BOARD OF DIRECTORS
Special Meeting Agenda
March 4th, 2025, 5:00 p.m.
Board Room
19039 Bay Street, El Verano
(707) 996-1037

PUBLIC NOTICE

Members of the public may participate in this open, public meeting in person.

Time will be provided for public comment. Any member of the public wishing to speak will be allowed 3 minutes to make a statement. Board President will call for comments prior to the Board deliberating on pending action. However, please note that no action can be taken on any item unless printed on the agenda and included with the meeting notice. Therefore, any item discussed by members of the public and not shown on the agenda will only be received for information. The Board of directors may choose to set such item for future discussion and staff report. A full agenda packet is available at the District office for public view. A fee may be charged for copies. During the meeting, information and supporting materials are available in the Boardroom. District facilities and meetings comply with the Americans with Disabilities Act. If special accommodations are needed, please contact the District as soon as possible, but at least two days prior to the meeting.

All open meetings are recorded. Recordings for each meeting are retained for a minimum of 90 calendar days and may be heard upon request, at no cost. Please contact a member of the District staff for assistance. ITEMS ON THIS AGENDA MAY BE TAKEN OUT OF THE ORDER SHOWN.

Any writings or documents provided to a majority of the Board regarding any item on this agenda will be made available for public inspection in the VOMWD office located at the above address during normal business hours.

1. CALL TO ORDER – PLEDGE – ROLL CALL

2. PUBLIC COMMENTS:

This section of the agenda is provided so that the public may express comments on any item within the District's jurisdiction not listed on the agenda. Board members can ask questions for clarification, respond to statements or questions from members of the public, refer a matter to staff, or follow Board procedures to direct staff to place a matter of business on a future agenda. The public may express comments on agenda items at the time of Board consideration.

3. PUBLIC PRESENTATION, HEARING OR WORKSHOP

Item 3.A Fiscal Year 2025-2026 Board Strategic Plan Workshop

I. Review and Finalize Updates to the Strategic Plan
II. Discuss Prioritized Capital Improvements from the Final Updated Water Master Plan
III. Prioritize Identified Projects for Inclusion in the District's Multi-Year Capital Improvement Planning Process

4. DISCUSSION AND ACTION (GENERAL BUSINESS)

Item 4.A Board Discussion Regarding the Timing of Expending Funds on SDC-Related Studies

5. REQUEST FOR FUTURE AGENDA ITEMS

6. ADJOURNMENT

The next scheduled Board meeting is a regular meeting at 6:30 p.m. on March 4th, 2025. Posted this 28th day of February, online and in three public places.

Amanda Hudson
_____
Amanda Hudson, Board Secretary

Valley of the Moon Water District

2025-2026 Strategic Plan: Goals and Objectives Update

Valley of the Moon Water District
A Public Agency Established in 1962
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Steve Caniglia – Vice-President
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Officers
Matt Fullner – General Manager
Amanda Hudson – Secretary to the Board
Burke, Williams & Sorensen LLP – District Counsel

Contents

Issues of Concern

Current and emerging issues facing the District help shape the direction of our strategic planning and overall goals as a community water system. By identifying key challenges and developing a plan for overcoming them, the District will be well-positioned for continued, reliable service for future generations. Some of the key challenges currently facing the District include:

1. Historically high levels of inflation from 2020 to 2024 (over 22% cumulatively), rapidly increasing costs for many essentials including wholesale water, electricity, and fuel, and lower revenue due to State mandated water conservation, coupled with a rate structure that places little emphasis on conservation and which spreads some of the increased costs related to high water demand to lower water users.

2. The 2021/22 drought has caused sustained, unprecedented low water demand, resulting in lower revenue for the District and its wholesaler, Sonoma Water, and the resulting rate pressure placed on District customers
3. The loss of the SDC Water Treatment Plant and system Capacity (the only large-scale local water supply available to help respond in emergencies involving a loss, or partial loss, of the Sonoma Water aqueduct)
4. Infrastructure:
    a. Aging infrastructure and the required maintenance or replacement of items such as mains, service lines, wells, booster pump stations, and storage tanks
    b. Undersized and inferior infrastructure and the needed upgrades to items like mains and booster pump stations (mainly for modern fire flow requirements)

~~1. Rate equity~~

~~2.~~1. ~~Increasing regulations (CARB, BAAQMD, RWQCB, SWRCB, EPA, NPDES reporting, new/updated employment laws, new Cross Connection Control regulations, lead service line reporting, etc.) and the extra staff and consultant time needed to comply, and the resulting rate pressure placed on District customers~~

~~a. The loss of the SDC Water Treatment Plant and system Capacity (the only large-scale local water supply available to help respond in emergencies involving a loss, or partial loss, of the Sonoma Water aqueduct)~~

~~b. Prioritize wells~~

~~3. The 2021/22 drought has caused sustained, unprecedented low water demand, resulting in lower revenue for the District and its wholesaler, Sonoma Water, and the resulting rate pressure placed on District customers~~

~~4. Declining groundwater and possible future cost increases from our local Groundwater Sustainability Agency (GSA) and the resulting rate pressure placed on District customers~~

~~5. Historically high levels of inflation from 2020 to 2024 (over 22% cumulatively) and the resulting rate pressure placed on District customers~~

5. Climate change affects the District in several ways including:
    a. ~~and t~~The need ~~for~~to explore renewable energy sources
    b. The growing risk of wildfire and extreme weather events and the need to harden District facilities against these threats Etc.
    ~~6.~~c. Possible future water supply uncertainty
6. Increasing regulations (CARB, BAAQMD, RWQCB, SWRCB, EPA, NPDES reporting, new/updated employment laws, new Cross Connection Control regulations, lead service line reporting, etc.) and the extra staff and consultant time needed to comply, and the resulting rate pressure placed on District customers

~~7.~~1. ~~Infrastructure:~~

~~a. Aging infrastructure and the required maintenance or replacement of items such as mains, service lines, wells, booster pump stations, and storage tanks~~

~~Undersized and inferior infrastructure and the needed upgrades to items like mains and booster pump stations (mainly for modern fire flow requirements)~~

Needless to say, the majority of the above 'issues of concern' have a direct impact on costs. As a single enterprise organization, this places additional water rate pressures on the District's customers.

Context on Issues of Concern:

Following the 2015 court ruling on tiered water rates in San Juan Capistrano, which found that water rates were unconstitutional if they did not reflect the actual cost of providing water service under Proposition 218, many water utilities, including the District, performed an overhaul of their rates and tier structures. Many of the District's costs are related to State mandated water conservation, and capital projects that are needed to meet peak demand and fire flow. The majority of the District's customers have dramatically reduced their water demand over the past several years, yet as a result of the ongoing need to ensure peak water demand and fire flow, coupled with rapidly increasing costs of wholesale water and energy, unprecedented recent inflation, and decline in overall revenue due to a reduction in water sales following two major droughts and the resultant "demand hardening", that same group of customers have seen their water bills remain static or even increase. In order to address this issue, the Board of Directors wishes to explore ways to reallocate expenses among the tiered rates, including the possible addition of a tier based on needed CIP for high demand users, mandated water conservation, or both. In spite of the foregoing, ~~T~~the District has a strong desire to keep rates stable (i.e. regular, small rate increases each year), and an additional tier in the rate structure, based on those costs, could be a way to achieve that goal. ~~in spite of the rapidly increasing costs of wholesale water and energy, unprecedented recent inflation, and low water sales due to the permanent demand hardening that has occurred following the two droughts in recent memory. One way this may be accomplished, is to find a legal way under prop 218 and the San Juan Capistrano case, to include a third tier in its rate structure. Currently there are two tiers based on the two water sources – imported water and ground water. While a third tier would raise rates for the highest users, it would stabilize or bring down rates for moderate to low water users.~~

- ~~In 2021 and 2022, the District carried out two staffing studies. The first focused on office and management staff and resulted in splitting the finance and administration manager into two positions one Finance manager and one Administration manager, as well as the creation of a "track D" administrative specialist, for a total of two additional office staff, and both were filled. This was in response to the increased load of government reporting, regulatory compliance, etc. that had led to a work overload in the office. The second focused on field staff and resulted in the theoretical creation of a laborer position (not filled), as well as increasing the number of operators back to the number the District had in the early 2010s. this was intended to help conduct certain in-house capital projects (which helps keep costs down), as well as providing a larger pool of qualified personnel to respond in emergencies, which increases system reliability. This has resulted in one~~

~~additional operator being hired. The new staffing structure, combined with good pay and benefits for District employees, has worked very well, resulting in less turnover, higher quality of service for our customers, better emergency response, the ability to apply for and manage grants, and the ability to respond to the regulatory environment in a timely and proactive manor. This is all being done with about one less FTE than would typically be expected for a system with the number of connections that VOMWD has, according to AWWA Benchmarking statistics. This is all the more impressive when one considers the fact that VOMWD's system is more complex and has more miles of main in operation than the average system with the same number of connections.~~

- The SDC treatment plant (or a package plant at the same site) may be able to be brought back online once redevelopment starts on the 180 acre core campus. The District is assumed to be the water purveyor for the site and has been working diligently for years to understand the water system from surface water diversions to distribution. It is possible that redevelopment could begin as soon as one and a half years from now, but could also be delayed depending on local politics and citizens against development in the area. As a result of possible delays, other water sources (groundwater wells) will be evaluated as part of the District's goal to increase readiness for a water outage from Sonoma Water.

- The District is a JPA member of the GSA and has a good working relationship with the GSA staff and Board. The District developed and provided a whitepaper to the GSA emphasizing conservation and metering above more expensive infrastructure as a means to reach sustainability more efficiently. At the same time, the District has been awarded a grant to study and construct two ASR wells, and while not complete, they are looking promising. The District hopes to use these wells to store wintertime water locally, for use later in the year, offsetting demand from the wholesaler when water availability could be restricted (in drought conditions). It would also strategically leave a pre-determined percentage of the water behind in the aquifer on each injection and recovery cycle for the overall benefit of the aquifer, and the District would like the GSA to be a financial partner in this effort.

- ~~The District has a strong desire to keep rates stable (i.e. regular, small rate increases each year) in spite of the rapidly increasing costs of wholesale water and energy, unprecedented recent inflation, and low water sales due to the permanent demand hardening that has occurred following the two droughts in recent memory. One way this may be accomplished, is to find a legal way under prop 218 and the San Juan Capistrano case, to include a third tier in its rate structure. Currently there are two tiers based on the two water sources – imported water and ground water. While a third tier would raise rates for the highest users, it would stabilize or bring down rates for moderate to low water users.~~

- Regarding infrastructure, the District needs to become much more aggressive on water main replacement. The District owns nearly 100 miles of water main, and water main has

about a 100 year lifespan. So the District needs to average about a mile of main replacement per year to stay ahead of the expected useful life of the mains it operates. Over the past decade, the District has averaged less than half a mile of main replacement per year. A compounding factor, is that the District installed a large percentage of the existing infrastructure (about 50%) within the decade or so period following its formation in 1962. There is therefore a large amount of pipe that will age out at nearly the same time in the 2060s and 70s.

- In 2021 and 2022, the District carried out two staffing studies. The first focused on office and management staff and resulted in splitting the finance and administration manager into two positions one Finance manager and one Administration manager, as well as the creation of a "track B" administrative specialist, for a total of two additional office staff, and both were filled. This was in response to the increased load of government reporting, regulatory compliance, etc. that had led to a work overload in the office. The second focused on field staff and resulted in the theoretical creation of a laborer position (not filled), as well as increasing the number of operators back to the number the District had in the early 2010s. this was intended to help conduct certain in-house capital projects (which helps keep costs down), as well as providing a larger pool of qualified personnel to respond in emergencies, which increases system reliability. This has resulted in one additional operator being hired. The new staffing structure, combined with good pay and benefits for District employees, has worked very well, resulting in less turnover, higher quality of service for our customers, better emergency response, the ability to apply for and manage grants, and the ability to respond to the regulatory environment in a timely and proactive manor. This is all being done with about one less FTE than would typically be expected for a system with the number of connections that VOMWD has, according to AWWA Benchmarking statistics. This is all the more impressive when one considers the fact that VOMWD's system is more complex and has more miles of main in operation than the average system with the same number of connections.

Strategic Goals and Objectives

In order to address the Issues of Concern, the following Strategic Goals have been developed. These goals are in alignment with the District's Mission Statement and are designed to ensure that the District will have the ability to carry out its mission for future generations.

1. Financial Stability
~~1. Organizational Efficiency~~
2. Water Supply Resilience
3. Infrastructure Sustainability
~~4.1. Financial Stability~~
~~5.~~4. Community Engagement
5. Environmental Stewardship
6. Organizational Efficiency

~~6.~~

~~Goal 1: Organizational Efficiency~~

~~In an ever-evolving regulatory environment, ensuring compliance with local, state, and federal guidelines is critical for the District's operations. This goal emphasizes the importance of proactively adhering to increasingly complex regulatory requirements, such as those set by the California Air Resources Board (CARB), the Bay Area Air Quality Management District (BAAQMD), State Water Resources Control Board (SWRCB) and the U.S. Environmental Protection Agency (EPA). To maintain compliance, the District has prioritize adequate resources for monitoring and reporting, and will continue to evaluate these needs on an ongoing basis. Alongside this, organizational efficiency has been a focal point: the District has optimized staffing structures to ensure it can meet its regulatory obligations without overburdening internal teams. Advocacy for regulatory reforms through the District's involvement with organizations like the Association of California Water Agencies (ACWA) will also play a role in balancing environmental protections with operational flexibility, ensuring affordability for the District's customers.~~

~~**Objective 1.1:** Maintain a proactive approach to comply with increasing regulatory requirements (e.g., CARB, BAAQMD, RWQCB, EPA) by allocating sufficient resources for monitoring, reporting, and implementing necessary changes.~~

~~**Objective 1.2:** Continue optimization of staffing to support regulatory compliance and improve operational efficiency, including ongoing evaluation of staffing needs and using consultants where necessary to avoid overburdening internal teams.~~

~~**Objective 1.3:** Advocate for regulatory reforms that help balance environmental protections with operational flexibility and customer affordability through involvement with ACWA, California Water Efficiency Partnership (Cal WEP), etc.~~

~~**Status:** The District completed two staffing studies that identified areas that needed to be shored up or restructured and has fully implemented the recommendations of both over the past three years. A compensation survey completed in 2024 showed that the District's employees are compensated within the District's target ranges for salaries and benefits. The District is a member of both ACWA and CalWEP, and also takes the opportunity to address lawmakers directly through local delegations. While the District has made significant progress in this area, Organizational Efficiency remains a strategic goal due to the nature of the ever changing and increasing regulatory environment~~.

Goal 1: Financial Stability

Maintaining financial stability is fundamental to ensuring that the District can continue to meet its obligations and provide reliable service to its customers. This goal aims to balance the need for fair and equitable rates with the pressures of rising operational costs, such as increasing wholesale water prices, energy costs, and inflation. The District will explore the implementation of a rate

structure that minimizes the financial burden on low and moderate water users while addressing these escalating costs. Seeking external funding opportunities, such as state or federal grants, will be key to supporting capital projects, particularly those that focus on infrastructure upgrades and sustainability.

Objective 1.1: Aggressively seek a multi-tier rate structure that places an emphasis on conservation, and cost allocation to the appropriate water user in accordance with Prop 218 and related case law.

Objective 1.2: Actively seek state, federal, or regional funding opportunities (e.g., grants and low-interest loans) for capital projects, especially those related to infrastructure upgrades and sustainability initiatives.

Objective 1.3: Pursue innovative financial strategies, including investment and proactive management of pension unfunded accrued liability (UAL) to help stave off rate volatility in the future.

Status: The District is currently in year three of a five-year water rate plan implementation. Planning efforts for the next rate plan will therefore, need to begin in the upcoming fiscal year, and the addition of a defensible multi-tier rate structure will be evaluated at that time. The District, with the assistance of its consultant EKI, successfully sought a $3 million grant from DWR for the conversion of two wells to ASR. This is the first major grant awarded to the District, and it has been an excellent learning experience for staff. Following the conclusion of the District's seismic vulnerability assessment (currently underway), the District plans to use this knowledge and experience to seek federal grants to address shortcomings found to harden against seismic vulnerabilities. Synergies will be sought to focus on areas of the water system that are both susceptible to seismic activity and are also in need of replacement due to fire flow requirements or age/condition or both. However, since a large local match will be needed, and it is very likely that there will not be 100% overlap of these needs, the District should plan to generate enough revenue to proactively replace water mains on a PAYGO basis. More expensive and rare projects such as pump station and water tank replacement will come about on a less regular basis. Low interest loans, bonds or grants should be sought in these scenarios.

Goal 2: Water Supply Resilience

The District has a long-term goal of having enough local water supply, that it can last weeks (if not longer) without the normal supply of water from our wholesaler, Sonoma Water, or normal power supplied by PG&E. The success of this goal hinges on securing additional reliable, resilient and ideally, sustainable water supplies for its customers, right here in the Sonoma Valley, and making sure each of those sources has a supply of backup power. This goal focuses on enhancing the District's water supply through both infrastructure improvements and strategic initiatives. A key objective is exploring the re-establishment of the SDC Water Treatment Plant or a similar system, which would provide enough local water capacity to bridge short to mid-term emergencies involving

the loss of our wholesale water. Bringing the SDC Water Treatment Plant back online will be a long-term process. Therefore, the District will prioritize additional water capacity in the form of groundwater wells in the near term. The District owns or leases several wells in its service area already. There is also approximately 5.5 million gallons of water storage capacity within the District, plus the water stored by Sonoma Water. Therefore, in assessing the immediate need for capital expenditures on new well capacity, the District should conduct an analysis to determine the length of time the District could continue to serve its customers in the event of a water outage from Sonoma Water in various scenarios. This would be weighed by the Board when allocating funds for capital projects each year. Another significant strategy is the expansion of Aquifer Storage and Recovery (ASR) systems in collaboration with the Groundwater Sustainability Agency (GSA) and Sonoma Water, ensuring the District can store surplus water during wet periods for future use during droughts. Additionally, maintaining proactive water conservation efforts is essential to ensure long-term sustainability and reduce external water dependencies.

Objective 2.1: Explore opportunities for re-establishing the SDC Water Treatment Plant ~~or a similar system~~ to boost local water capacity for emergency situations.

Objective 2.2: Understanding that the reestablishment of the SDC water treatment plant is a long-term goal, focus on the development of local groundwater supplies in the near-term.

> **Objective 2.2 (a):** Assess the immediate need for capital expenditure on the development of additional groundwater sources by conducting an analysis of current local production capabilities and local water storage in various scenarios.

Objective 2.3~~4~~: Ensure that all new and existing sources of water have sufficient backup power to help bridge the gap during power outages or public safety power shutoffs (PSPSs).

Objective 2.4~~2~~: Implement and expand Aquifer Storage and Recovery (ASR) systems in collaboration with the Groundwater Sustainability Agency (GSA) and Sonoma Water, to store water during wet periods for future use during droughts.

Objective 2.5~~3~~: Continue to engage in proactive water conservation programs to maintain long-term water availability and reduce customer dependency on external water sources through participation in organizations like CalWEP and SMSWP.

~~**Objective 2.4:** Ensure that all new and existing sources of water have sufficient backup power to help bridge the gap during power outages or public safety power shutoffs (PSPSs).~~

Status: The District is still in a precarious position with respect to water supply resiliency under certain circumstances, especially those involving the loss, or partial loss, of the wholesale water system operated by Sonoma Water. It has therefore, dedicated staff time and funds to communicating with the County, State and likely Developer of the former SDC property, on the resurrection of the water sources on the site and has also initiated an assessment of the site's water infrastructure components in an effort to provide opinion of probable cost (OPC) figures to be

used in the redevelopment of the site's water infrastructure. Furthermore, two District owned wells are being studied and outfitted for ASR which will help ensure there is water available locally from them in an emergency, and the District plans to bring an additional leased well online this year.

Goal 3: Infrastructure Sustainability

A strong, reliable infrastructure is essential for delivering consistent, high-quality water to our customers. This goal underscores the need to enhance the District's physical assets and modernize aging systems. A key priority is accelerating the replacement of outdated water mains, with a target of replacing one mile per year. This effort will focus on the most vulnerable sections of the system that are at risk of failure. Additionally, upgrading undersized infrastructure to meet modern fire flow and emergency response standards is crucial for ensuring public safety. The District will also maintain a comprehensive Water Master Plan~~, incorporating advanced technologies (a maintenance management system, or "MMS")~~ to monitor the condition of infrastructure, ensuring that maintenance and replacement efforts are effectively prioritized. The District is also dedicated to the continued incorporation of advanced technologies (such as maintenance management system, or "MMS", Automated Metering Infrastructure "AMI", and Artificial Intelligence "AI") into its Information Technology infrastructure to maximize efficiencies wherever possible.

Objective 3.1: Aggressively increase the rate of water main replacement to one mile per year, prioritizing sections of the system that are aging and at risk of failure.

Objective 3.2: Upgrade undersized infrastructure to meet modern fire flow and emergency response standards, especially for booster pump stations and key distribution mains.

Objective 3.3 Continue evaluating ways to harden remote structures (such as well houses, booster stations and tank sites) against the threat of wildfire, extreme weather events and seismic activity.

Objective 3.~~4~~3: Maintain a comprehensive Water Master Plan (WMP) to prioritize maintenance and replacement activities, incorporating advanced technologies (MMS, AMI, AI etc.) for monitoring the condition of infrastructure and maximizing efficiency.

