and expansion of non-potable water reuse in South Santa Clara County (South County). In 2017, Valley Water established the Joint Water Resources Committee (Committee) with elected officials representing the Cities of Gilroy and Morgan Hill to pursue collaborative relationships and agreements to support water reuse expansion. In 2021, the Committee established a Technical Working Group (TWG) to evaluate future water reuse opportunities in South County. The TWG has generally met monthly since its inception.

The TWG initially focused its attention on reviewing and revising the water reuse agreements in South County that were adopted in 1999 and 2006. In June 2023, the TWG completed revisions to the Producer-Wholesaler Agreement between SCRWA and Valley Water which updated practices, roles and responsibilities, regulatory requirements, legal terms and conditions, and removed superfluous language. Subsequently, the TWG was informed that organizational changes in Gilroy would limit its participation to update these water reuse agreements until further notice until new staff is on board.

An integral element of the South County water reuse agreements was the preparation of a Master Plan to support recycled water projects. The first *South County Recycled Water Master Plan* (2004 Master Plan) was completed in 2004. The plan identified Immediate-, Short-, and Long-Term recycled water investment projects to improve the South County recycled water system's reliability and to expand the use of recycled water in South County. In 2015, Valley Water and its South County partners developed an update to the 2004 master Plan that supported the continued expansion of water reuse in South County. This report - the *2015 South County Recycled Water Master Plan Update -* included a capital improvement program and associated costs for recycled water expansion preferred alternatives. This plan also evaluated the feasibility of emerging issues including indirect potable reuse (IPR) and direct potable reuse (DPR).

In 2023, the Technical Work Group completed further updates to the 2015 Master Plan Update - the *2023 South County Recycled Water Master Plan Update.* This Committee update will focus on a discussion of our completed planning activities to update the 2015 South County Recycled Water Master Plan, which presents revisions to the current reuse infrastructure (new pipeline), recycled water customer updates and their reuse potential, evaluations of potential new users along the distribution system, incorporation of planned future system upgrades, and updated discussion of constraints to ongoing operation and future expansion options. The TWG will highlight water reuse options for the South County system, opportunities for further discussion to provide reuse in Morgan Hill, and recommended capital projects for further discussion to expand water reuse in South County. The TWG will also provide the status of a United States Bureau of Reclamation (USBR) grant to complete a South County Recycled Water System Feasibility Study. This Feasibility Study will build off the 2023 master planning work, as well as expand discussion into potential opportunities for purified water implementation in South County.

ENVIRONMENTAL JUSTICE IMPACT:
There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:
Attachment 1: PowerPoint

UNCLASSIFIED MANAGER:
Kirsten Struve, 408-630-3138

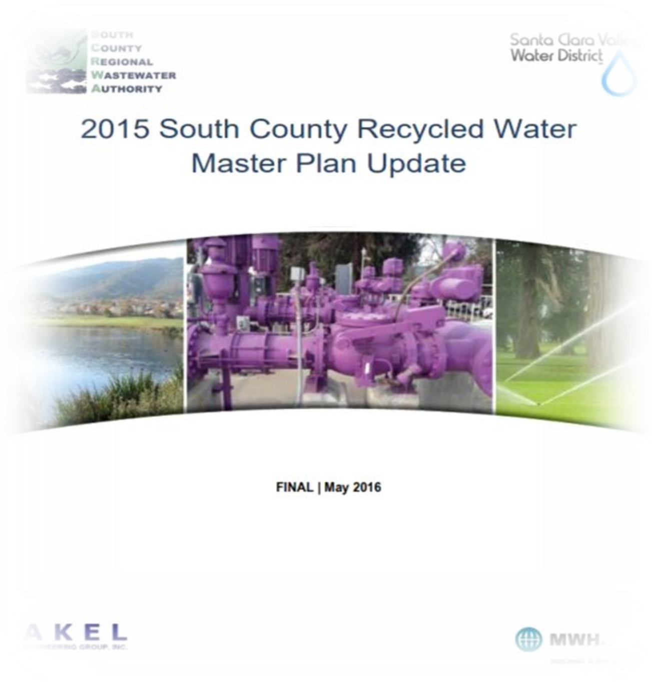
South Santa Clara County Water Reuse Collaboration