Status: Some progress has been made in this area by the District, but there is still room for improvement. ~~A good~~ AMI and MMS system~~s~~ ~~is~~are in place and in daily use by District staff, and important records have been digitized for the system~~s~~. In early 2025, the District completed an update to its 2019 WMP, focusing on the prioritized capital improvement list. Some key fire flow upgrades have been made in the system, most recently in Glen Ellen and Chestnut. In spite of these strides in the right direction however, water main replacement remains anemic, at less than half a mile on average per year. Also, staff has begun using AI where possible, however, it is anticipated that this area will grow rapidly over the next several years, opening up new opportunities and efficiencies for the District.

~~Goal 4: Financial Stability~~

~~Maintaining financial stability is fundamental to ensuring that the District can continue to meet its obligations and provide reliable service to its customers. This goal aims to balance the need for fair and equitable rates with the pressures of rising operational costs, such as increasing wholesale water prices, energy costs, and inflation. The District will implement a rate structure that minimizes the financial burden on low and moderate water users while addressing these escalating costs. Seeking external funding opportunities, such as state or federal grants, will be key to supporting capital projects, particularly those that focus on infrastructure upgrades and sustainability.~~

~~**Objective 4.1:** Actively seek state, federal, or regional funding opportunities (e.g., grants and low-interest loans) for capital projects, especially those related to infrastructure upgrades and sustainability initiatives.~~

~~**Objective 4.2:** Pursue innovative financial strategies, including investment and proactive management of pension unfunded accrued liability (UAL) to help stave off rate volatility in the future.~~

~~**Status:** The District, with the assistance of its consultant EKI, successfully sought a $3 million grant from DWR for the conversion of two wells to ASR. This is the first major grant awarded to the District, and it has been an excellent learning experience for staff. Following the conclusion of the District's seismic vulnerability assessment (currently underway), the District plans to use this knowledge and experience to seek federal grants to address shortcomings found to harden against seismic vulnerabilities. Synergies will be sought to focus on areas of the water system that are both susceptible to seismic activity and are also in need of replacement due to fire flow requirements or age/condition or both. However, since a large local match will be needed, and it is very likely that there will not be 100% overlap of these needs, the District should plan to generate enough revenue to proactively replace water mains on a PAYGO basis. More expensive and rare projects such as pump station and water tank replacement will come about on a less regular basis. Low interest loans, bonds or grants should be sought in these scenarios.~~

Goal ~~4~~5: Community Engagement

Effective community engagement is essential for fostering transparency, building trust, and ensuring that residents are informed about critical water issues. This goal focuses on strengthening the District's communication efforts, promoting public involvement, and ensuring that the community is engaged in discussions about water conservation, infrastructure, and regulatory changes. By creating opportunities for open dialogue and collaboration, the District will better understand the needs and concerns of its customers while empowering them to be active participants in sustainable water management.

- **Objective ~~5~~4.1:** Foster open communication through regular community outreach, such as speaking with community groups, newsletters~~, and~~ social media communication, and

direct email and text messaging to keep residents informed about key issues like emergencies, water conservation, infrastructure projects, and regulatory impacts.

- **Objective 45.2:** Continue to bBuild partnerships with local organizations, schools, and community groups to promote water conservation education and encourage sustainable water practices at the grassroots level t-hrough involvement in the SMSWP.
- **Objective 54.3:** Establish effective channels for feedback such as open public comment periods at regular Board meetings, ensuring that residents can voice their concerns, ask questions, and provide input on the District's operations, policies, and priorities.

Status: The District is a member and active participant in the Sonoma Marin Saving Water Partnership (SMSWP), which helps its members communicate effectively to constituents about water conservation, drought response and sustainable gardening practices. The District is also active on its social media pages and website, where it provides news, budgets, planning documents, water quality data etc. The District's Board and staff are also very effective at communicating with the public in a transparent way, addressing concerns, and adjusting policy when needed. In an effort to ensure timely dissemination of accurate information, the District is also continually seeking current email addresses from its customers. Some examples of the kind of information shared via email include: leak alerts, emergency notifications and account specific communications.

Goal 56: Environmental Stewardship

Environmental stewardship is essential to the District's long-term sustainability and its role in safeguarding vital water resources. This goal focuses on reducing the environmental impact of District operations through innovative technologies and sustainable practices. For example, the District will explore the integration of In-Pipe Micro-Hydro Generators (IPMHG) to harness energy from existing water flows, improve energy efficiency, and support renewable energy efforts alongside solar power generation and battery storage. Additionally, the District will continue to prioritize fleet electrification to reduce carbon emissions and operational costs. By incorporating these strategies and expanding sustainability efforts, the District will ensure that its water management practices contribute positively to both the environment and the community. While complete carbon neutrality may not be possible given the nature of water delivery, there are steps that can be taken to minimize emissions and offset the power demands of the District's operations.

Objectives:

- **Objective 56.1:** Explore, and possibly implement In-Pipe Micro-Hydro Generators (IPMHG) in the District's infrastructure to generate renewable energy from water flows, reducing reliance on external power sources and contributing to the District's overall energy efficiency alongside solar power generation and battery storage.

- **Objective 56.2:** Advance fleet electrification by transitioning the District's equipment and vehicle fleet to electric where possible, reducing greenhouse gas emissions and promoting a sustainable approach to District operations.
- **Objective 56.3:** Continue to promote water conservation, adopt sustainable practices in daily operations, and collaborate with regional entities and stakeholders (such as the SMSWP and CalWEP) to support long-term environmental and water resource sustainability.

Status: In 2023, the District installed a large solar array which has had the effect of offsetting some power demand in the system. The District's first electric vehicle (EV) has also been purchased, taking advantage of the power generation. Every storage tank in the system that also acts as a hub for the Districts SCADA telemetry, has had a small solar array and battery backup installed. This has not only removed the power demand of those sites from the system, but it has also increased system reliability by making the power demand at the site independent of the power grid, which can be susceptible to outages and PSPSs.

During the 2021/2022 drought, the District implemented its water shortage contingency plan, and began messaging to customers about the need to conserve water. The District's customers responded extremely well, conserving as much as 40% in some months compared to the same period in previous years. There is still a lot of room for progress on this goal, including maintaining and improving current water conservation messaging, the addition of new power generation capacity, and further fleet electrification.

Goal 6: Organizational Efficiency

In an ever-evolving regulatory environment, ensuring compliance with local, state, and federal guidelines is critical for the District's operations. This goal emphasizes the importance of proactively adhering to increasingly complex regulatory requirements, such as those set by the California Air Resources Board (CARB), the Bay Area Air Quality Management District (BAAQMD), State Water Resources Control Board (SWRCB) and the U.S. Environmental Protection Agency (EPA). To maintain compliance, the District has prioritized adequate resources for monitoring and reporting, and will continue to evaluate these needs on an ongoing basis. Alongside this, organizational efficiency has been a focal point: the District has optimized staffing structures to ensure it can meet its regulatory obligations without overburdening internal teams. Advocacy for regulatory reforms through the District's involvement with organizations like the Association of California Water Agencies (ACWA) will also play a role in balancing environmental protections with operational flexibility, ensuring affordability for the District's customers. Furthermore, the District takes the opportunity during the budget preparation each year, to evaluate each and every line item, to determine if it adds to the District's efficiency or takes away from it and only funds the item if it furthers the mission of the District in an efficient manner.

Objective 6.1: Maintain a proactive approach to comply with increasing regulatory requirements (e.g., CARB, BAAQMD, RWQCB, EPA) by allocating sufficient resources for monitoring, reporting, and implementing necessary changes.

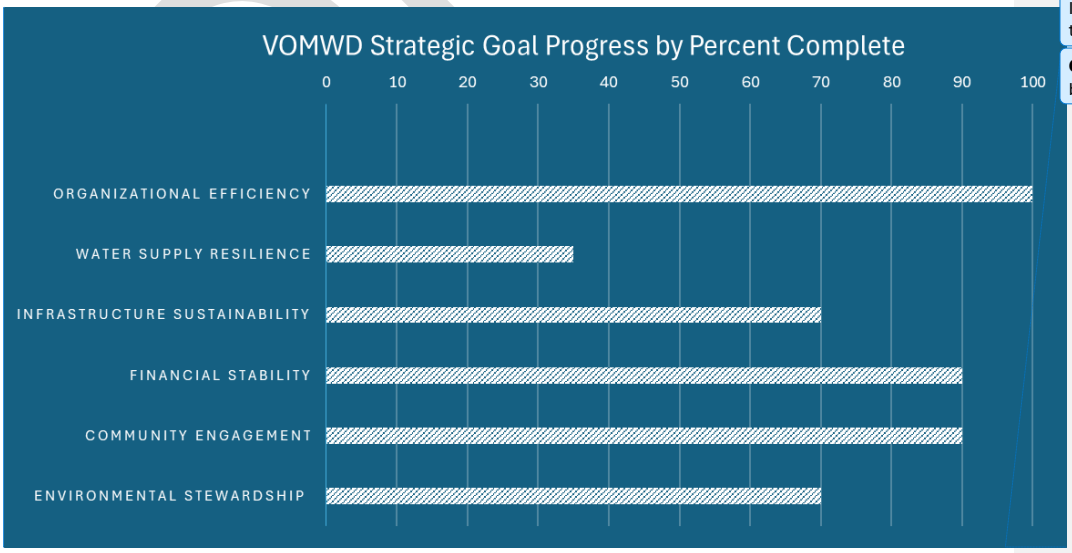
Objective 6.2: Continue optimization of staffing to support regulatory compliance and improve operational efficiency, including ongoing evaluation of staffing needs and using consultants where necessary to avoid overburdening internal teams.

Objective 6.3: Advocate for regulatory reforms that help balance environmental protections with operational flexibility and customer affordability through involvement with ACWA, California Water Efficiency Partnership (Cal WEP), etc.

Objective 6.4: Continue to evaluate ways to gain organizational efficiencies and cut costs where possible, including through the annual budget process.

Status: The District completed two staffing studies that identified areas that needed to be shored up or restructured and has fully implemented the recommendations of both over the past three years. A compensation survey completed in 2024 showed that the District's employees are compensated within the District's target ranges for salaries and benefits. The District is a member of both ACWA and CalWEP, and also takes the opportunity to address lawmakers directly through local delegations. While the District has made significant progress in this area, Organizational Efficiency remains a strategic goal due to the nature of the ever changing and increasing regulatory environment

Summary of Findings:



Commented [MF1]: Removed graphic because the percentages are too arbitrary and could be misleading. I'm rewording the descriptions to give a sense of where the District is without putting a number to it.

Commented [MF2]: Figure not updated. Will update based on Board input regarding percentages.

~~4~~1 Financial Stability

~~**Goal 4 is currently 90% achieved.**~~ The District is in good financial health, customer water rates are sustainable, the District is gaining experience with grant management and conservative investment management. Room for improvement exists in the areas of addressing the current tiered rate structure, ~~unfunded pension liability and~~ future revenue generation in light of the needed infrastructure investments and unfunded pension liability.

~~1 Organizational Efficiency~~

~~**Goal 1 is currently 100% achieved.** However, this is an area where things change quickly and adaptations need to be made frequently. The District will therefore, continue to monitor and make adjustments as needed.~~

2 Water Supply Resilience

~~**Goal 2 is currently 35% achieved.**~~ The loss of the SDC water source has set the District back significantly in this area. Planning efforts are underway, but there is a significant gap between current water supply resilience and where the District would like to be. In light of the political nature of the redevelopment of SDC, it is possible that bringing the water system back online will take several years, therefore, groundwater wells may also be evaluated as part of a short-term solution.

3 Infrastructure Sustainability

~~**Goal 3 is currently 70% achieved.**~~ The District is well managed and has good policy direction regarding infrastructure and capital programs. However, there is significant room for improvement regarding aging water main replacement. If not addressed in the coming years, these older water mains will begin to fail at an unsustainable rate. Further action is therefore needed soon, to avoid this scenario.

~~4 Financial Stability~~

~~**Goal 4 is currently 90% achieved.** The District is in good financial health, customer water rates are sustainable, the District is gaining experience with grant management and conservative investment management. Room for improvement exists in the areas of addressing unfunded pension liability and future revenue generation in light of the needed infrastructure investments.~~

~~4~~5 Community Engagement

~~**Goal 5 is currently 90% achieved.**~~ While the District is in an excellent position with regard to community engagement, communication, and transparency, there is always room for

improvement. Staff and the Board will therefore, continually see fresh ways to enhance community engagement.

56 Environmental Stewardship

~~Goal 6 is currently 70% achieved.~~ The District has been quite proactive in this area by conducting a study to ascertain power consumption efficiency, the installation of solar and battery backup, the hybridization of some standby generators, the addition of one EV to its fleet, and now, by studying IPMHG. However, there is room to further offset power demand in the system, which would not likely have a financial payback, and to further electrify the fleet. Fleet electrification may prove difficult in the short term, due to the limited availability of the size and type of vehicles the District needs to operate.

61 Organizational Efficiency

The District is ~~Goal 1~~ is currently in ~~100% achieved~~great shape with respect to organizational efficiency and staffing. However, this is an area where things change can quickly and adaptations need to be made frequently. The District will therefore, continue to monitor and make adjustments as needed.

WATER MASTER PLAN AND CAPITAL IMPROVEMENT PLAN UPDATE

Valley of the Moon Water District
El Verano, CA

6 February 2025
EKI C40120.00

EKI ENVIRONMENT & WATER, INC.

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Water Master Plan and Capital Improvement Plan Update

Valley of the Moon Water District

6 February 2025

Prepared for:

Valley of the Moon Water District
19039 Bay Street
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Water Master Plan and Capital Improvement Plan Update

Valley of the Moon Water District

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APPENDICES

ABBREVIATIONS AND ACRONYMS

ACP	asbestos cement pipe
ADD	average day demands
AF	acre feet
AFY	acre feet per year
AMI	advanced metering infrastructure
ASR	Aquifer Storage and Recovery
BPS	Booster Pump Station
CCI	Construction Cost Index
CIP	Capital Improvement Program, Capital Improvement Project, or cast-iron pipe
DIP	ductile iron pipe
District	Valley of the Moon Water District
DMA	District Metered Areas
DSS	Decision Support System
du	dwelling unit
DWR	California Department of Water Resources
ea	each
EKI	EKI Environment & Water
EL	elevation
ENR	Engineering News Record
ES	Executive Summary
ETo	reference evapotranspiration
°F	degrees Fahrenheit
FF	Fire Flow
fps	feet per second
ft	feet
ft/k-ft	feet per thousand feet
FY	fiscal year
gal	gallons
General Plan	2005 Sonoma County General Plan
GIS	geographic information system
GPCD	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HDPE	high-density polyethylene
hp	horsepower
In	inch

JPA	Joint Exercise of Powers Agreement
LAFCO	Sonoma Local Agency Formation Commission
LF	linear feet
MDD	Max Day Demands
MFR	Multi-Family Residence
MG	Million Gallons
MGD	million gallons per day
MMD	maximum month demand
NAD83	North American Vertical Datum 1983
NAVD 88	North American Vertical Datum of 1988
OPC	Opinion of Probable Cost
PHD	Peak Hour Demands
PRV	pressure reducing valve
psi	pounds per square inch
PVC	polyvinyl chloride
PZ	pressure zone
Restructured Agreement	Restructured Agreement for Water Supply
SBx7-7	2020 Senate Bill x7-7
SCADA	Supervisory Control and Data Acquisition
SCWA	Sonoma County Water Agency
SDC	Sonoma Development Center
sf	square feet
SFR	Single Family Residence
SGMA	Sustainable Groundwater Management Act of 2014
SVMWC	Sobre Vista Mutual Water Company
SWRCB	State Water Resources Control Board
Title 22	California Code of Regulations, Title 22
UNK	unknown
UWMP	Urban Water Management Plan
USACE	U.S. Army Corps of Engineers
V	Volume
WMP	Water Master Plan

EXECUTIVE SUMMARY

On behalf of the Valley of the Moon Water District (District), EKI Environment & Water, Inc. (EKI) has prepared this Water Master Plan (WMP) and Capital Improvement Plan (CIP) Update. The District's WMP was last updated in 2019 (EKI, 2019), and since then the District has addressed many of the capital improvement projects recommended in that plan. The details for several other projects have been modified in the interim, and the District has identified new condition-related improvement needs. In addition, several planning assumptions from the 2019 WMP have changed, including the existing and projected demands and storage evaluation criteria for the Glen Ellen Area (Zone 1F). Lastly, the District has identified three new locations to install new pressure zones or district metered areas (DMAs) to better manage high and low pressures.

District's Existing Water Infrastructure

The District's water system facilities have been updated based on completed and in-progress CIP projects, many of which were identified in the 2019 WMP, including:

- The addition of the Pedroncelli and Craig groundwater wells
- The installation of the new Saddle Tank
- Modifications to the District's pressure reducing valve (PRV) settings
- Installation of approximately 7,715 linear feet of water mains based on approximately 37 individual as-builts listed as project groups below:
  - EST 2947 – The Walnut Ave, Oak St. & Penny Ln. Water Main Replacement Project
  - EST 2958 – Aqua Caliente Road, Arnold Drive, and Summer Meadow Lane Main Replacement Project (including a new normally closed cross connection between PZ1 and PZ1B)
  - EST 2967 – The Boyes Blvd. Bridge Pipeline Replacement Project
  - EST 2983 – The Pedroncelli and Craig Well installations
  - EST 2984 - The Gibson St., Riddle Rd Easement, Sobre Vista (near Lake Josephine), Brookview & Lomita Steel Water Main Replacements
  - EST 2993 – The Fetters Ave., Malek Rd., Depot Rd., Sobre Vista Dr., and Wake Robin Rd. Main and Service Line Replacement Project
  - EST 2996 – The Arnold Dr Main Replacement Project
  - EST 3021 – The Waterline Improvement Project on Chestnut Rd to Chestnut Tank
  - EST 3034 to EST 3040 – Various service line, and hydrant installations
- Upcoming capital improvement projects currently in design or construction, including:
  - Altimira Fire Flow Improvement Project
  - Verano Hotel Frontage Public Water Main Improvements;
  - 18661 Lomita Avenue New Water Main Project
  - Boyes Food Center Mixed Use Development Water Main Improvement Project

Existing and Future Water Demands

Potable water use has generally decreased over the past 20 years, although significant variations have occurred from year to year and are associated with changing hydrologic and economic conditions. Following the 2013-2016 drought, the District's total and per capita water use increased slightly between fiscal year (FY) 2017 and FY 2021, reflecting a partial drought rebound. However, total demand decreased in FY 2022 through FY 2024 in response to the recent drought.

Based on a review of demand data and discussions with the District, the water demand data from FY 2021, prior to the recent drought, was assumed to be representative of existing demands. Total existing demand was estimated to be 2,853 acre-feet per year (AFY) for planning and modeling purposes, equal to the total average FY 2021 billing data plus the maximum construction water and water loss from the last five years (FY 2020 - FY 2024). To account for 32 new accounts added since FY 2021, demand was added for these accounts based on land use specific FY 2021 demand factors.

The total projected future demand is estimated to be 3,477 AFY in FY 2045, consistent with demand projections presented in the District's 2020 Urban Water Management Plan (UWMP). Future demands for planned development projects were spatially allocated based on their location and land uses, and the remaining increase in demand was spread proportionally across the District. Existing and future projected demands are summarized in Table ES-1 by pressure zone.

Water System Supplies

The District, along with seven other cities and special districts in Sonoma County and Marin County, has a water supply agreement with Sonoma County Water Agency (SCWA). The majority of the District's water supply comes from SCWA purchases and is delivered through the Sonoma Aqueduct (approximately 79% on average over the past six years). The District's remaining water is supplied by eight (8) groundwater wells that are owned (or leased) and operated by the District.

Supply and Storage Capacity Assessment

EKI recommends firm supply capacity requirements for each pressure zone met through the combination of SCWA turnouts, groundwater wells, and booster pump stations to meet the applicable combination of max day demands, peak hour demands, fire flow requirements, and/or fire storage refilling requirements based on the available storage in each zone. EKI recommends continuing to use water supply and storage criteria that were updated in the *Evaluation of Storage and Supply Requirements for Glen Ellen* (EKI, 2021b).

The supply assessment indicates that Pressure Zones 2E, 3E, 2B, 3D, and 1F have supply capacity deficits under existing and future conditions. To meet the supply criteria for each zone, EKI recommends the following improvements:

- Installation of a new 450 gallons per minute (gpm) booster pump station (BPS) to deliver supply from Pressure Zone 1B to Pressure Zone 1F;
- Installation of dedicated 1,000 gpm fire pumps at Donald BPS and Chestnut BPS; and
- Upgrades to the Sobre Vista Lower BPS as part of a consolidation of Pressure Zones 2E and 3E.

Table ES-1. Projected Existing and Future Annual Demands by Pressure Zone

Pressure Zone	Existing Demands (AFY) (a)	Future Demands (AFY)		
		Projected Infill Growth (b)	Planned New Development (c)	Total Future Demands (b) (d)
1	1,916	2,060	259	2,319
1A	224	241	-	241
1B	236	254	150	404
1F	257	277	-	277
2A	2.0	2	-	2.1
2B	20	21	-	21
2D	107	115	-	115
2E	0.29	0.31	-	0.31
3D	14	15	-	15
3E	48	52	-	52
4E	0.22	0.24	-	0.24
5E	5.3	6	-	5.7
SCWA	24.1	26	-	26.0
Total	2,853	3,042	409	3,477

Notes:

(a) Equals the total average FY 2021 billing data by pressure zone plus maximum construction water and the max water loss from the last 5 years (FY 2020 - FY 2024). To account for the 32 new accounts added since 2021, demand was added for each account based on land use specific FY 2021 demand factor.

(b) Projected infill growth and total future demands for each pressure zone are proportionate to the pressure zones' existing demands.

(c) Planned new developments include the proposed 810 W Agua Caliente Development, Verano Avenue Multi-Family Residential Development, and the Springs Specific Plan.

(d) Total future demand of 3,477 AFY in 2045 per the District's 2020 UWMP.

Based on discussions with the District, we recommend installing the new Eldridge BPS and relocating the existing Eldridge PRV north of the Sonoma Developmental Center (SDC). This location would allow for surface water supplies from SDC to be pumped to Pressure Zone 1F if these facilities are annexed by the District in the future.

Based on the system-wide storage evaluation, a significant 3.87 million gallons (MG) storage surplus exists. With the District's current storage facilities and accounting for SCWA storage and groundwater supplies, existing emergency storage ranges from 3.5 to 4.2 days of average day demand (ADD) and future available emergency storage is projected to range between 3.2 to 3.7 days of ADD depending on the demand assumptions. This represents a robust volume of emergency storage that should allow for the District and SCWA under most scenarios to address any supply disruption for the storage is depleted.

Hydraulic Assessment

To evaluate distribution system performance against performance criteria, EKI conducted steady-state model simulations of (1) peak hour demand (PHD) and (2) maximum day demand (MDD) plus fire flow (FF) for both the Existing, Future, and Future with CIPs Scenarios. As a part of this modeling analysis, the District identified three areas in the system which could benefit from the installation of new pressure

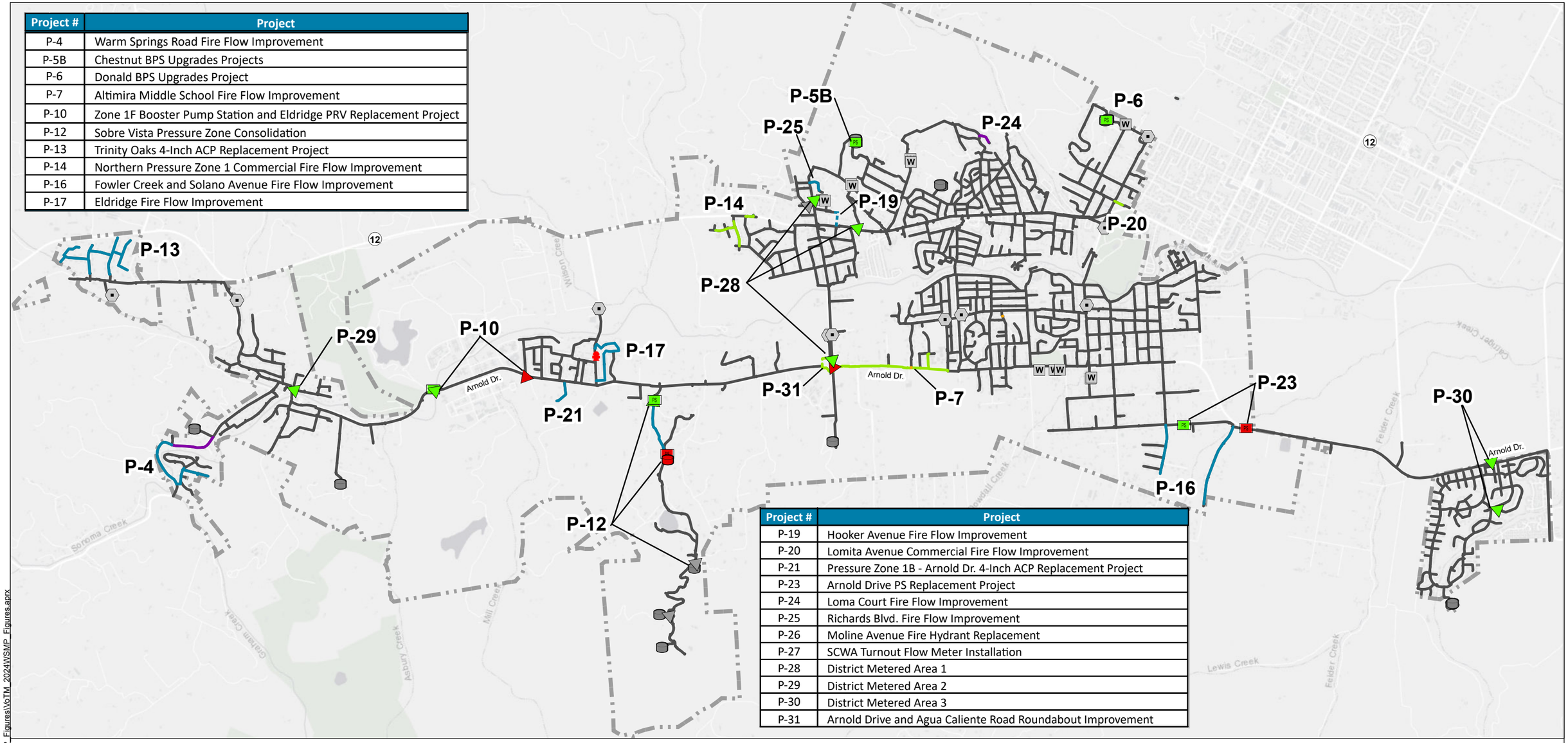
regulating stations to reduce pressures. These three areas have been included in the Future with CIPs scenario to ensure no unintended effects occurred with the re-zoning of these portions of the system.

EKI modeled the remaining proposed improvements from 2019 under future demand conditions to confirm that the identified deficiencies had been addressed. Generally, the remaining projects identified in the 2019 WMP have been carried forward without any modifications, indicating that they are still appropriate solutions to the identified deficiencies. However, one project, the Agua Caliente Road Transmission Improvement, has been removed from the CIP list due to the proposed new pressure zone modifications in the Agua Caliente Knolls area, as discussed below in Section 7.6, which also addresses the fire flow deficiencies identified in this area.

Recommended Updates to the Capital Improvement Program

Figure ES-1 shows an overview of the recommended improvements. A summary of the recommended improvements, as well as the CIPs included in the District's existing 5-year CIP budget, are presented in Table ES-2. As shown in Table ES-2, the total OPC for the proposed CIP in December 2024 dollars is approximately $26.6 million to $34.3 million (depending on whether the pipeline projects will be constructed by the District or a construction contractor). It should be noted that the recommended CIP only identifies improvements at a master plan level and does not constitute a design of such improvements. Subsequent detailed design is required to determine the exact sizes and locations of these proposed improvements. The recommended CIP is discussed in more detail in Section 8.

Project #	Project
P-4	Warm Springs Road Fire Flow Improvement
P-5B	Chestnut BPS Upgrades Projects
P-6	Donald BPS Upgrades Project
P-7	Altimira Middle School Fire Flow Improvement
P-10	Zone 1F Booster Pump Station and Eldridge PRV Replacement Project
P-12	Sobre Vista Pressure Zone Consolidation
P-13	Trinity Oaks 4-Inch ACP Replacement Project
P-14	Northern Pressure Zone 1 Commercial Fire Flow Improvement
P-16	Fowler Creek and Solano Avenue Fire Flow Improvement
P-17	Eldridge Fire Flow Improvement



Project #	Project
P-19	Hooker Avenue Fire Flow Improvement
P-20	Lomita Avenue Commercial Fire Flow Improvement
P-21	Pressure Zone 1B - Arnold Dr. 4-Inch ACP Replacement Project
P-23	Arnold Drive PS Replacement Project
P-24	Loma Court Fire Flow Improvement
P-25	Richards Blvd. Fire Flow Improvement
P-26	Moline Avenue Fire Hydrant Replacement
P-27	SCWA Turnout Flow Meter Installation
P-28	District Metered Area 1
P-29	District Metered Area 2
P-30	District Metered Area 3
P-31	Arnold Drive and Agua Caliente Road Roundabout Improvement

Legend

- Sphere of Influence

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Recommended CIPS

- Replace existing hydrant with 6-inch hydrant & lateral
- Future PRV
- Future/Upgraded Pump Station
- Abandon Valve
- Abandon Pump Station
- Abandon Enclosed Storage Facility

Replacement Pipe, inches

- 6
- 8
- 10
- 12

New Pipe, inches

- 6
- 8
- 10
- 12

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 5 February 2025.

N

0 3,000 6,000
Feet

Recommended Capacity-Related Water System Improvements

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure ES-1

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Table ES-1
Summary of Recommended Water System Capital Improvement Projects

Project #	Project	Improvement Description	Priority	Recommended Pipe Diameter (in)	Pipe Length (Linear Feet)	Total Project OPC (a)(b)	
						District Staff	External Contractor
Facilities and Maintenance Projects							
P-29	District Metered Area 2 (PZ-1G)	Install new 8-inch PRV station with flow metering at the intersection of Kearney Avenue and East Agua Caliente Road, running parallel to the existing zone separating closed valve, and new 12-inch PRV stations with flow metering (1) on West Agua Caliente Road east of the roundabout (2) on Highway 12 between Vailetti Drive and Sunnyside Avenue to create new pressure zone 1G in the Agua Caliente Knolls area.	1	--	--	$670,000	$920,000
P-27	SCWA Turnout Flow Meter Installation	Install flow meters at each of the SCWA turnout PRVs and integrate with SCADA system.	2	--	--	$770,000	$1,040,000
P-28	District Metered Area 1 (PZ-1H)	Install new 6-inch PRV station with flow metering at the corner of Arnold Drive and Carmel Ave and create new pressure zone in Glen Ellen.	2	--	--	$230,000	$330,000
P-30	District Metered Area 3 (PZ-1I)	Install new 6-inch PRV stations with flow metering on (1) Avenida Sebastiani between Via Colombard and Avenida Barbera and (2) on Arnold Drive between Mission Drive and Avenida Sebastiani, and close the valve on South Temelec Circle between Mission Drive and Herbazal Street to create new pressure zone 1I in the Temelec Area.	2	--	--	$450,000	$620,000
Pipeline Projects							
P-4	Warm Springs Road Fire Flow Improvement	Replace existing 6-inch PVC, ACP, and DIP water mains with new 8-inch and 10-inch PVC water mains, replace 47 existing service connections, and replace four existing fire hydrants.	1	8 10	3,400 1,500	$1,990,000	$3,120,000
P-7	Altimira Middle School Fire Flow Improvement	Replace existing 6-inch and 8-inch PVC and ACP water mains with new 12-inch PVC water mains along Arnold Drive, replace existing 6-inch pipe with new 8 and 12-inch pipe adjacent to Altimira Middle School, replace 15 existing service connections, and replace three existing fire hydrants. This project could be combined with P-31 for efficiency.	1	10 12	50 4,235	$2,210,000	$3,290,000
P-13	Trinity Oaks 4-Inch ACP Replacement Project	Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace 49 existing service connections, and replace six existing fire hydrants in the Trinity Oaks area. District to coordinate with Fire Department to determine if additional hydrants are needed. These hydrants would be funded by the Fire Department.	1	8	6,000	$2,280,000	$3,550,000
P-17	Eldridge Fire Flow Improvement	Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace 49 existing service connections, and replace three existing fire hydrants in the Eldridge area. Abandon the 4-inch ACP water main on Madrone Avenue and reconnect services to existing 8-inch water main. This project has been identified as high priority due to the condition of the ACP water mains in this zone.	1	8	3,900	$1,540,000	$2,470,000
P-31	Arnold Drive and Agua Caliente Road Roundabout Improvement	Replace existing 8-inch ACP water mains with new 12-inch PVC water mains and relocate the existing Hannah Lower PRV out of the center of the new roundabout. This project has been identified as high priority due to the safety concerns with operating this PRV. This project could be combined with P-7 for efficiency.	1	12	2,000	$1,230,000	$1,760,000
P-14A	Northern Pressure Zone 1 Commercial Fire Flow Improvement - La Grama	Replace existing 6-inch water mains with new 12-inch PVC water mains, replace 3 existing service connections, and replace three existing fire hydrants.	2	12	1,425	$760,000	$1,150,000
P-16	Fowler Creek and Solano Avenue Fire Flow Improvement	Replace existing 6-inch ACP water mains with new 8-inch PVC water mains, replace ten existing service connections, and replace five existing fire hydrants.	2	8	4,200	$1,550,000	$2,380,000
P-14B	Northern Pressure Zone 1 Commercial Fire Flow Improvement - HWY 12	Replace existing 8-inch ACP water mains with new 12-inch PVC water mains, replace one existing service connections, and replace one existing fire hydrants. Based on discussions with the District, the commercial areas along HWY 12 have been vacant in this area for an extended period. This project is only recommended if new development occurs here.	3	12	280	$160,000	$260,000

Table ES-1 (cont.)
Summary of Recommended Water System Capital Improvement Projects

Project #	Project	Improvement Description	Priority	Recommended Pipe Diameter (in)	Pipe Length (Linear Feet)	Total Project OPC (a)(b)	
						District Staff	External Contractor
Pipeline Projects							
P-19	Hooker Avenue Fire Flow Improvement	Install new 8-inch PVC water main between Highway 12 and Hooker Ave.	3	8	550	$200,000	$300,000
P-20	Lomita Avenue Commercial Fire Flow Improvement	Replace existing 6-inch ACP water main with new 12-PVC water main along Lomita Avenue, replace two service connections, and replace one hydrant.	3	12	300	$170,000	$280,000
P-21	Pressure Zone 1B - Arnold Dr. 4-Inch ACP Replacement Project	Replace existing 4-inch ACP water main with new 8-inch PVC water main in Pressure Zone 1B west of Arnold Drive, and replace three existing service connections.	3	8	800	$290,000	$440,000
P-24	Loma Court Fire Flow Improvement	Replace existing 6-inch with new 8-inch PVC along Loma Court, replace 11 existing service connections, and replace one existing fire hydrant.	3	8	500	$220,000	$370,000
P-25	Richards Blvd. Fire Flow Improvement	Replace existing 6-inch ACP and DIP water main with 8-inch PVC water main along Richards Blvd, replace four existing service connections, and one existing hydrant.	3	8	300	$130,000	$240,000
Pump Stations, Tanks, and Wells							
P-5B	Chestnut BPS Upgrades Projects	Replace existing Chestnut BPS with two (2) 100-gpm domestic pumps and one (1) 1,000 gpm fire pump at 60 ft total dynamic head (TDH).	1	--	--	--	$2,600,000
P-6	Donald BPS Upgrades Project	Replace existing Donald BPS with two (2) 115-gpm domestic pumps and one (1) 1,000 gpm fire pump at 220 ft TDH.	1	--	--	--	$2,600,000
P-10	Zone 1F Booster Pump Station and Eldridge PRV Replacement Project	Install new PRV and BPS with a firm capacity of 450 gpm at 275 ft TDH. Abandon existing Eldridge PRV.	2	--	--	--	$2,130,000
P-12	Sobre Vista Pressure Zone Consolidation	Replace Lower Sobre Vista BPS with a firm capacity of 290 gpm at 270 ft TDH; demolish Lower Sobre Vista Tank and Upper Sobre Vista BPS; connect PZ-2E and 3E; install individual service PRVs in former PZ-2E area; Replace existing 8-inch ACP water mains with new 8-inch PVC water mains.	2	--	--	--	$2,650,000
P-23	Arnold Drive PS Replacement Project	Install new BPS with a firm capacity of 500 gpm along Orange Avenue. Demolish existing Arnold Drive BPS.	3	--	--	--	$1,800,000
					TOTAL WATER DISTRIBUTION SYSTEM IMPROVEMENTS OPC (c)	**$26,630,000**	**$34,300,000**

Notes:
(a) Costs shown are presented in December 2024 dollars based on an ENR CCI of 15,400.54 (20-city average), with totals rounded to the nearest $10,000.
(b) Costs for pipeline projects include construction contingency (25%), design (10%), construction management (5%), permitting (5%), and Project Implementation (5%). Costs for other projects (i.e. BPS installations) include construction contingency (30%), design (15%), construction management (5%), permitting (5%), and Project Implementation (5%).
(c) Total district constructed OPC includes contractor costs for pump station, tanks, wells, and other projects not anticipated to be constructed by the District.

1 INTRODUCTION

On behalf of the Valley of the Moon Water District (District), EKI Environment & Water, Inc. (EKI) has prepared this Water Master Plan (WMP) and Capital Improvement Plan (CIP) Update. The District's WMP was last updated in 2019 (EKI, 2019), and since then the District has addressed many of the capital improvement projects identified in that plan. The details for several other projects have been modified in the interim, and the District has identified new condition-related improvement needs. In addition, several planning assumptions from the 2019 WMP have changed, including the existing and projected demands and storage evaluation criteria for the Glen Ellen Area (Zone 1F). Lastly, the District has identified three new locations to install new pressure zones or district metered areas (DMAs) to better manage high and low pressures.

The District has requested an update to the District's WMP and CIP that reprioritizes remaining and newly identified projects based on the capacity, resiliency, and reliability of the District's current distribution system and supply sources to ensure that the District can continue to reliably and cost-effectively serve its customers through 2045. The scope of work for this update included a simplified master planning process intended to streamline the refinement of the CIP.

1.1 Project Scope

The scope of the WMP and CIP Update included the following:

- An updated summary and description of the District's water service area and existing water system, including new as-built records for projects completed since 2019;
- An assessment of existing and projected water demands by pressure zone which has been updated using the Global Water Supply Assessment Tracking Tool and the *2020 Urban Water Management Plan* (EKI, 2021a);
- An assessment of the District's existing water supply, storage, and pumping capacities and condition, incorporating updated storage criteria used for the *Evaluation of Storage and Supply Requirements for Glen Ellen* (EKI, 2021b);
- Updates to the hydraulic model to assess the existing water system's ability to deliver existing and future water demands and fire flows and identify potential capital improvements to improve system operation;
- Development, prioritization, cost estimation of recommended capital improvements; and,
- Preparation of the Draft and Final Water Master Plan and Capital Improvement Plan Update Report.

1.2 Previous Evaluations and Planning Studies

The current CIP Update references the following planning studies, including:

- 2019 Water Master Plan (EKI, 2019);
- 2020 Urban Water Management Plan (EKI, 2021a);
- 2021 Evaluation of Storage and Supply Requirements for Glen Ellen (EKI, 2021b);

1.3 Report Organization

The CIP Update report is organized following the same format as the 2019 WMP, with sections streamlined to highlight key updates, including:

- Executive Summary
- Section 1 - Introduction
- Section 2 - Background
- Section 3 - Existing Water System Facilities
- Section 4 - Existing and Future Water Demands and Fire Flow Requirements
- Section 5 - Water Supply and Storage Capacity Evaluation
- Section 6 - Water Distribution System Performance and Sizing Criteria
- Section 7 - Water Distribution System Modeling Evaluation
- Section 8 - Recommended Capital Improvement Program
- Section 9 - References

2 BACKGROUND

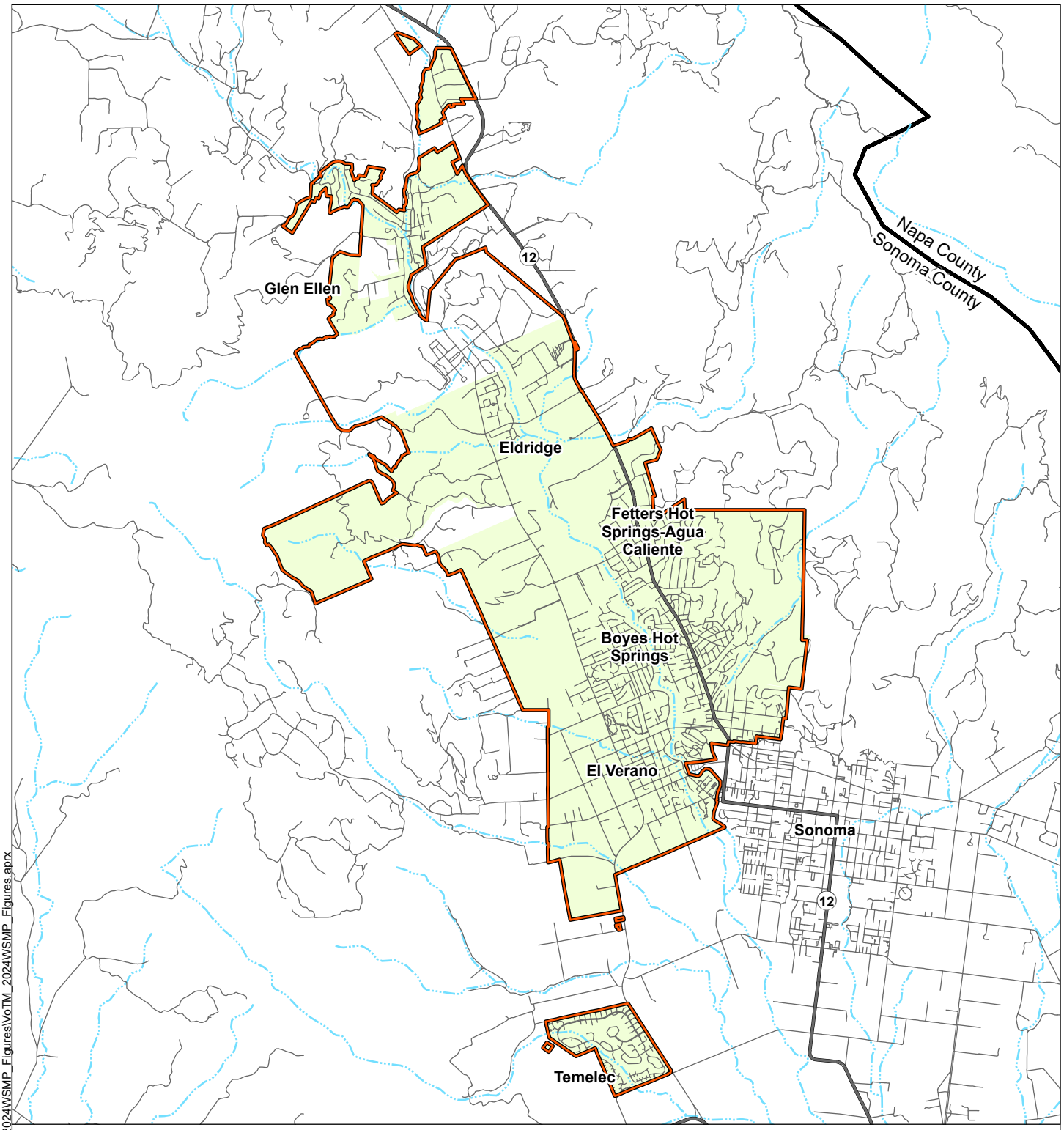
This section describes the physical characteristics of the District's water service area, as well as the current and projected population for the service area. Since the preparation of the 2019 WMP the District's service area and demographics have not changed significantly.