Joint Water Resources Committee Meeting
January 3, 2024

Valley Water

South County RW Master Planning

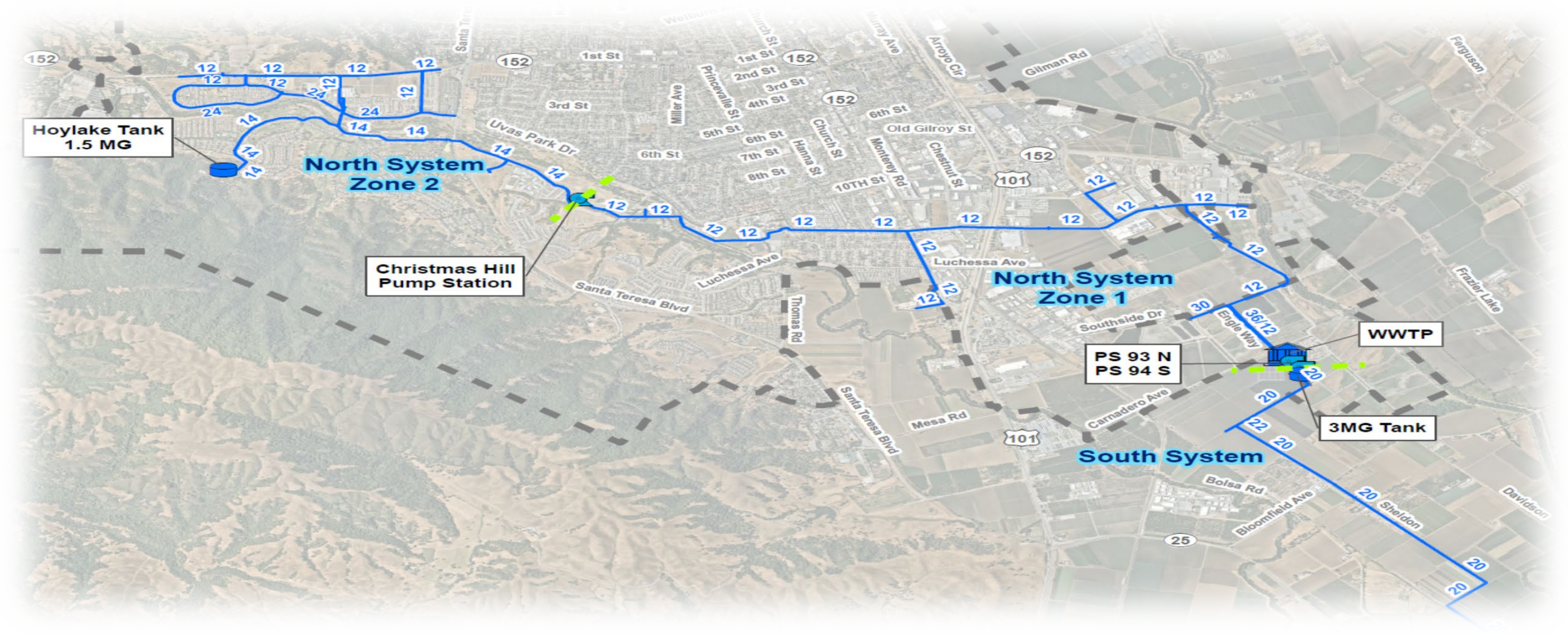
- 2004 RW Master Plan
- 2015 RW Master Plan Update
- 2023 RW Master Plan Update



2023 RW Master Plan Update

- New Infrastructure Integration
- Expansion Opportunities & Options
- Revised Capital Investment Strategy