2.1 Site Location and History

The District's service area is located in Sonoma County, approximately 50 miles north of San Francisco, and is adjacent to the City of Sonoma. As shown in Figure 2-1, the District's water service area extends from the Trinity Oaks Subdivision in the north to the Temelec Subdivision in the south. The service area encompasses approximately 11.8 square miles and includes residential and commercial customers. Elevations in the service area range from approximately 60 feet above mean sea level to approximately 1,190 feet above mean sea level.

The District's Sphere of Influence, a boundary determined by the Sonoma Local Agency Formation Commission (LAFCO) indicating the likely eventual limits of the District's service area, was amended in October 2017 to include areas beyond the District's current service area. As shown in Figure 2-1, the District's Sphere of Influence now also includes the following areas outside of the water service area:

1. Territory served by the Sobre Vista Mutual Water Company (SVMWC); and
2. Territory occupied by the Sonoma Developmental Center (SDC), which currently owns and operates a municipal water supply, treatment, and distribution system on the campus.



Legend

- VOMWD Service Area
- Sphere of Influence
- County
- Highway
- Road
- Stream

N

0 8,000 16,000

(Scale in Feet)

Sources

1. Aerial photograph provided by ESRI's Arc GIS Online, 3 December 2024.

Notes

1. All locations are approximate.
2. Service area and sphere of influence provided by VOMWD on 25 March 2016.

District Service Area Map

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 2-1

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

2.2 Service Area Climate

The District's service area has a climate that is typical of the Napa County and Sonoma County areas, characterized by summers that are dry and warm and winters that are relatively mild with most rainfall occurring during this season. The regional averages for reference evapotranspiration (ETo), rainfall, and temperature are summarized in Table 2-1.

Table 2-1. Climate Characteristics

Month	Reference Evapotranspiration, ETo (a) (inches)	Average Rainfall (b) (inches)	Average Temperature (b)	
			Min (°F)	Max (°F)
January	1.0	6.14	37.2	57.2
February	1.6	5.27	39.9	63.2
March	3.0	4.05	40.8	66.4
April	4.5	1.77	42.3	71.2
May	5.6	0.82	46.0	77.2
June	6.6	0.23	49.7	84.1
July	7.1	0.03	51.2	88.6
August	6.3	0.08	50.8	88.2
September	4.7	0.33	49.3	86.3
October	3.3	1.67	45.5	78.6
November	1.5	3.85	40.6	65.9
December	1.0	5.18	37.1	57.5
Annual	**46.1**	**29.4**	**44.2**	**73.7**

Notes:

(a) Reference evapotranspiration data for Valley of the Moon from Appendix A of the California Code of Regulations, Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance, 15 July 2015.

(b) Precipitation and temperature data for the Sonoma Climate Station (048351) from the Western Regional Climate Center for the period 1 January 1893 through 31 May 2016.

2.3 Number of Service Connections

Table 2-2 and Figure 2-2 summarize the number of customer service connections in each water use category between Fiscal Year (FY) 2016 and FY 2024. Customers in the District's service area are classified by the following categories:

- Single-Family Residential (SFR);
- Multi-Family Residential (MFR);
- Commercial;
- Institutional; and,
- Irrigation (MFR and Commercial).

The SFR category comprises approximately 90% of all customer service connections in the District. The number of SFR service connections has slightly grown by 19 (0.3%) since FY 2017. The number of Commercial and Institutional and Irrigation connections has remained stable over the past eight years.

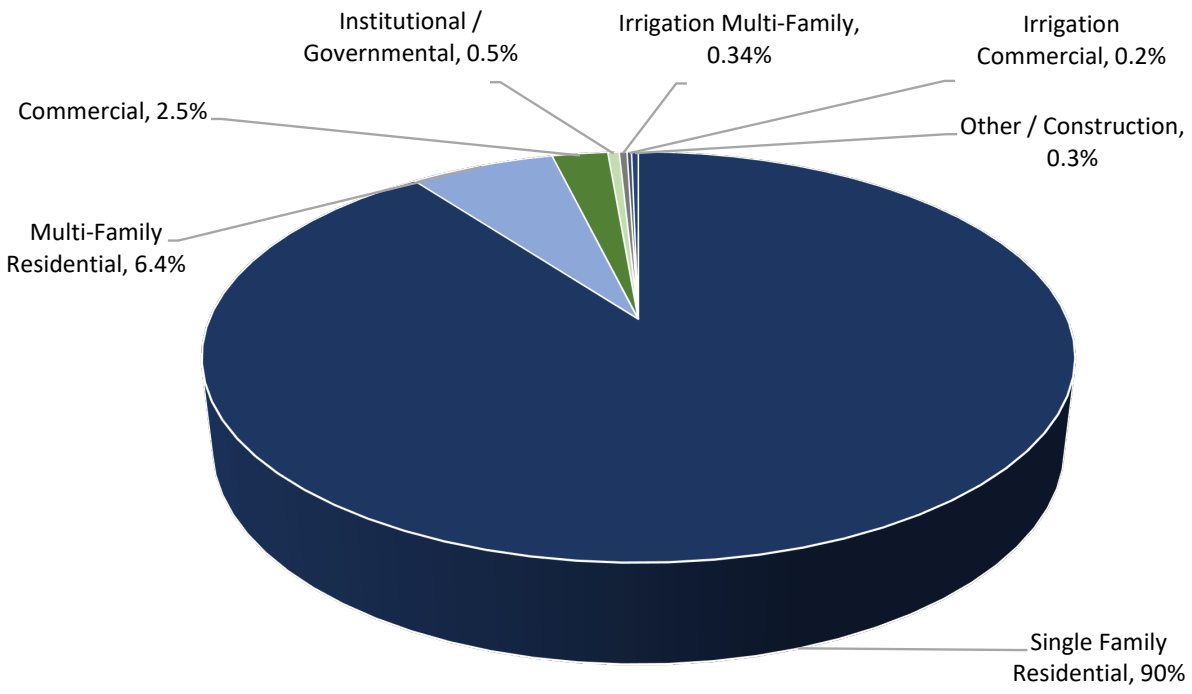
Table 2-2
Number of Current and Historical Potable Water Services by Customer Category

Water Use Sector	Number of Potable Water Service Connection (a)								
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Single Family Residential	6,226	6,239	6,235	6,220	6,230	6,235	6,247	6,256	6,258
Multi-Family Residential	439	440	446	446	448	446	448	448	447
Commercial	166	172	171	172	170	171	165	163	172
Institutional / Governmental	33	34	33	33	33	34	34	34	35
Irrigation Multi-Family	20	22	22	22	24	24	24	24	24
Irrigation Commercial	12	13	12	11	11	12	12	13	14
Other / Construction	21	24	24	23	21	21	17	18	21
Total Number of Services	***6,917***	***6,944***	***6,943***	***6,927***	***6,937***	***6,943***	***6,947***	***6,956***	***6,971***

Abbreviation:
FY - fiscal year

Notes:
(a) Number of service connections for FY 2016 - 2017 and FY 2018 - 2024 were processed from water billing data provided by the District on 1 August 2018 and 30 October 2024, respectively, based on the number of unique billing data accounts in each land use classification.

Figure 2-2
Current (FY 2024) Potable Water Services by Customer Category



2.4 Service Area Demographics

The demographics of the District's customers include a wide range of income, household size, and water demands. Typically, the more affluent households are located along the foothills and are characterized by larger lots and homes with higher water demands for irrigation. On the other end of the spectrum, there are two disadvantaged communities located within the District which tend to have smaller lots and lower water use.

Due to the District's setting in the heart of a tourist destination, Sonoma Valley, another factor impacting water use in recent years has been the increase in the number of second homes and vacation rentals. These accounts tend to have higher water use because the sites do not have fulltime owners looking for leaks and managing irrigation water use in accordance with weather patterns.

2.5 Current and Projected Population

The current 2024 population was estimated using a persons-per-connection method consistent with methodology used in the District's 2020 Urban Water Management Plan (UWMP). A population estimate was obtained by compiling population estimates from the persons-per-connection method. The persons-per-connection factor for the District per the State Water Board Division of Drinking Water (DDW) Electronic Annual Report (EAR) was 3.3. Using this methodology, the District's existing service area population is estimated to be 23,004.

The 2020 UWMP assumed a 1.5% population growth per year compared to the 2020 population. The current 2024 population is on track with the estimated 2025 population. The existing and projected service area population based on the UWMP projections are summarized in Table 2-3.

Table 2-3. Population Projections

	2024 (Existing)	2025	2030	2035	2040	2045
Population Estimates (a)	23,004	24,860	26,782	28,851	31,081	33,483

Notes:

(a) The 2024 population is calculated based upon a persons-per-connection method assuming a persons-per-connection factor of 3.3 per the District's 2020 Urban Water Management Plan (2020 UWMP). Projected populations are based on the District's 2020 UWMP.

2.6 Anticipated Future Development

The District anticipates providing connections and service to the following major developments in the future:

- 810 West Agua Caliente Road: the proposed development includes the construction of a hotel, townhomes, affordable housing units, and a retirement community on vacant land at the intersection of Arnold Drive and Agua Caliente Road (EKI, 2021a);
- Verano Ave Multi-Family Residential Development: An 80-unit multi-family development on Verano Avenue across from Maxwell Farms Regional Park anticipated to be completed by 2025; and,

- The Springs Specific Plan: the proposed development is bounded by Agua Caliente Road at the north and Verano Avenue at the south and bisected by the Highway 12 commercial corridor includes up to an additional 124 single-family dwellings units, 561 multi-family or live-work dwelling units, 167,000 square feet of commercial space, 120 hotel rooms, 82,000 square feet of office space, and 27,000 square feet of recreational area anticipated to be completed over the next 50 years.

Water demand projections associated with these developments are discussed further in Section 4.

Additional development is anticipated within the District's sphere of influence as part of redevelopment of the SDC Site. The SDC Site is currently owned by the State of California. The SDC Site has rights and access to local surface water supplies and associated treatment, storage, and distribution infrastructure. The SDC water system was previously permitted and operated as a public water system but was shut down in 2019 when the SDC was closed. The SDC Site is located within the District's sphere of influence, and the District plans to annex the SDC area and incorporate the SDC water system into its system when the site is redeveloped. EKI recently supported the District's planning efforts related to serving the SDC Project. In 2022 and 2023, EKI prepared the following planning documents in support of the SDC Project:

1) The *Water Supply Assessment for the SDC Specific Plan* (EKI, 2022);
2) A hydraulic assessment that evaluated how the SDC water supply infrastructure could be integrated with the District's water system (EKI, 2023a);
3) A conceptual transition plan that outlined steps to transition control of SDC water rights, facilities, and operations to the District (EKI, 2023b); and,
4) A peer review of the Sonoma Developmental Center Water System Assessment Report prepared by Wood Rodgers and dated April 2023.

The development will likely include between 200 and 500 dwelling units. However, the timeline for this future development is uncertain and it is not currently with the District's service area. Thus, the SDC is not included in this master planning effort.

3 EXISTING WATER SYSTEM FACILITIES

The District's water supply is provided by the Sonoma County Water Agency (SCWA) and groundwater wells owned and operated by the District. The District owns, operates, and maintains the potable water distribution system that serves drinking water to its residential, commercial, and institutional customers. This section summarizes the District's water supply facilities and distribution system, including water storage, pumping facilities, and pipe network. A map of the District's existing water system is shown on Figure 3-1 and a hydraulic profile schematic of the District's water system is shown on Figure 3-2.

The District's water system facilities have been updated based on completed and in-progress CIP projects, many of which were identified in the 2019 WMP, including:

- The addition of the Pedroncelli and Craig groundwater wells
- The installation of the new Saddle Tank
- Modifications to the District's pressure reducing valve (PRV) settings
- Installation of 7,715 linear feet of pipe based on approximately 37 individual as-builts listed as project groups below:
  - EST 2947 – The Walnut Ave, Oak St. & Penny Ln. Water Main Replacement Project
  - EST 2958 – Aqua Caliente Road, Arnold Drive, and Summer Meadow Lane Main Replacement Project (including a new normally closed cross connection between PZ1 and PZ1B)
  - EST 2967 – The Boyes Blvd. Bridge Pipeline Replacement Project
  - EST 2983 – The Pedroncelli and Craig Well installations
  - EST 2984 - The Gibson St., Riddle Rd Easement, Sobre Vista (near Lake Josephine), Brookview & Lomita Steel Water Main Replacements
  - EST 2993 – The Fetters Ave., Malek Rd., Depot Rd., Sobre Vista Dr., and Wake Robin Rd. Main and Service Line Replacement Project
  - EST 2996 – the Arnold Dr Main Replacement Project
  - EST 3021 – the Waterline Improvement Project on Chestnut Rd to Chestnut Tank
  - EST 3034 to EST 3040 – Various service line, and hydrant installations
- Upcoming capital improvement projects currently in design or construction, including:
  - Altimira Fire Flow Improvement Project
  - Verano Hotel Private Water Improvements;
  - 18661 Lomita Avenue New Water Main Project
  - Boyes Food Center Mixed Use Development Water Main Improvement Project

3.1 Water Supply Facilities

The District, along with seven other cities and special districts in Sonoma and Marin County, has a water supply agreement with Sonoma County Water Agency (SCWA) for the purchase of Russian River water. The majority (approximately 79% under normal water year conditions) of the District's water supply comes from SCWA Russian River water purchases. The District's remaining water is supplied by eight (8)

groundwater wells that are owned (or leased) and operated by the District. The District's imported water and groundwater supply facilities are described in detail below.

3.1.1 SCWA Supply and Transmission System

The District's water supply contract with SCWA, known as *Restructured Agreement for Water Supply* (Restructured Agreement), was executed in 2006 and entitles the District to 8.5 million gallons per day (MGD) during any month and an annual maximum of 3,200 AFY. Provided the supply is available, the Restructured Agreement permits the District to take delivery of water more than its entitlement during a given month, provided specific conditions specified in the Restructured Agreement are met.

The SCWA's storage and transmission system is shown on Figure 3-3. As described below, the system includes lakes, streams, rivers, aqueducts, tanks and other facilities.

The SCWA storage and transmission system is supplied water from the natural flow of the Russian River. The Russian River water is stored in Lake Sonoma, behind Warm Springs Dam, and in Lake Mendocino, behind Coyote Dam. These dams are federal projects under the jurisdiction of the U.S. Army Corps of Engineers (USACE). SCWA is the local sponsor and partners with the USACE for the water supply portion of the reservoir projects. SCWA owns and operates the water supply pools at both Lake Sonoma and Lake Mendocino. The design water supply pool capacities of Lake Sonoma and Lake Mendocino are 245,000 AFY and 122,500 AFY, respectively.

The SCWA uses approximately 14 miles of the natural channel of Dry Creek and approximately eight miles of the Russian River to convey water from Lake Sonoma to its diversion facilities. Water is diverted and extracted from the stretch of river located just upstream of Wohler Bridge and downstream of Mirabel via six Ranney Collectors. The diverted river water percolates through sand and gravel and only needs the addition of chlorine to meet the California Drinking Water Program drinking water quality standards. A system of aqueducts, booster pumps, and tanks then distribute the water to the various Water Contractors and other transmission system users. The transmission system was designed to meet peak day demands of its customers.

SCWA also owns and operates three groundwater supply wells located in the Santa Rosa Plain Subbasin of the Santa Rosa Valley Groundwater Basin. These groundwater wells are located along the Russian River-Cotati Intertie Pipeline and are used to supplement the SCWA water supply.

The SCWA Restructured Agreement established a goal for each water contractors including the District to supply and maintain approximately 40% of its maximum month demand through local sources to mitigate against drought, emergencies, and temporary Transmission System outages.

The District's SCWA supply is conveyed from the Sonoma Aqueduct, which is owned and operated by the SCWA and serves both the District and the City of Sonoma. Storage in this portion of the Sonoma Aqueduct is provided by the Annadel Tanks located upstream of the District near Oakmont, the Eldridge Tanks located between the northern and southern portions of the District south of Glen Ellen, and the Sonoma Tanks located downstream of the District and serve the City of Sonoma. Pressure for the aqueduct in this region is provided by Sonoma Booster Pump Station No. 1 and Sonoma Booster Pump Station No. 2, located on the east side of Spring Lake. The Eldridge Booster Pump Station located at the Eldridge Tank is typically off-line.

The District is supplied through 10 turnouts that are spread along the aqueduct from just north of Trinity Road and Highway 12 south to Verano Avenue and Fifth Street West near the City of Sonoma (see Figure 3-1). Two turnouts are located upstream of the SCWA Eldridge Tanks (Glen Ellen and Trinity Oaks turnouts), and the remaining eight turnouts are located downstream of the Eldridge Tanks. The SCWA meters water to the District at each turnout. Pressure available at each turnout depends on the hydraulic

conditions along the aqueduct and the fill cycles of the SCWA Eldridge and Sonoma Tanks. Pressures are typically substantially lower at the turnouts when the tanks are filling. Detailed information regarding each turnout is listed in Table 3-1.

Downstream of each SCWA turnout, the District owns and operates pressure reducing valve (PRV) stations. These stations are described in Section 3.4.2.

3.2 Groundwater Supply

The District supplements its purchased SCWA water with the use of local groundwater. The District owns and/or operates a total of eight active municipal production wells.[1] Portions of the District are located within the Sonoma Valley Subbasin, which is identified by the California Department of Water Resources (DWR) as 2-002.02 and is a subbasin of the Napa-Sonoma Valley Groundwater Basin (DWR 2-002). As shown in Figure 3-4, four of the District's existing wells (Verano, Larbre, Craig, and Pedroncelli) are located within Sonoma Valley Subbasin; the other wells are outside of the DWR-defined groundwater basins.

3.2.1 Groundwater Management

The Sonoma Valley Subbasin is not adjudicated and has not been identified by DWR as a critically-overdrafted groundwater basin. The Basin is listed as a high priority and is subject to mandatory management under the Sustainable Groundwater Management Act of 2014 (SGMA) requirements. The Sonoma Valley Groundwater Sustainability Agency (GSA) was formed in June 2017 through a Joint Exercise of Powers Agreement (JPA) between the District and the City of Sonoma, North Bay Water District, Sonoma Resource Conservation District, SCWA, and County of Sonoma.

The Groundwater Sustainability Plan for the Sonoma Valley Groundwater Subbasin (GSP) was submitted to the California Department of Water Resources in January 2022 and approved by DWR on January 26, 2023. [2] The GSP establishes a standard for sustainability of groundwater management and use and determines how the basin will achieve this standard by 2042.

3.2.2 Groundwater Wells and Treatment

The District's active groundwater wells are summarized in Table 3-2. The capacities of the District's wells range from 90 gallons per minute (gpm) to 300 gpm. The District cycles through its wells; each well typically pumps for nine months and then remains offline for a three-month recovery period.

The District's "Well 5A" or "Verano Well" is currently not used due to water quality issues that cannot be treated with the existing iron and manganese treatment system.[3] However, the District is currently implementing an Aquifer Recovery and Storage (ASR) project at the Verano Well and Park Avenue well sites, which may allow for reactivation of the Verano Well. The ASR Project is currently in the pilot testing phase and construction of permanent ASR facilities at the two well sites (if pilot testing is successful) is anticipated to be completed by early 2026. The ASR project is expected to provide enhanced water supply reliability during droughts, natural disaster events, and seasonal periods of peak water demand.

[1] The District also owns a ninth well, Trinity Oaks Well, which is inactive. There are no plans to reactivate this well.
[2] The GSP and the letter of determination from DWR can be viewed here: https://sonomavalleygroundwater.org/gsp/
[3] Water quality issues include elevated arsenic and temperature, and hydrogen sulfide odors.

Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV/PSV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 3 December 2024.
2. Pressure zone information adapted from Water System Map, January 2015.

N

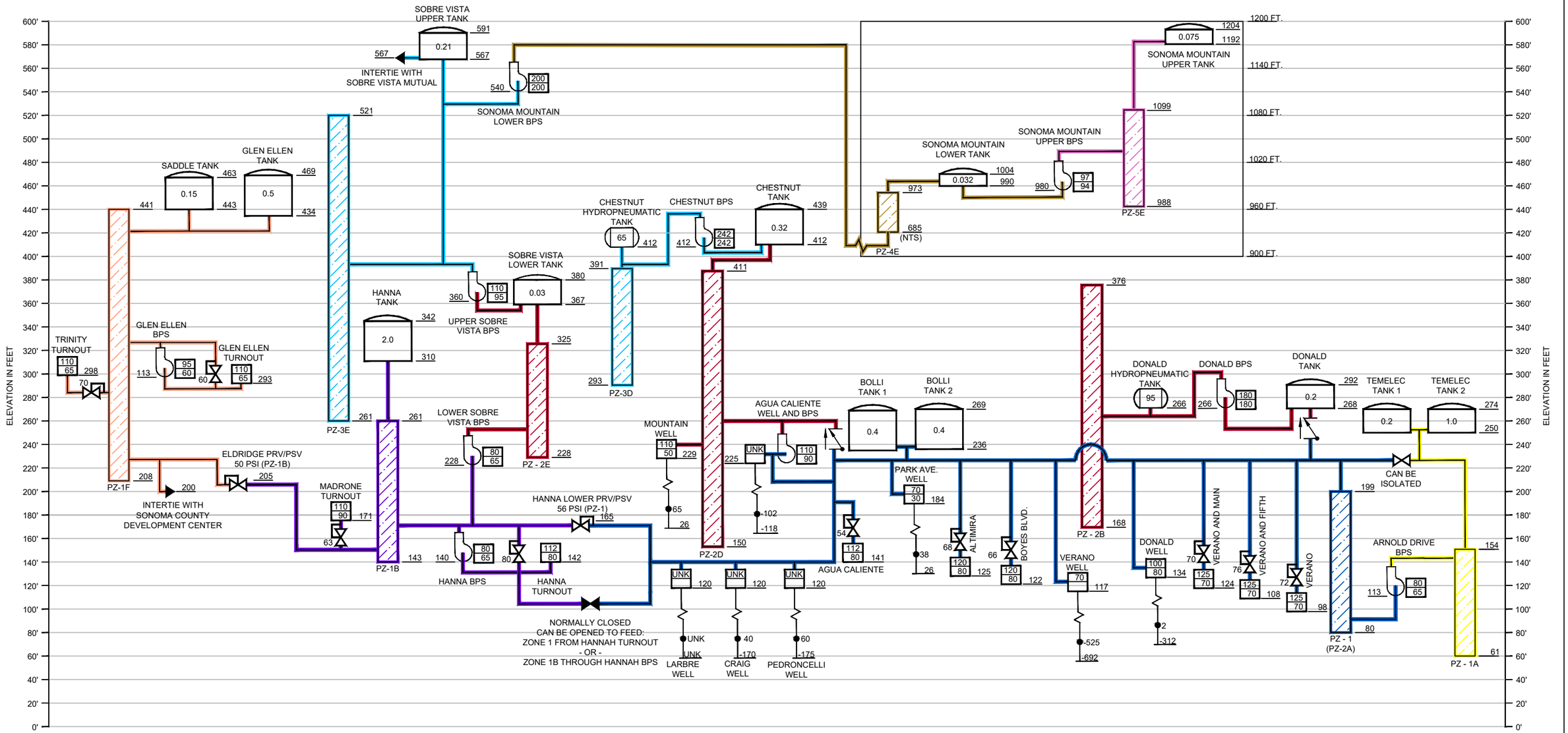
0 3,000 6,000
Feet

Existing Water System Facilities

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 3-1

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx



Legend:

- Tank with Volume (MG), Base and High Water Level Elevation
- SCWA Turnout with Max and Min Aqueduct Pressure (psi)
- Pressure Reducing/Sustaining Valve with Elevation and Pressure Settings (psi)
- Open Valve
- Check Valve
- Hydropneumatic Tank with Pressure Setting (psi) and Base Elevation
- Pump Station with Max and Min Discharge Pressure (psi) and Base Elevation
- Supply Well with Well Head, Pump, and Bottom Elevations and Max and Min Discharge Pressures (psi)
- Pressure Zone with Highest and Lowest Elevation Served

Abbreviations:

BPS	= Booster Pump Station
EL.	= Elevation
MG	= Million Gallons
PRV	= Pressure Reducing Valve
psi	= Pounds Per Square Inch
PZ	= Pressure Zone
SCWA	= Sonoma County Water Agency
UNK	= Unknown
V	= Volume

Notes:

1. All elevations are approximate.
2. Elevations are based on NAD88 vertical datum.
3. PRV/PSV settings have been updated based on hydraulic modeling recommendations and may vary +/- 5 psi.

Sources:

1. 2007 Water Master Plan, Brielje & Race.
2. Water System Map, January 2015.
3. Valley of the Moon Water System Schematic.

Existing Water System Hydraulic Profile

Valley of the Moon Water District

February 2025
EKI C40120.00

Figure 3-2

eki environment & water

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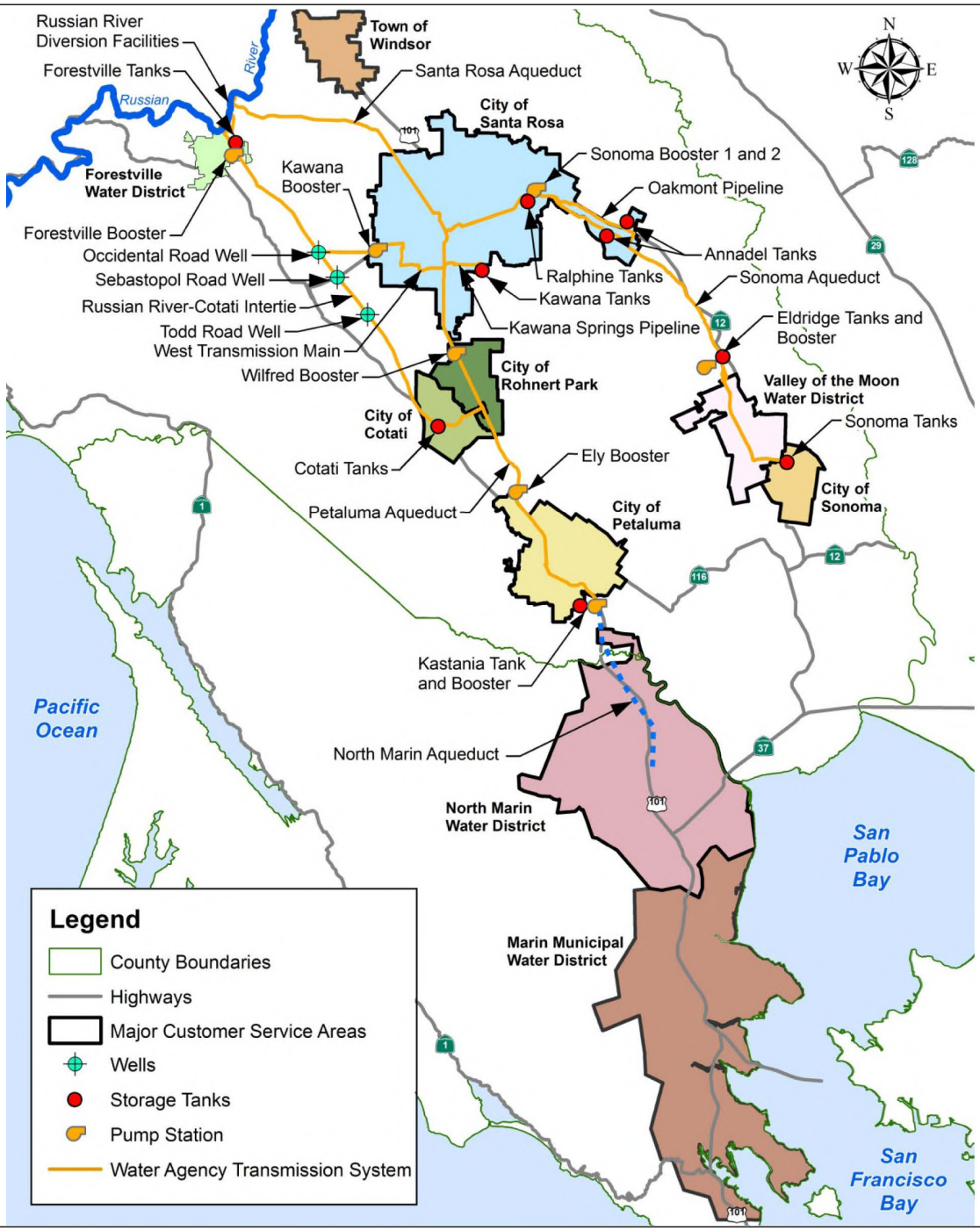


Notes

1. All locations are approximate.
2. Not to scale.

Sources

1. Sonoma County Water Agency 2010 Urban Water Management Plan

SCWA Service Area and Water Transmission System Facilities

DRAFT

Valley of the Moon Water District
Sonoma County, CA
January 2025
C40120.00

Figure 3-3

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

Table 3-1
SCWA Turnout Information

SCWA Turnout	Pressure Zone Served	Meter Size (in)	Turnout Elevation (ft)	SCWA Aqueduct Pressure at Turnout (psi) (a)		Associated District PRV Station (b)
				Low	High	
Verano	1	6	98	70	125	PRV-1
Verano and Main	1	10	124	70	125	PRV-2
Verano and Fifth	1	6	108	70	125	PRV-3
Boyes Boulevard	1	6	122	80	120	PRV-4
Altimira	1	6	125	80	120	PRV-5
Agua Caliente	1	6	141	80	112	PRV-6
Hanna	1B	10	142	80	112	PRV-7
Madrone	1B	6	171	90	110	PRV-9
Glen Ellen	1F	6 & 4	293	65	110	PRV-11
Trinity Oaks	1F	6	298	65	110	PRV-12

Notes:

(a) Pressure in aqueduct at each turnout location vary based on the SCWA tank filling cycles. Pressure ranges are approximate.

(b) The District operates PRV stations directly downstream of each turnout location to reduce pressures as necessary from the aqueduct pressures. Refer to Table 3-5 for PRV station information.

Lastly, in 2023, the District drilled an 800 feet deep exploratory borehole adjacent to its Chestnut Tank to determine the feasibility of installing a permanent production well at this location. Zone testing was performed at several intervals to determine potential yield and water quality of a future well and it was determined that a well at the site would likely be capable of producing over 100 gpm, however several potential water quality concerns were noted (EKI, 2024b).[4] The District is not currently pursuing a well at this location, however, may do so in the future.

3.3 Emergency Interties

The District has emergency interties with the SDC and Sobre Vista Mutual Water Company (SVMWC). In the event of an emergency, either the District can supply SVMWC or SDC with potable water under the terms of their agreements. The District can also receive water from SDC, although the SDC is currently being served via the SCWA Aqueduct instead of its local surface water supplies and thus would not be able to supply the District should the SCWA Aqueduct be impaired.

3.4 Water Distribution System Pressure Zones and Facilities

The District's existing water distribution system facilities include pipe network, PRV stations, water storage facilities, booster pump stations, and other features. The District's distribution system consists of several pressure zones. The District's distribution system facilities are discussed in the following sections.

3.4.1 Pressure Zones

The District's water distribution system has 11 pressure zones as shown on Figure 3-1. The District's service area also includes several customers that are supplied with water directly from the SCWA aqueduct. The majority of the District's customers that are located on the valley floor are served from the SCWA aqueduct pressure (Pressure Zones 1, 1A, 1B, 1F) while customers in the higher elevations of the Sonoma Valley are served by separate pressure zones. Pressures Zones 1 and 1A are typically operated as a single pressure zone, but the District can isolate Pressure Zone 1A by pumping from Zone 1 via Arnold Drive Pump Station if there is insufficient aqueduct pressure. Under certain conditions, booster pump stations are needed to supply flow to Pressure Zones 1B and 1F, as discussed in Section 3.4.3. Minimum and maximum service point elevations are shown on Figure 3-2 and summarized in Table 3-3.

The number of services in each zone is listed in Table 3-3 and Table 3-4. Approximately 68% of service connections are in Pressure Zone 1 and 94% of connections in total are in the lower aqueduct zones (Pressure Zones 1, 1A, 1B, and 1F). All of the District's commercial, institutional, and landscape accounts are located in the lower aqueduct zones (Pressure Zones 1, 1A, 1B, and 1F).

3.4.2 Pressure Reducing Valve Stations

The District maintains 13 PRV Stations in its system. Ten of the PRV stations are installed directly downstream of each SCWA turnout to control the pressures delivered from the aqueduct to the District's distribution system. In addition, the district operates the Eldridge PRV to separate Pressure Zones 1F and 1B and the Hanna Lower PRV to separate Pressure Zone 1B and Pressure Zone 1. These valves typically remain close but are set to open in case of an emergency to deliver flow from Pressure Zones 1F to 1B through the Eldridge PRV and from Pressure Zone 1B and 1 through the Hanna PRV. Information on the District's PRV Information is provided in Table 3-5.

[4] Water quality concerns include elevated manganese and water temperature.

3.4.3 Water Storage Facilities

As shown in Table 3-6, the District has approximately 5.5 million gallons (MG) of total storage in 13 ground-level storage tanks. The District's tanks are used to help meet system demands during peak hours, provide emergency storage, and provide fire flow storage. During the October 2017 Sonoma County wildfires, the District's Saddle Tank was destroyed but has since been reconstructed in 2020 with a new 0.15 MG welded steel tank.

3.4.4 Booster Pump Stations and Hydropneumatic Tanks

As shown in Table 3-7, the District has 10 booster pump stations (BPSs) to serve upper pressure zones and fill upper storage tanks. The Hanna and Glen Ellen BPSs operate to boost pressure from the SCWA aqueduct during certain operating conditions to supply Pressure Zones 1B and 1F, respectively. Seven BPSs have backup power on-site and the District has portable generators that it uses to power the remaining BPSs during power outages. Hanna Pump Station is the only BPS with variable frequency drive pumps; all other pumps are constant speed.

Hydropneumatic tanks are installed at Donald and Chestnut BPSs to supply Pressure Zones 2B and 3D, respectively, during lower demand periods to limit cycling the BPSs. Characteristics of these hydropneumatic tanks are described in Table 3-7.

3.4.5 Water Mains and Other Distribution System Features

The District's water distribution network consists of approximately 92 miles of pipe ranging from <2 inches to 14 inches in diameter. Pipe materials are primarily asbestos cement pipe (ACP) and polyvinyl chloride (PVC) pipe, but there are also sections of cast-iron pipe (CIP), ductile iron pipe (DIP), steel pipe, and high-density polyethylene (HDPE) pipe. Table 3-8 summarizes the District's distribution pipelines by diameter and material. The District's standard material for new pipe installations is PVC pipe. Distribution system pipe sizes are shown on Figure 3-5 and materials are shown on Figure 3-6.

The Districts distribution system also contains valves, blow offs, air release valves, hydrants, service connections, meters, and other appurtenances necessary to reliably operate the system.

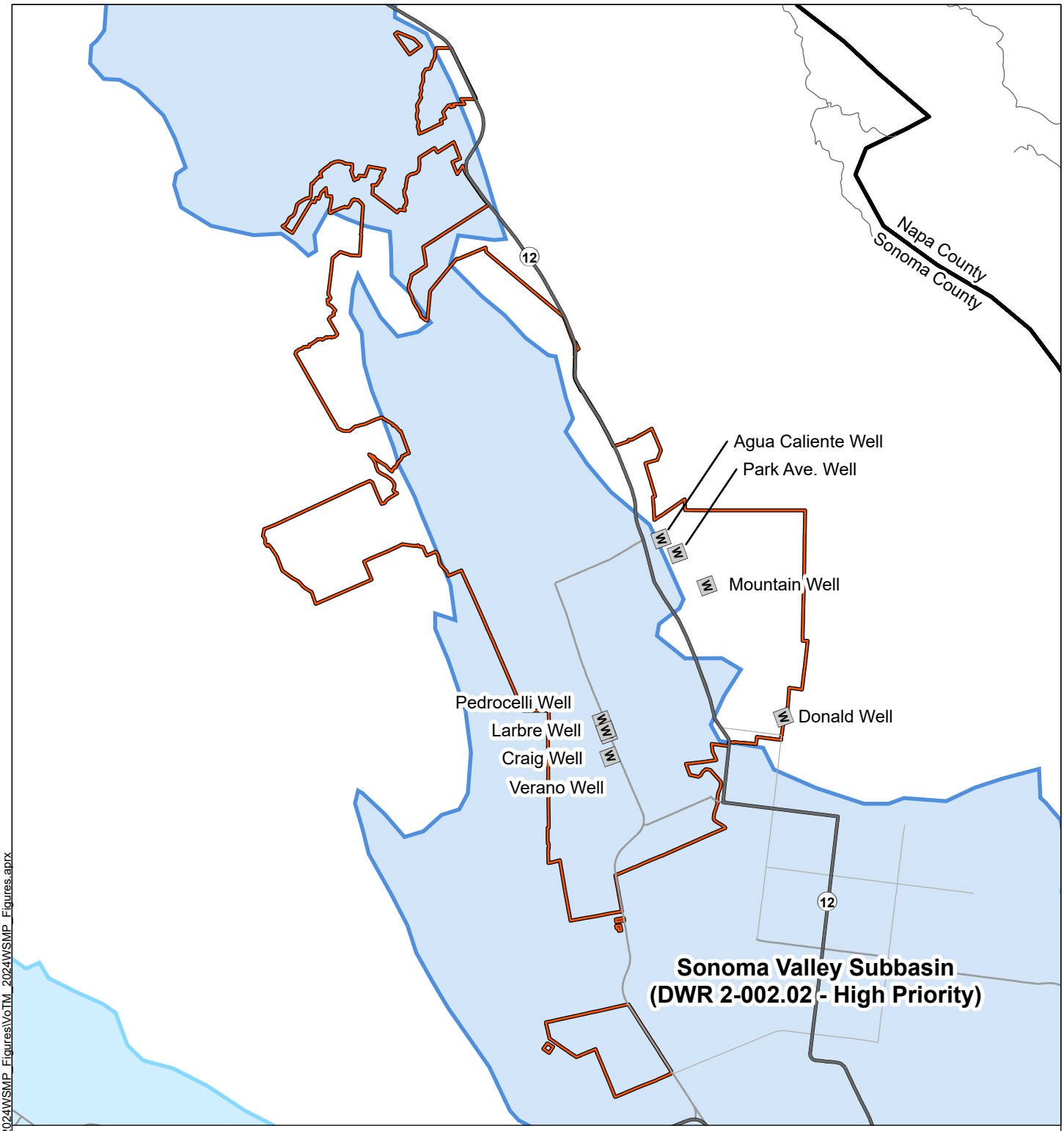
Since publishing the 2019 WMP, the District has replaced approximately 2,820 feet of steel pipe. The majority of the remaining steel pipes are small diameter service connections, but a few steel bridge crossings remain.

3.4.6 SCADA System

The District has a supervisory control and data acquisition (SCADA) system monitoring all wells, pump stations, storage tanks, hydropneumatic tanks. The system allows the District to remotely control operational setpoints and monitors for discharge flows, suction and discharge pressures, tank levels, pump runtimes, and chlorine residual. Alarms are set for minimum and maximum levels and pressures. The District also monitors levels in and flows from the SCWA Eldridge Tank and flows in the Aqueduct upstream and downstream of the District.

Between 2016 and 2017, the District upgraded the SCADA System and added tank hatch alarms and video cameras.

Since the 2019 WMP, the District has not made any major changes the SCADA system but has incorporated the new well and tank facilities into the SCADA system.



Legend

- Sonoma Valley Subbasin
- Other Groundwater Basins
- Sphere of Influence
- County
- Highway
- Road
- W Production Well

N

0 8,000 16,000

(Scale in Feet)

Summary of Local and Regional Groundwater Management

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 3-4

Sources

1. Aerial photograph provided by ESRI's Arc GIS Online, 8 January 2025.

Notes

1. All locations are approximate.
2. Service area and sphere of influence provided by VOMWD on 25 March 2016.

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

Table 3-2
Groundwater Well Information

Well Name	Pressure Zone Served	Ground Surface Elevation (ft)	Pump Elevation	Bottom of Casing Elevation (ft)	Design Flow Rate (gpm)	Motor Horsepower	Design Head (ft)	Backup Power	Treatment
Existing Wells									
Donald	1	134	2	-312	110	15	288	No	Chlorination - Chlorine Tablets
Mountain Ave.	2D	229	65	26	110	15	290	Yes	Chlorination - Chlorine Tablets
Park Ave.	1	184	38	26	90	7.5	370	No	Chlorination - Chlorine Tablets
Agua Caliente	1	225	-102	-118	120	25	370	Yes	Chlorination - Chlorine Tablets
Verano	1	117	-525	-692	300	50	400	No	Iron/Manganese/Arsenic Treatment - Green Sand Filtration
Larbre	1	120	--	--	110	15	200	No	Grit Removal Chlorination - Chlorine Tablets
Pedroncelli (a)	1	120	60	-175	150	--	--	No	Chlorination - Chlorine Tablets
Craig (a)	1	120	40	-170	125	15	375	No	Chlorination - Chlorine Tablets
Future Wells									
Park Ave. (New)(b)	1	184	15	-116	125	--	--	--	Chlorination - Chlorine Tablets

Notes:

(a) Information shown for the Pedroncelli and Craig wells per Permit Application by EKI dated May 2022. Due to flow from the upper to lower aquifer, the Pedroncelli well was grouted to a depth of 295 ft and the Craig well was grouted to a depth of 290 ft. Additionally, per discussions with the District the expected flowrate for the Pedroncelli well has been reduced to 150-gpm due to air entrainment.