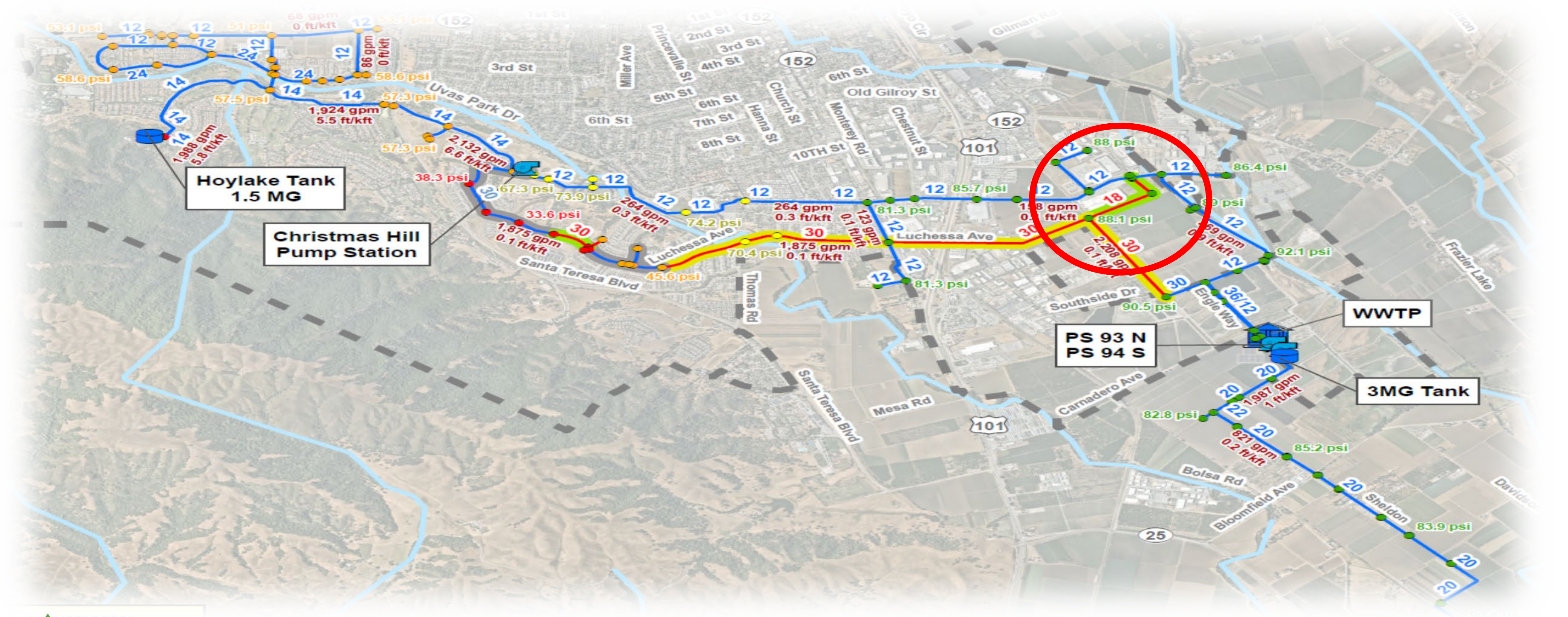
South County RW System Map



Valley Water

70

2023 Updated Distribution System

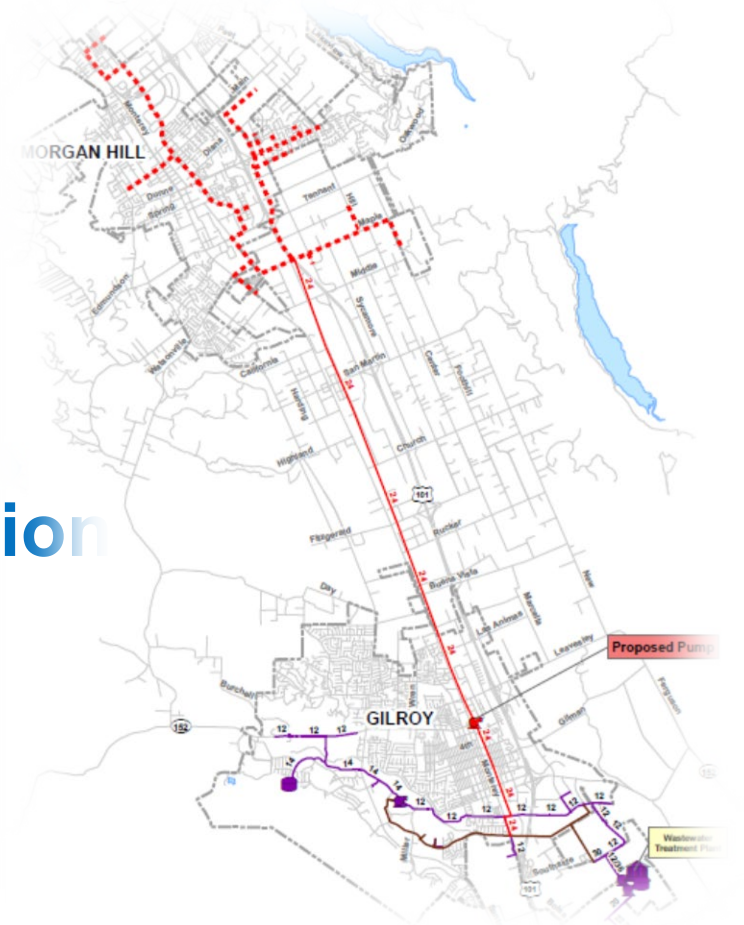


2023 CIP Recommendations

Valley Water

Morgan Hill Water Reuse Opportunities

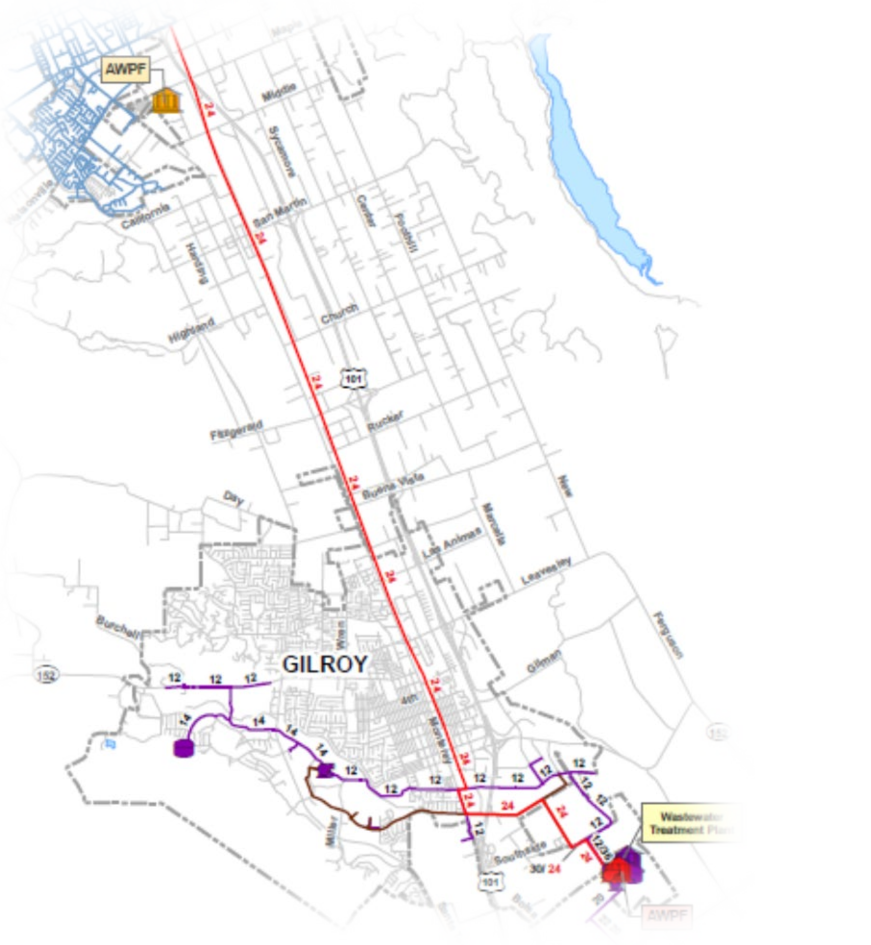
- **Feasible Reuse Options**
  - Direct Potable Reuse
  - Non-potable from SBWR
  - MH Purification for groundwater recharge
  - MH Purification for surface water augmentation
  - Recycled Water from SCRWA
  - SCRWA Purification for MH groundwater recharge



Valley Water

MH Water Reuse Opportunities

- **Considerations & Next Steps**
  - $75 to $150M Cost Estimates
  - Conceptual Level Planning
  - Benefits / Limitations
  - Implementation Uncertain
  - New Technologies
  - DPR Regulations



South County RW Federal Funding

- **2016 BOR Title XVI** **($5.7M)**
- **2023 BOR Planning** **($330K)**
- **Feasibility Study**
- **Storage Priority**

USBR Feasibility Study Planning Grant

- Pre-Planning & Feasibility
- Title XVI Funding
- NPR, IPR, and DPR
- Timing & Schedule


QUESTIONS
ANSWERS

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File No.: 24-0018 **Agenda Date:** 1/3/2024
Item No.: 4.3.

COMMITTEE AGENDA MEMORANDUM
Joint WRC with Cities of Gilroy/Morgan Hill/SCRWA

Government Code § 84308 Applies: Yes ☐ No ☒
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:
Review and Accept the Joint Water Resources Committee 2024 Proposed Work Plan, and Confirm the Next Meeting Date.

RECOMMENDATION:
A. Review and Accept the Joint Water Resources Committee 2024 Proposed Work Plan; and
B. Confirm the next meeting date.

SUMMARY:
Work Plans are created and implemented by all Board Committees to increase Committee efficiency, provide increased public notice of intended Committee discussions, and enable improved follow-up by staff. Work Plans are dynamic documents managed by Committee Chairs and are subject to change. Committee Work Plans also serve to assist to prepare an Annual Committee Accomplishments Reports. Discussion of topics as stated in the Plan have been described based on information from the following sources: • Items referred to the Committee by the Board; • Items requested by the Committee to be brought back by staff; • Items scheduled for presentation to the full Board of Directors; and • Items identified by staff.

ENVIRONMENTAL JUSTICE IMPACT:
There are no Environmental Justice impacts associated with this item.

ATTACHMENTS:
Attachment 1: 2024 JWRC Proposed Work Plan

UNCLASSIFIED MANAGER:
Candice Kwok-Smith, 408-630-3193

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(Proposed) 2024 Joint Water Resources Committee Workplan

CATEGORY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Water Supply Master Plan and South County Opportunities	X									X		
South County Water Reuse Collaboration and Implementation - Water Purification Potential for Future Water Supply	X			X		X				X		
South County Water Reuse Program Feasiblility Study	X			X		X				X		
STANDING ITEMS												
Elect Committee Chair and Vice Chair (Annually)	X											
Approval of Meeting Minutes	X			X		X				X		
Review Committee Work Plan	X			X		X				X		

*Yellow highlighted item – new items on the work plan.
Revised: 12/21/23

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