(b) The new Park Well is currently being installed and is expected to be in service by mid-2025. Design information shown based on the Aquifer Storage and Recovery Drilling Phase design plans by EKI dated Jan 2023.

Abbreviations:

gpm = gallons per minute ft = feet

Table 3-3
Pressure Zone Information

Pressure Zone	Service Point Elevation (ft) (a)		Number of Service Connections (FY2024)
	Min	Max	
1	80	199	4,767
1A (b)	61	154	806
1B	142	243	422
1F	208	441	538
2A (b)	134	212	2
2B	168	376	27
2D	150	411	329
2E	228	325	2
3D	293	391	27
3E	261	521	34
4E	685	973	0
5E	988	1,099	3

Notes:

(a) Elevations are approximate and based on NAD88. Service points include service connections or hydrants.

(b) Pressure Zones 1A and 2A typically operate as part of Pressure Zone 1 but can be isolated, if necessary.

Table 3-4
Current and Historical Potable Water Services by Pressure Zone and Customer Classification

Sector	Number of Potable Water Service Connections by Pressure Zone												
	1	1A	1B	1F	2A	2B	2D	2E	3D	3E	5E	Hydrant Meters	SCWA (a)
Single Family Residential	4,200	793	393	465	2	27	318	2	25	26	3	--	4
Multi-Family Residential	369	2	17	38	--	--	11	--	2	8	--	--	--
Commercial	126	7	5	25	--	--	--	--	--	--	--	--	--
Institutional	27	--	3	4	--	--	--	--	--	--	--	--	1
Irr. Multi-Family Residential	18	4	1	2	--	--	--	--	--	--	--	--	--
Irr. Commercial	11	--	1	1	--	--	--	--	--	--	--	--	--
Other/Construction	16	--	2	3	--	--	--	--	--	--	--	9	--
Total Number of Services	**4,767**	**806**	**422**	**538**	**2**	**27**	**329**	**2**	**27**	**34**	**3**	**9**	**5**

Notes:
(a) SCWA serves these customers directly off of the aqueduct.

Table 3-5
PRV Station Information

PRV ID	Description	Pressure Zone Served	Size (in)	PRV Setting (psi) (a)	Elevation (ft)
SCWA Turnout Pressure Reducing					
PRV-1	Verano Turnout PRV	1	8	76	98
PRV-2	Verano and Main Turnout PRV	1	10	65	124
PRV-3	Verano and Fifth Turnout PRV	1	6	71	108
PRV-4	Boyes Boulevard Turnout PRV	1	6	66	121
PRV-5	Altimira Turnout PRV	1	8	64	125
PRV-6	Agua Caliente Turnout PRV	1	6	57	141
PRV-7	Hanna Turnout PRV	1B	10	80	142
PRV-9	Madrone Turnout PRV	1B	6	63	171
PRV-11	Glen Ellen Turnout PRV	1F	6 & 4	60	293
PRV-12	Trinity Oaks Turnout PRV	1F	6	70	298
PRV-15	Theodor PRV (b)	(2D)	6	57	190
Other Regulating Valves					
PRV-10	Eldridge PRV/PSV	1F to 1B	6	50 PSI (PZ1B)	213
PRV-13	Hanna Lower PRV/PSV	1B to 1	8	56 PSI (PZ1)	165

Notes:

(a) Data from 9 September 2024 Pumping and Storage Report provided by Valley of the Moon Water District 30 September 2024. Settings for PZ-1 PRVs updated per District comments provided on 16 January 2025.

(b) The Theodor PRV serves to reduce excessive pressures to approximately ten homes in PZ-2D on Falcon Ln.

Abbreviations:

gpm - gallons per minute
in - inch
PRV - pressure reducing valve
SCWA - Sonoma County Water Agency

Table 3-6
Water Storage Facility Information

Tank Number	Tank Name	Pressure Zones Served (a)	Date Constructed	Material	Capacity (MG)	Height (ft)	Diameter (ft)	Tank Floor Elevation (ft)
T-1	Temelec 1	1A & 1	1985	Welded Steel	1.0	24.0	84	250
T-2	Temelec 2	1A & 1	1966	Welded Steel	0.2	24.0	38	250
T-3	Donald	2B & 1*	1963	Welded Steel	0.2	24.1	40	268
T-4	Glen Ellen	1F, 1B*, & 1*	2006	Welded Steel	0.5	35.0	52	434
T-5	Saddle	1F, 1B*, & 1*	2020	Welded Steel	0.15	24.0	40	443
T-6	Bolli 1	1	2001	Welded Steel	0.4	33.0	46	236
T-7	Bolli 2	1	2001	Welded Steel	0.4	33.0	46	236
T-8	Chestnut	2D, 3D, and 1*	1992	Welded Steel	0.32	27.0	48	412
T-9	Hanna	1B & 1*	1977	Welded Steel	2.0	32.0	104	310
T-10	Sobre Vista - Lower	2E	Pre-1909	Concrete - HDPE Lined	0.03	13.0	20	367
T-11	Sobre Vista - Upper	3E	2002	Bolted Steel	0.2075	24.0	38	567
T-14	Sonoma Mountain - Lower	4E	2006	Bolted Steel	0.032	16.0	18.5	990
T-15	Sonoma Mountain - Upper	5E	2002	Bolted Steel	0.022	8.0	21.6	1192

Notes:
(a) An asterisk (*) indicates the lower pressure zones can be served indirectly through from this tank through pressure reducing valves.

Table 3-7
Booster Pump Station Information

Booster Pump Station	Pump No.	Pressure Zone (Tank) Served	Head (ft)(a)	Design Flow (gpm)(a)	Horsepower (hp)(a)	Firm Capacity (gpm)	Elevation (ft)	Backup Power	Hydropneumatic Tank Volume (gallons)	Hydropneumatic Pressure Setting (psi)
Arnold Dr.	PS-1	1 to 1A	160	500, 500	20, 20	500	114	No	--	--
Donald (b)	PS-2	1 to 2B	210	100, 100, 350	2, 7.5, 25	450	268	Yes	2,000	95
Chestnut	PS-4	2D to 3D	155	100, 100	5, 5	100	413	Yes	3,000	65
Agua Caliente	PS-5	1 to 2D	205	350, 350	25, 25	350	225	Yes	--	--
Sobre Vista Lower	PS-6	1 to 2E	160	130, 130	7.5 , 7.5	130	229	Yes	--	--
Sobre Vista Upper	PS-7	2E to 3E	105	100, 100	10, 10	100	351	Yes	--	--
Glen Ellen	PS-9	SCWA to 1F	175	450, 450	25, 25	450	290	Yes	--	--
Hanna	PS-10	SCWA to 1B	160	800, 800	20, 20	800	143	Yes	--	--
Sonoma Mntn. Lower	PS-11	3E to 4E	475	26, 26	5, 5	26	535	Yes	--	--
Sonoma Mntn. Upper	PS-12	4E to 5E	220	17, 17	5, 5	17	980	No	--	--

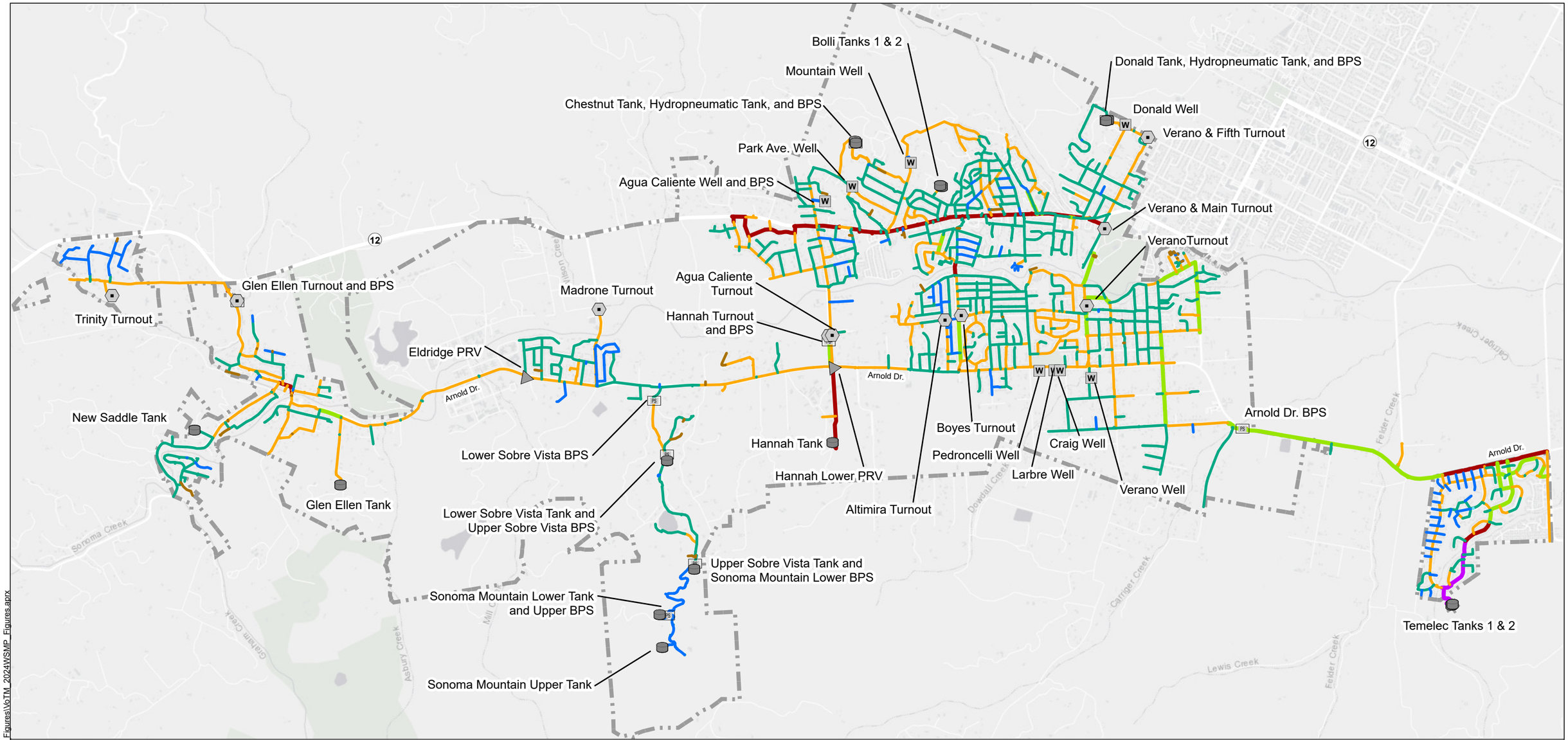
Notes:
(a) Source: Water Master Plan,2019.
(b) Updated flow and firm capacity of Donald pump station fire pump based on fire flow testing data collected on 18 December 2018.

Table 3-8
Pipeline Lengths by Diameter and Material

Pipeline Diameter (inches)	Length (ft)							Length (miles)	Percent of Water System
	ACP	CIP	DIP	HDPE	PE	PVC	Steel		
≤2	94	--	39	778	424	2,353	1,460	0.97	1.1%
3	--	--	--	--	--	--	20	0.00	0.0%
4	29,655	85	850	6,691	--	2,602	9	7.56	8.2%
6	159,417	--	11,177	3,548	--	58,315	411	44.10	48.0%
8	90,683	--	4,251	--	--	60,248	798	29.54	32.1%
10	19,619	--	743	--	--	6,805	--	5.15	5.6%
12	7,534	--	1,464	75	--	12,660	--	4.12	4.5%
14	2,692	--	--	--	--	--	--	0.51	0.6%
Total	309,694	85	18,524	11,091	424	142,984	2,698	91.95	100%
Percent of System	63.79%	0.02%	3.82%	2.28%	0.09%	29.45%	0.56%	--	--

Notes:

(a) Pipeline lengths, diameters, and material includes all active potable water transmission and distribution pipelines present in the AutoCAD files of the Water System Map provided by the District and updated by EKI based on as-built records.



Legend

Sphere of Influence

Existing District Infrastructure

- PRV/PSV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well

Existing Pipe Diameter, Inches

- ≤ 2
- 3
- 4
- 6
- 8
- 10
- 12
- 14

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 20 December 2024.
2. Pressure zone information adapted from Water System Map, January 2015.

N

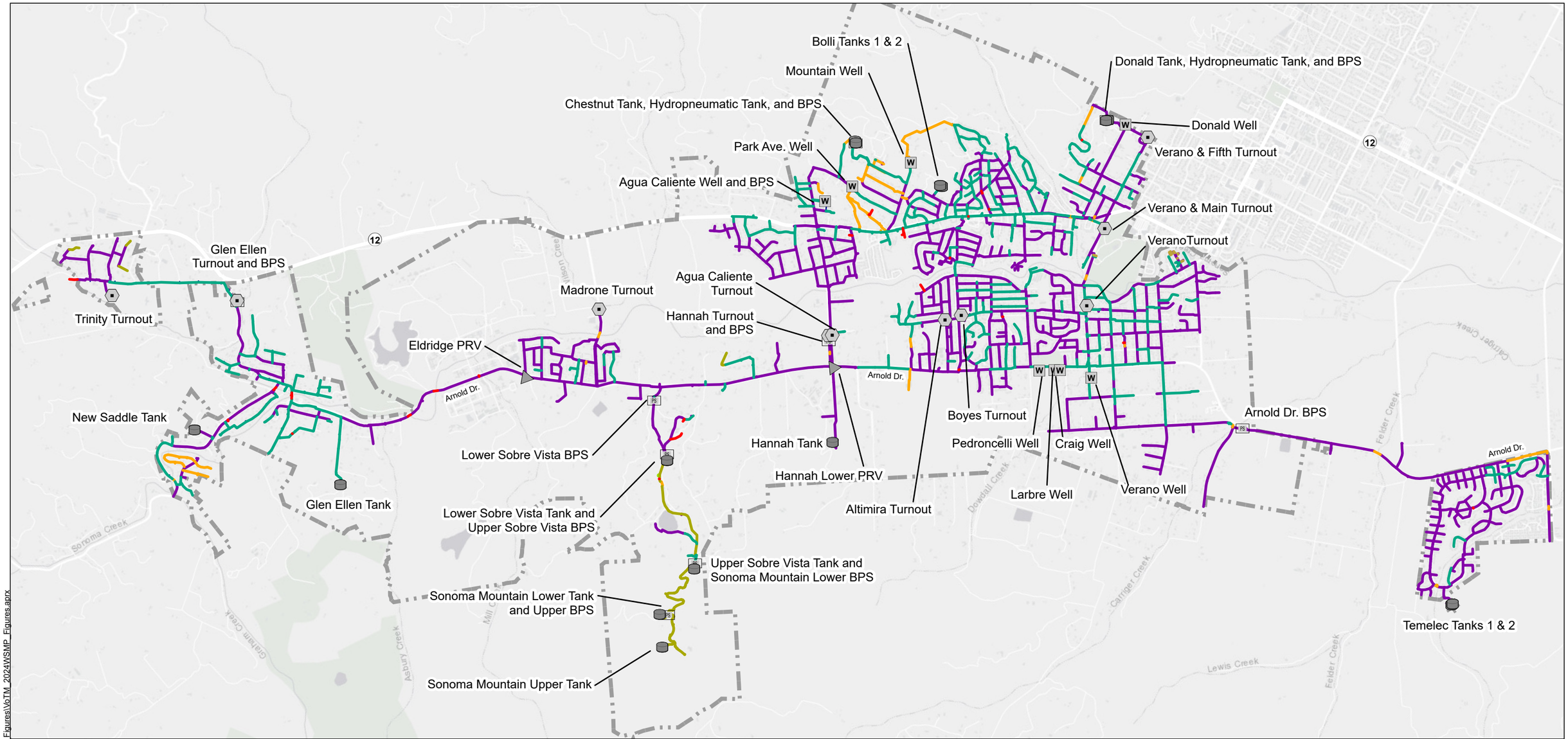
0 3,000 6,000
Feet

Existing Water Main Diameters

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 3-5

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx



Legend

- Sphere of Influence

Existing District Infrastructure

- PRV/PSV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Existing Pipe Materials

- Ductile Iron
- Cast Iron
- PVC
- Asbestos-Cement Pipe
- Steel
- HDPE

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 19 December 2024.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Existing Water Main Materials

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 3-6

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

4 EXISTING AND FUTURE WATER DEMANDS AND FIRE FLOW REQUIREMENTS

The following sections summarize the District's historical and current water demands, water demand projections, water peaking factors, and fire flow requirements.

4.1 Current and Historical Water Production and Consumption

Table 4-1, Figure 4-1, and Figure 4-2 provide historical context by summarizing the District's potable water use, service area population, and per capita potable water demand for the fiscal years (FY) 1998 through 2024.[5] Historical water use is based on total annual SCWA water purchases and local groundwater production. Total potable water use in FY 2024 was 2,099 acre-feet (AF). Table 4-2 and Figure 4-3 provide potable water production by supply source between FY 2011 and FY 2024.

Potable water use has generally decreased over the past 20 years, although significant variations have occurred from year to year and are associated with changing hydrologic and economic conditions. The District experienced a decrease in both total and per capita demand in FY 2009 and FY 2010, likely reflecting the impacts of the economic recession. The subsequent increase in water use from FY 2011 to FY 2013 is thought to reflect improved economic conditions. Between FY 2014 and FY 2016, total and per capita water use declined as the drought occurring during this timeframe intensified. The District experienced particularly significant decreases in demand in FY 2015 and 2016, with total potable water demand decreasing by approximately 29% from 2013 demands. This decrease in demand is likely attributable to the severe drought conditions that persisted into 2016 and that resulted in mandatory state-wide restrictions in urban water use imposed by the State Water Resources Control Board (SWRCB). Total and per capita water use increased slightly between FY 2017 through FY 2021, reflecting a partial rebound following the drought. However, once again due to the recent drought, total demand decreased in FY 2022 through FY 2024.

Although population has increased over the past 20 years, per capita water use since 1998 has generally decreased as shown in Figure 4-2. Specifically, per capita water use has dropped to 81 gallons per capita per day (GPCD) in FY 2024, similar to usage in the FY 2016 drought. Per capita demands have been below the District-adopted 2020 Senate Bill x7-7 (SBx7-7) Target of 124 GPCD since FY 2009.

The District-wide current and historical potable water use from FY 2010 to FY 2024 is presented in Table 4-3, Figure 4-4, and Figure 4-5 by individual customer sectors. Table 4-4, Figure 4-6, and Figure 4-7 present current and historical water use by individual pressure zones. Table 4-5 presents demands by pressure zone and customer categories. Water demand within the District's service area is measured using water meters that are installed at each customer account. Records of current and historical water use at each account are maintained by the District and are based on billing data.

Water use in the District's service area is predominantly associated with residential use. Residential customers account for approximately 84% of the total water deliveries in FY 2024, with single-family residential (SFR) use accounting for 63% and multi-family residential (MFR) use accounting for 20%. Commercial and institutional accounts represent 8% and 3% of total use, respectively. Dedicated irrigation accounts used the smallest percentage of water at less than 1% of total production.

Based on a review of demand data and discussions with the District, the water demand data from FY 2021, prior to the recent drought, was assumed to be representative of existing demands. Total existing demand

[5] The District's fiscal years span from 1 July of the prior calendar year to 30 June of the calendar year. As such, "FY 2015" represents 1 July 2014 to 30 June 2015, and so forth.

was estimated to be 2,853 acre-feet per year (AFY) for planning and modeling purposes, equal to the total average FY 2021 billing data plus the maximum construction water and water loss from the last five years (FY 2020 - FY 2024). To account for 32 new accounts added since FY 2021, demand was added for these accounts based on land use specific FY 2021 demand factors.

4.2 Water Demand Projections

The total projected future demand is estimated to be 3,477 AFY in FY 2045, consistent with demand projections presented in the District's 2020 Urban Water Management Plan (UWMP). As described in more detail in the 2020 UWMP, projected water demands were estimated by:

- Applying an estimated growth rate to the number of accounts within each water use sector based on projected population and employment growth rates,
- Identifying known planned developments within the District to verify that account growth projections consider all currently anticipated growth,
- Evaluating and selecting water demand factors for each water use sector based on review of recent average per account water use representing three scenarios (i.e., pre-drought conditions, post-drought conditions, and a partial drought rebound scenario),
- Estimating future passive savings using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE model), and
- Calculating estimated future water demand that incorporates the anticipated account growth, water demand factors, and estimated future passive water savings.

4.2.1 Anticipated Development Projections

As discussed in Section 2.6, the District anticipates several large developments to be completed in the near-term future. Specifically, a 72-unit multi-family residential development on Verano Avenue across from Maxwell Farms Regional Park is anticipated to be complete by 2025 and the mixed-use Springs Specific Plan is planned to be completed over the next 50 years.[6] EKI has estimated demands for these planned developments to more accurately allocate projected demands spatially within the District's service area. The Springs Specific Plan is anticipated to be fully completed beyond the District's planning horizon (2045), but EKI has included all the estimated water demands associated with the development in the future demands for conservatism.

For each of these developments, Table 4-6 summarizes the assumptions for increases in new development, assumed water demand factors, and projected increase in water demands for each land use type.

[6] As discussed in Section 2.6, the District is considering the addition of the SDC but has not incorporated these into the water demand projections because they are in the infancy of the planning process.

Table 4-1
Current and Historical Potable Water Use and Population

Fiscal Year	Potable Water Use (AF) (a)	Service Area Population (b)	Potable Water Use (MG) (a)	Per Capita Potable Water Use (GPCD) (c)
1998	3,146	21,179	1,025	133
1999	3,518	21,432	1,146	147
2000	3,545	21,658	1,155	146
2001	3,526	21,853	1,149	144
2002	3,445	22,006	1,123	140
2003	3,394	22,237	1,106	136
2004	3,576	22,422	1,165	142
2005	3,298	22,913	1,075	129
2006	3,424	23,127	1,116	132
2007	3,484	23,239	1,135	134
2008	3,339	23,549	1,088	127
2009	3,039	23,515	990	115
2010	2,584	23,636	842	98
2011	2,733	23,717	890	103
2012	2,886	23,793	940	108
2013	3,042	23,801	991	114
2014	3,029	23,847	987	113
2015	2,528	23,874	824	95
2016	2,151	23,878	701	80
2017	2,415	23,927	787	90
2018	2,719	23,954	886	101
2019	2,445	22,912	797	95
2020	2,590	22,892	844	101
2021	2,810	22,912	916	109
2022	2,203	22,925	718	86
2023	2,043	22,955	666	79
2024	2,099	23,004	684	81

Abbreviations:

AF - acre-feet
GPCD - gallons per capita per day
MG - million gallons
UWMP - Urban Water Management Plan

Notes:

(a) Detailed historical and current water demand data from 2016 through 2024 are documented in Table 4-3 and Table 4-5.
(b) Historical population from 1998 to 2007 is based on population estimates included in the 2015 UWMP. Population data from 2007 to 2018 are estimated following the 2015 UWMP assumption of 3.455 persons per service connection. Population data from 2019 to 2024 are estimated following the 2020 UWMP assumption of 3.3 persons per service connection.
(c) Per capita potable water use is calculated by dividing the total annual potable water demand by service area population and the number of days in a year.

Figure 4-1
Current and Historical Potable Water Use and Population

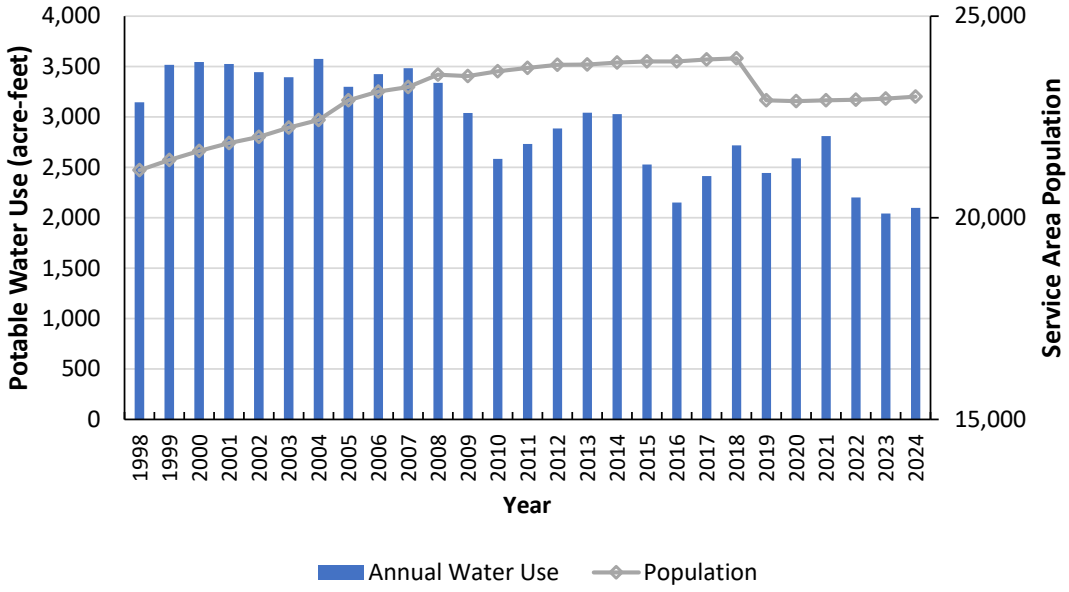


Figure 4-2
Current and Historical Per Capita Potable Water Use

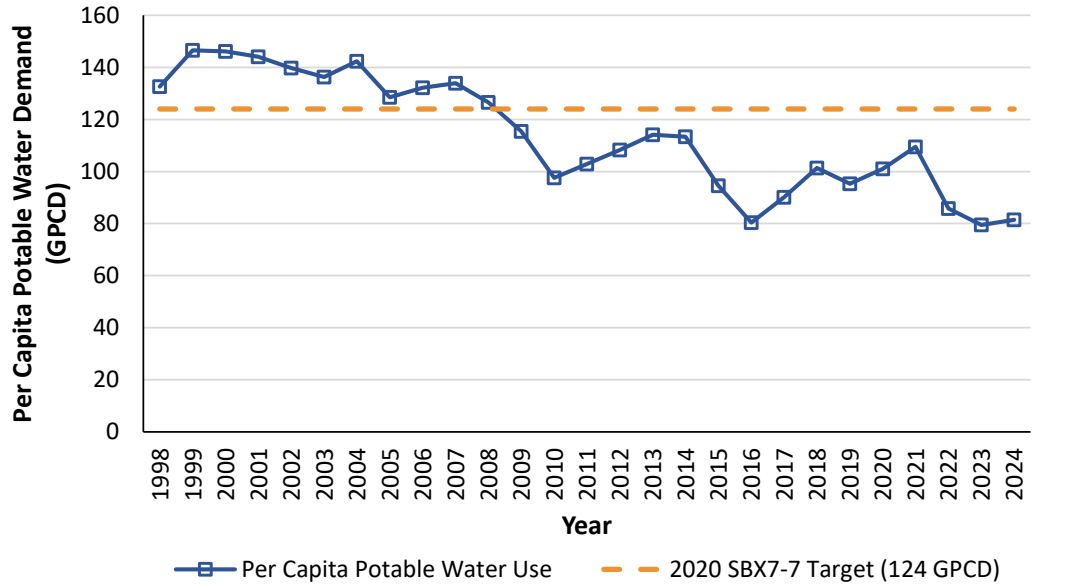


Table 4-2
Current and Historical Potable Water Production by Source

Potable Water Source	Annual Production (AF) (a)													
	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Imported Water														
SCWA	2,183	2,437	2,589	2,534	1,947	1,691	1,819	2,075	1,919	2,171	2,220	1,766	1,508	1,622
Local Supply														
Donald	75	71	82	81	119	137	140	164	105	115	153	114	134	113
Mountain Ave.	57	71	65	75	84	28	82	63	86	74	52	45	44	52
Park Ave.	101	53	58	66	94	50	129	102	80	57	96	48	37	31
Agua Caliente	99	87	92	123	135	121	111	166	133	128	168	115	121	99
Verano	38	--	--	--	--	--	--	--	--	--	--	--	--	--
Pedroncelli	--	--	--	--	--	--	--	--	--	--	--	--	0.02	0
Craig	--	--	--	--	--	--	--	--	--	--	--	--	72	88
Larbre	180	167	156	150	149	123	134	149	123	45	121	115	127	94
Production Wells Total	*550*	*449*	*453*	*495*	*581*	*459*	*596*	*644*	*526*	*419*	*589*	*437*	*535*	*477*
Total Water Production	**2,733**	**2,886**	**3,042**	**3,029**	**2,528**	**2,151**	**2,415**	**2,719**	**2,445**	**2,590**	**2,810**	**2,203**	**2,043**	**2,099**
Percent Imported	*80%*	*84%*	*85%*	*84%*	*77%*	*79%*	*75%*	*76%*	*78%*	*84%*	*79%*	*80%*	*74%*	*77%*
Percent Local Supply	*20%*	*16%*	*15%*	*16%*	*23%*	*21%*	*25%*	*24%*	*22%*	*16%*	*21%*	*20%*	*26%*	*23%*

Abbreviations:
AF - acre-feet
FY - fiscal year
SCWA - Sonoma County Water Agency

Note:
(a) Production data for FY 2016 to FY 2018 provided by the District in October 2018. Production data for FY 2019 to FY 2024 provided by the District in September 2024.

Figure 4-3
Current and Historical Potable Water Production by Source

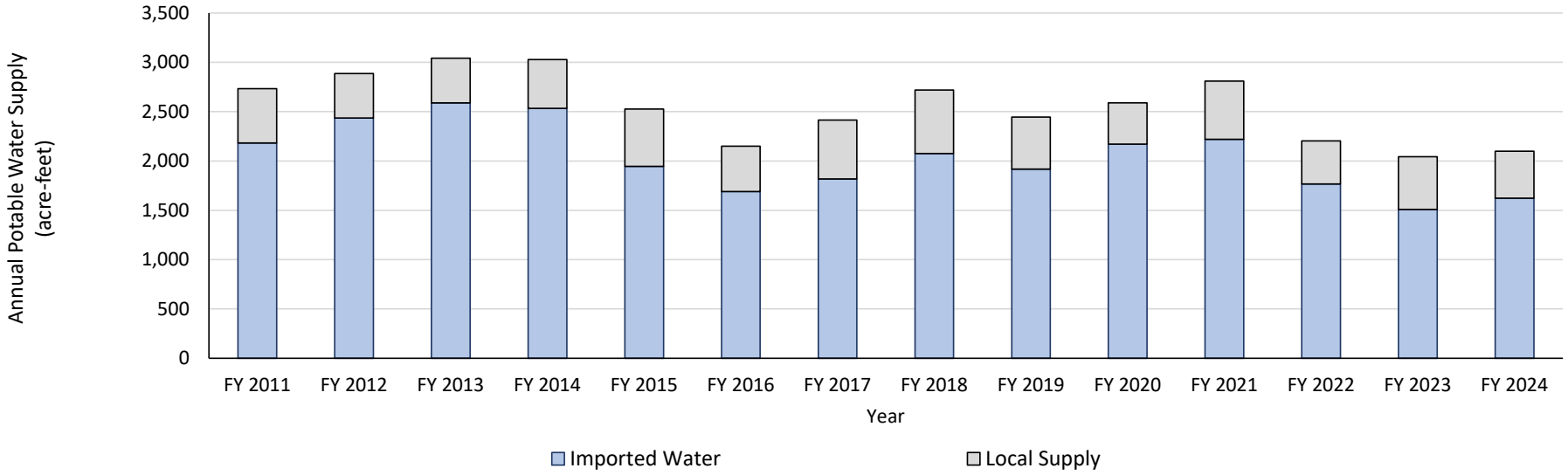


Table 4-3
Current and Historical Potable Water Use by Customer Category

Water Use Sector	Potable Water Demand (AF) (a)														
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Single Family Residential	1,669	1,641	1,691	1,853	1,829	1,546	1,350	1,401	1,574	1,494	1,658	1,737	1,398	1,231	1,332
Multi-Family Residential	476	469	505	531	516	457	411	438	484	468	513	507	443	422	426
Commercial	178	179	180	185	182	176	167	169	176	172	170	146	143	157	172
Institutional/Governmental	76	80	107	102	100	80	74	73	81	67	62	77	55	52	54
Irrigation Multi-Family	24	29	30	34	44	32	17	24	42	37	35	39	21	17	21
Irrigation Commercial	16	14	13	13	14	10	7	8	13	10	10	13	14	9	12
Fire Services/Other	0.6	0.2	0.3	0.7	0.4	0.3	0.2	0.3	0.4	0.5	0.8	0.6	0.8	1.0	7.1
Total Water Consumption	**2,440**	**2,413**	**2,526**	**2,718**	**2,685**	**2,301**	**2,026**	**2,115**	**2,371**	**2,249**	**2,448**	**2,520**	**2,075**	**1,890**	**2,023**
Non-revenue Water (b)	6%	12%	12%	11%	11%	9%	6%	12%	13%	8%	5%	10%	6%	8%	4%
	144	320	360	324	343	226	125	300	348	196	142	290	128	153	76
Total Water Demand (c)	**2,584**	**2,733**	**2,886**	**3,042**	**3,029**	**2,528**	**2,151**	**2,415**	**2,719**	**2,445**	**2,590**	**2,810**	**2,203**	**2,043**	**2,099**

Abbreviations:
AF - acre-feet
FY - fiscal year

Notes:
(a) FY 2016 - 2017 and FY 2018 - 2024 water use data were processed from water billing data provided by the District on 1 August 2018 and 30 October 2024, respectively.
(b) Non-revenue water includes water used for fire hydrant flushing and testing, for water main flushing, as well as distribution system water losses. This value is calculated as the difference between metered water consumption and total water production.
(c) Total water demand is the sum of metered water consumption and non-revenue water.
(d) Totals may not add exactly due to rounding.

Figure 4-4
Annual Water Use by Customer Category: FY 2010 - FY 2024

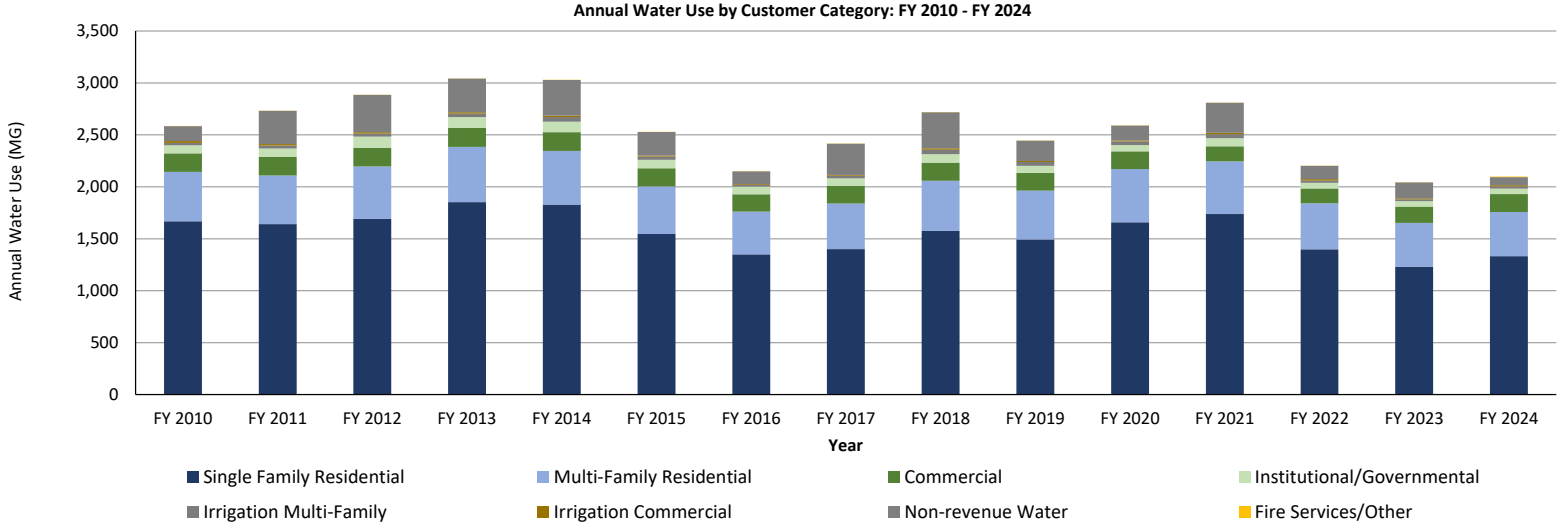


Figure 4-5
Percentage of Total Water Use by Customer Category: FY 2016 - FY 2024

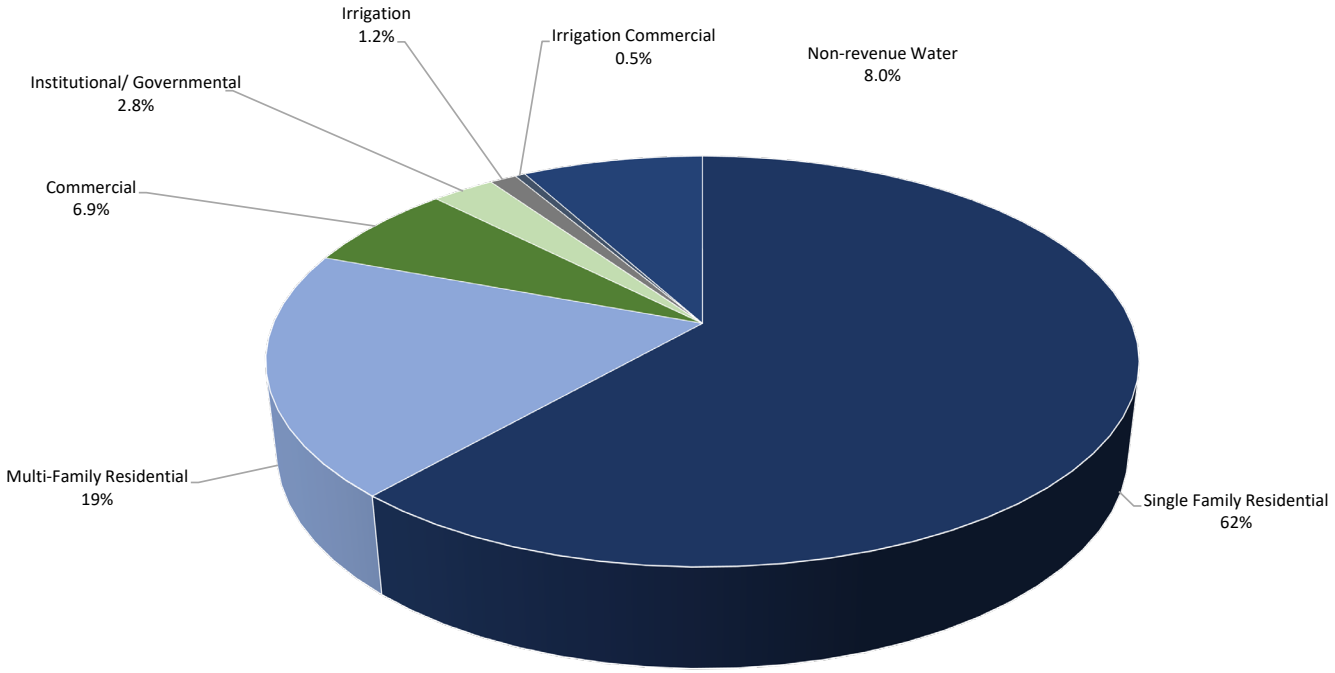


Table 4-4
Current and Historical Potable Water Use by Pressure Zone

Pressure Zone	Potable Water Demand (AF) (a)														
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
1	1,678	1,656	1,710	1,856	1,822	1,580	1,391	1,453	1,632	1,549	1,663	1,698	1,428	1,325	1,393
1A	184	189	203	214	213	176	164	172	195	178	192	200	151	146	156
1B	208	200	213	229	230	190	165	171	190	195	209	211	172	150	163
1F	209	210	219	242	239	202	183	194	199	169	194	226	179	149	176
2A	1.7	2.1	2.5	2.2	2.1	1.8	1.4	1.2	1.2	1.5	2.1	1.8	1.5	0.9	1.0
2B	17	17	17	18	17	16	13	14	16	15	16	18	14	12	12
2D	93	89	91	97	104	85	70	71	85	81	91	95	78	66	69
2E	1.2	0.9	1.4	0.6	0.5	0.6	0.4	0.4	0.2	0.2	0.2	0.3	0.2	0.2	0.3
3D	10	10	11	12	13	12	9.0	8.7	10.1	10.8	12.4	12.5	9.8	8.2	8.7
3E	33	31	37	38	37	33	28	24	32	36	40	43	33	25	33
5E	0.9	1.7	0.3	0.4	0.3	0.3	0.3	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.5
SCWA (b)	3.1	2.8	4.8	3.9	5.3	4.7	11	3.9	3.5	3.7	4.5	4.7	5.0	5.8	5.1
Portable Hydrant Meters	1.7	4.1	16.8	5.5	2.7	0.4	0.3	2.1	5.2	10.4	24.1	9.0	2.3	1.3	3.9
Total Water Consumption	**2,440**	**2,413**	**2,526**	**2,718**	**2,685**	**2,301**	**2,036**	**2,115**	**2,371**	**2,249**	**2,447**	**2,519**	**2,075**	**1,889**	**2,022**
Non-revenue Water (c)	6%	12%	12%	11%	11%	9%	5%	12%	13%	8%	6%	10%	6%	8%	4%
	144	320	360	324	343	226	115	300	349	196	143	291	129	154	77
Total Water Demand (d)	**2,584**	**2,733**	**2,886**	**3,042**	**3,029**	**2,528**	**2,151**	**2,415**	**2,719**	**2,445**	**2,590**	**2,810**	**2,203**	**2,043**	**2,099**

Abbreviations:
AF - acre-feet
FY - fiscal year
SCWA - Sonoma County Water Agency

Notes:
(a) FY 2016 - 2017 and FY 2018 - 2024 water use data were processed from water billing data provided by the District on 1 August 2018 and 30 October 2024, respectively.
(b) SCWA serves these customers directly off of the aqueduct.
(c) Non-revenue water includes water used for fire hydrant flushing and testing, for water main flushing, as well as distribution system water losses. This value is calculated as the difference between metered water consumption and total water production.
(d) Total water demand is the sum of metered water consumption and non-revenue water.
(e) Totals may not add exactly due to rounding.

Figure 4-6
Annual Water Use by Pressure Zone: FY 2010 - FY 2024

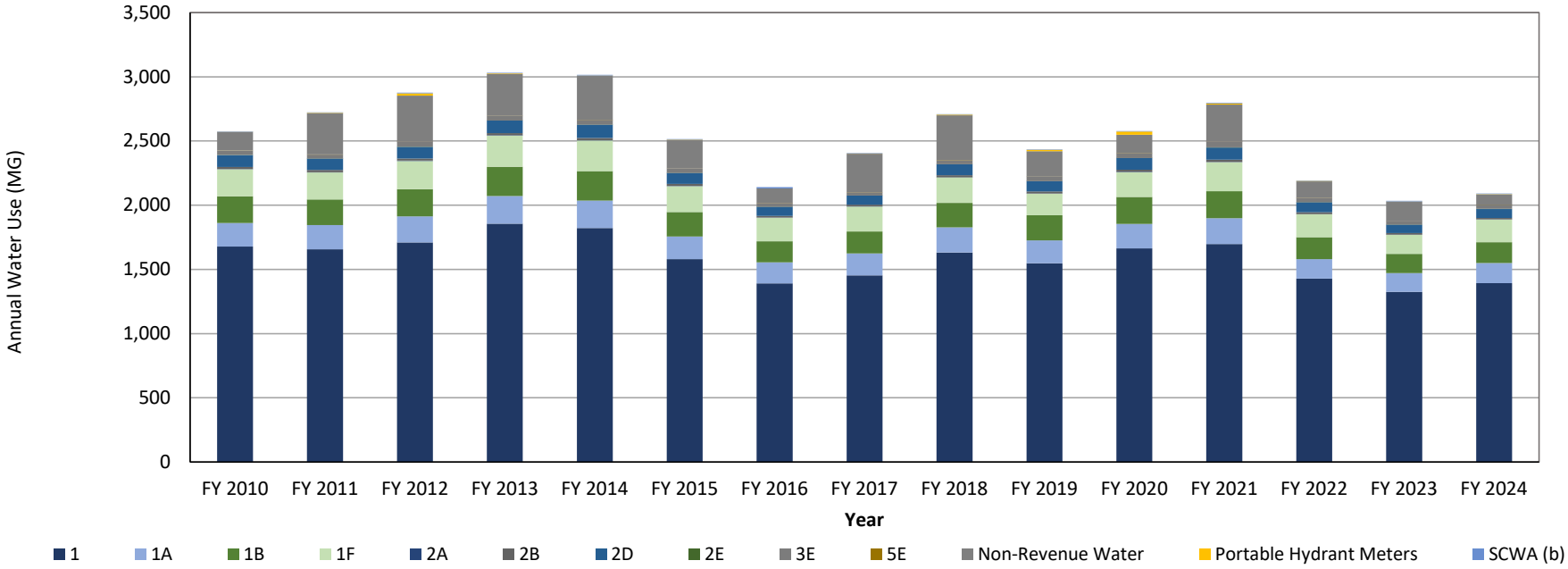


Figure 4-7
Percentage of Total Water Use by Pressure Zone: FY 2010 - FY 2024

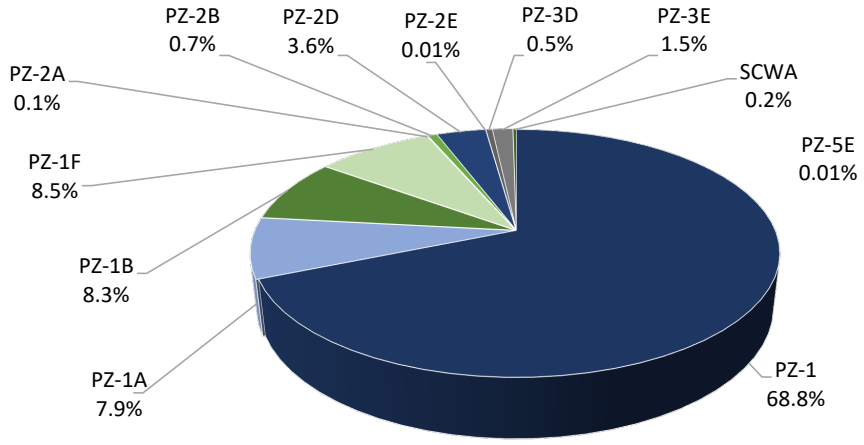


Table 4-5
Current and Historical Potable Water Use by Pressure Zone and Customer Category

Sector	Potable Water Demand (AF) (a)								
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Pressure Zone 1									
Single Family Residential	879	921	1,039	995	1,098	1,128	924	820	874
Multi-Family Residential	322	336	369	349	369	381	339	327	325
Commercial	125	124	129	126	122	94	99	122	129
Institutional	46	46	51	39	37	50	36	34	32
Irr. Multi-Family Residential	13	20	34	32	31	34	19	15	18
Irr. Commercial	4.6	5.5	10.1	7.4	6.9	9.3	11.0	6.7	9.3
Fire Service/Other	0.2	0.1	0.0	0.0	0.1	0.1	0.2	0.3	6.2
Subtotal Pressure Zone 1	*1,391*	*1,453*	*1,632*	*1,549*	*1,663*	*1,698*	*1,428*	*1,325*	*1,393*
Pressure Zone 1A									
Single Family Residential	117	121	137	126	139	146	113	105	110
Multi-Family Residential	42	44	49	46	48	50	36	38	43
Commercial	1.5	2.5	2.1	1.4	1.0	1.2	1.2	1.7	1.8
Irr. Multi-Family Residential	3.2	4.0	7.3	4.3	3.9	3.2	1.6	1.4	1.7
Subtotal Pressure Zone 1A	*164*	*172*	*195*	*178*	*192*	*200*	*151*	*146*	*156*
Pressure Zone 1B									
Single Family Residential	105	110	122	118	130	136	105	93	104
Multi-Family Residential	28	29	32	37	45	41	42	35	33
Commercial	8.4	7.5	8.0	15	12	8.7	8.9	7.2	7.5
Institutional	23	23	27	23	20	23	15	13	17
Irr. Multi-Family Residential	0.4	0.4	0.3	0.4	0.2	1.0	0.1	0.3	0.8
Irr. Commercial	0.8	0.8	1	1.0	1.1	1.0	0.7	0.7	0.6
Fire Service/Other	0.00	0.03	0.02	0.02	0.02	0.02	0.01	0	0
Subtotal Pressure Zone 1B	*165*	*171*	*190*	*195*	*209*	*211*	*172*	*150*	*163*
Pressure Zone 1F									
Single Family Residential	132	139	147	127	147	173	131	109	130
Multi-Family Residential	16	17	16	12	15	17	13	12	13
Commercial	31	33	32	26	28	33	32	25	30
Institutional	1.5	1.3	1.4	1.5	1.4	1.4	1.1	1.0	0.9
Irr. Multi-Family Residential	0.1	0.2	0.2	0.03	0.05	0.2	0.1	0.02	0.02
Irr. Commercial	2.1	2.2	2.4	1.9	2.1	2.2	2.0	1.3	1.9
Fire Service/Other	0.0	0.2	0.4	0.4	0.4	0.2	0.4	0.2	0.2
Subtotal Pressure Zone 1F	*183*	*194*	*199*	*169*	*194*	*226*	*179*	*149*	*176*
Pressure Zone 2A									
Single Family Residential	1.4	1.2	1.2	1.5	2.1	1.8	1.5	0.9	1.0
Subtotal Pressure Zone 2A	*1.4*	*1.2*	*1.2*	*1.5*	*2.1*	*1.8*	*1.5*	*0.9*	*1.0*
Pressure Zone 2B									
Single Family Residential	13	14	16	15	16	18	14	12	12
Subtotal Pressure Zone 2B	*13*	*14*	*16*	*15*	*16*	*18*	*14*	*12*	*12*
Pressure Zone 2D									
Single Family Residential	68	68	82	78	88	92	75	64	67
Multi-Family Residential	2.5	2.5	3.5	2.7	2.8	3.1	2.6	2.4	2.2
Subtotal Pressure Zone 2D	*70*	*71*	*85*	*81*	*91*	*95*	*78*	*66*	*69*
Pressure Zone 2E									
Single Family Residential	0.4	0.4	0.2	0.2	0.2	0.3	0.2	0.2	0.3
Subtotal Pressure Zone 2E	*0.4*	*0.4*	*0.2*	*0.2*	*0.2*	*0.3*	*0.2*	*0.2*	*0.3*
Pressure Zone 3D									
Single Family Residential	7.8	7.8	9.1	9.6	11	11	8.9	7.2	7.8
Multi-Family Residential	1.2	0.8	1.1	1.3	1.4	1.0	0.9	1.1	1.0
Subtotal Pressure Zone 3D	*9.0*	*8.7*	*10.1*	*10.8*	*12.4*	*12.5*	*9.8*	*8.2*	*8.7*

Table 4-5 (Cont.)
Current and Historical Potable Water Use by Pressure Zone and Customer Category

Sector	Potable Water Demand (AF) (a)								
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Pressure Zone 3E									
Single Family Residential	19	16	19	23	25	29	23	17	24
Multi-Family Residential	9	8	13	13	15	14	10	8	9
Subtotal Pressure Zone 3E	*28*	*24*	*32*	*36*	*40*	*43*	*33*	*25*	*33*
Pressure Zone 5E									
Single Family Residential	0.3	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.5
Subtotal Pressure Zone 5E	*0.3*	*0.5*	*0.3*	*0.2*	*0.2*	*0.2*	*0.2*	*0.3*	*0.5*
SCWA(c)									
SCWA - Single Family Residential (c)	7.7	1.0	0.8	0.7	1.3	1.7	1.3	1.5	1.4
SCWA - Institutional (c)	3.1	3.0	2.7	3.0	3.1	3.0	3.8	4.3	3.8
Subtotal SCWA (c)	*11*	*3.9*	*3.5*	*3.7*	*4.5*	*4.7*	*5.0*	*5.8*	*5.1*
Portable Hydrant Meters									
Hydrant Meter - Multi-Family Residential	--	--	0.9	6.9	17	--	--	--	--
Hydrant Meter - Commercial	0	2	4.2	3.4	6.7	9.0	2.3	1.3	3.9
Subtotal of Other Uses	*0.3*	*2.1*	*5.2*	*10.4*	*24.1*	*9.0*	*2.3*	*1.3*	*3.9*
Total Water Consumption	**2,036**	**2,115**	**2,371**	**2,249**	**2,447**	**2,519**	**2,075**	**1,889**	**2,022**
Non-revenue Water	*114.7*	*300.3*	*348.6*	*196.4*	*142.8*	*290.7*	*128.5*	*154.2*	*77.2*
Total Water Demand (d)	**2,151**	**2,415**	**2,719**	**2,445**	**2,590**	**2,810**	**2,203**	**2,043**	**2,099**

Abbreviations:

AF- acre-feet
FY - fiscal year
Irr. - irrigation
SCWA - Sonoma County Water Agency

Notes:

(a) FY 2017 - 2018 and FY 2019 -2024 water use data were processed from water billing data provided by the District on 1 August 2018 and 30 October 2024, respectively.
(b) Non-revenue water includes water used for fire hydrant flushing and testing, for water main flushing, as well as distribution system water losses. This value is calculated as the difference between metered water consumption and total water production.
(c) SCWA serves these customers directly off of the aqueduct.
(d) Total water demand is the sum of metered water consumption and non-revenue water.
(e) Totals may not add exactly due to rounding.
(f) Pressure Zone 4E is a pressure break between Pressure Zone 3E and 5E and does not have any service connections.

Table 4-6
Projected Water Demands for Anticipated New Development

Land Use Designation	Pressure Zone	Net Increase in New Development (a)		Water Demand Factor Including Losses (b)		Net Increase in Water Demands (AF)
810 W Agua Caliente Development (c)						
Single-Family Residential	1B	142	du	0.31	AFY/du (d)	43
Multi-Family Residential	1B	220	du	0.13	AFY/du (d)	28
Residential - Casitas	1B	120	du	0.15	AFY/du (e)	18
Commercial - Hotel	1B	119	room	0.17	AFY/Room (f)	20
Commercial - Assisted Living	1B	56	du	0.11	AFY/du (f)	6.4
Commercial - Food Services	1B	21,270	sf	0.00011	AFY/sf (g)	2.2
Commercial - Retail	1B	6,923	sf	0.00009	AFY/sf (g)	0.6
Office	1B	23,100	sf	0.00007	AFY/sf (g)	1.6
Outdoor Irrigation	1B	844,020	sf	-- (h)		35
					Subtotal	*150*
Verano Ave Multi-Family Residential Development (i)						
Multi-Family Residential	1	72	du	0.14	AFY/du (d)	10.1
					Subtotal	*10.1*
Springs Specific Plan						
Single-Family Residential	1	124	du	0.34	AFY/du (d)	42
Multi-Family Residential	1	423	du	0.14	AFY/du (d)	59
Work-Live/MF in Mixed Use	1	138	du	0.14	AFY/du (d)	19
Commercial	1	167,029	sf	1.4	AFY/4,000 sf (j)	59
Commercial - Hotel	1	120	Rooms	0.17	AFY/Room (f)	20
Office	1	82,226	sf	1.40	AFY/4,000 sf (k)	29
Recreation	1	26,648	sf	3.68	AFY/5,000 sf (l)	20
					Subtotal	*249*
					TOTAL NET INCREASE IN WATER DEMANDS	**409**

Abbreviations:

AF - acre-feet
DSS - Decision Support System
du - dwelling unit
sf - square feet
UMWP - Urban Water Management Plan
WSA - Water Supply Assessment

Notes:

(a) Net increases in new development were provided by the District based on current conservative estimates.
(b) Factor of 1.12 applied to each demand factor to account for water loss.
(c) The land use information and water demand factors for the 810 W Agua Caliente development are per the project's WSA completed in March 2024.
(d) The single family and multi-family residential water demand factor are per the Districts 2020 UWMP.
(e) Residential-Casitas water demand factor is from the August 2018 City of Redlands Impact Fees and Capacity Fees for Accessory Dwelling Units prepared by David Taussig & Associates.
(f) Commercial-Hotel and Commercial-Assisted Living water demand factors are from the City of Ventura's April 2020 Final Water Demand Factor Study, City of Ventura, prepared by Wood Rodgers.
(g) Commercial-Food Services, Commercial-Retail, and Office water demand factors are from the US Energy Information Administration's 2012 Commercial Buildings Energy Consumption Survey: Water Consumption in Large Buildings Summary.
(h) Irrigation water demand is calculated per the MWELO MAWA. The calculations and assumptions are described in more detail in the project's WSA.
(i) Verano Ave Multi-Family Residential Development project information provided by the District on 30 September 2024.
(j) Commercial water demand factor is based on the DSS Model 2040 commercial per account demand, including passive savings, assuming 4,000 sf of commercial space per account consistent with the November 2018 Springs Specific Plan Projected Water Demands (De Novo, 2018).
(k) Commercial water demand factor is based on the DSS Model 2040 commercial per account demand, including passive savings, assuming 4,000 sf of commercial space per account consistent with the November 2018 Springs Specific Plan Projected Water Demands (De Novo, 2018).
(l) Recreation water demand factor is based on the DSS Model 2040 institutional per account demand, including passive savings, assuming 5,000 sf of recreational space per account consistent with the November 2018 Springs Specific Plan Projected Water Demands (De Novo, 2018).

4.2.2 Total Projected Demands

Existing and future projected demands are summarized in Table 4-7 by pressure zone. The total projected future demand is consistent with the UWMP projections for 2045. Future demands for planned development projects were spatially allocated based on their location and land uses, and the remaining increase in demand was spread proportionally across the District.

Table 4-7. Projected Existing and Future Annual Demands by Pressure Zone

Pressure Zone	Existing Demands (AFY) (a)	Future Demands (AFY)		
		Projected Infill Growth (b)	Planned New Development	Total Future Demands (b) (c)
1	1,916	2,060	259	2,319
1A	224	241	-	241
1B	236	254	150	404
1F	257	277	-	277
2A	2.0	2	-	2.1
2B	20	21	-	21
2D	107	115	-	115
2E	0.29	0.31	-	0.31
3D	14	15	-	15
3E	48	52	-	52
4E	0.22	0.24	-	0.24
5E	5.3	6	-	5.7
SCWA	24.1	26	-	26.0
Total	2,853	3,042	409	3,477

Notes:

(e) Equals the total average FY 2021 billing data by pressure zone plus maximum construction water and the max water loss from the last 5 years (FY 2020 - FY 2024). To account for the 32 new accounts added since 2021, demand was added for each account based on land use specific FY 2021 demand factor.

(f) Projected infill growth and total future demands for each pressure zone are proportionate to the pressure zones' existing demands.

(g) Total future demand of 3,477 AFY in 2045 per the District's 2020 UWMP.

4.3 Peak Demands

Peaking factors have not been updated as a part of the preparation of this update and are based on the peaking analysis performed for the 2019 WMP.

As a part of the 2019 WMP preparation, EKI reviewed the District's historical water consumption and production data and available SCADA flow and tank level data to identify the peaking factors for each pressure zone relative to average day demand (ADD) that best estimate maximum month demand (MMD), maximum day demands (MDD), and peak hour demands (PHD). A list of the sources of inflows, storage, and outflows for each zone are listed in Table 4-8. Based on the consumption data and calculated daily and hourly demands by zone, EKI developed pressure-zone-specific peaking factors. These peaking factors and key assumptions are listed in Table 4-9. Table 4-10 lists the projected existing and future peak demands by pressure zone based on these peaking factors and the average day demands.

The application of these peaking factors to assess system capacity and performance is described in Section 5.

4.4 Fire Flow Requirements

Fire protection for the District is provided by Sonoma Valley Fire and Rescue Authority and by the Glen Ellen Fire Department. The Sonoma Valley and Glen Ellen Fire Departments have indicated that a fire flow of 2,500 gpm should be provided in commercial and institutional areas. In residential areas, a fire flow of 1,000 gpm is required.[7] These fire flows must be available for a minimum of two hours in conjunction with maximum day demand conditions while maintaining a minimum residual pressure of 20 pounds per square inch (psi) at all system nodes. The distribution of the required fire flows within the District are shown on Figure 4-8.

As discussed in the following sections, these flows and durations are used to establish supply capacity criteria, pipe sizing, and storage and supply capacity requirements.

[7] In the 2007 Master Plan, a residential fire flow of 500 gpm was required and a fire flow of 1,000 gpm was desired. In light of the October 2017 Sonoma fires, this requirement has been updated to require a residential fire flow of 1,000 gpm.

Table 4-8
Sources of Inflow and Outflow and Storage by Pressure Zone

Pressure Zone	Sources of Flow In	Storage Tanks	Sources of Flow Out	Notes
1	SCWA Turnouts[a]: Verano, Verano & Main, Verano & 5th, Boyes Blvd, Altimira, & Agua Caliente Wells: Donald, Park Ave. Aqua Caliente, Verano, Pedroncelli, Craig, & Larbre *PRV: Hanna Lower (only intended to open in emergency; not metered)[b]	Storage Tanks: Bolli 1 & 2, Temelec 1 & 2, Donald	Booster Pump Stations: Agua Caliente & Donald	Daily demands calculated together for Pressure Zones 1, 1A, 2A, 1B, 2D, 3D, and 1F (only through October 2017) (see Note b, c, d) because the pressure zones were not isolated.
1A				
2A				
1B	SCWA Turnouts[a]: Madrone & Hanna *PRV: Eldridge (only intended to open in emergency; not metered)[c]	Storage Tanks: Hanna	*PRV: Hanna Lower (only intended to open in emergency; not metered)[b]	
2D	Wells: Mountain Ave. Booster Pump Stations: Agua Caliente	Storage Tanks: Chestnut	Booster Pump Stations: Chestnut Isolation Valves between Pressure Zones 2D and 1 (typically closed)[d]	
3D[e]	Booster Pump Stations: Chestnut	Hydropneumatic: Chestnut[f]	None	
1F	SCWA Turnouts[a]: Glen Ellen (6" & 4") & Trinity Oaks	Storage Tanks: Glen Ellen & Saddle	*PRV: Eldridge (only intended to open in emergency; not metered)[c]	Daily demands calculated as part of Pressure Zones 1, 1A, 2A, 1B, 2D, and 3D until November 2017 (see Note c).
2B	Booster Pump Stations: Donald	Hydropneumatic: Donald[e]	None	
2E	Booster Pump Stations: Sobre Vista Lower	Storage Tanks: Sobre Vista Lower	Booster Pump Stations: Sobre Vista Upper	Daily and hourly demands could not be calculated because flow and tank level data not sensitive enough for the low demands.
3E	Booster Pump Stations: Sobre Vista Upper	Storage Tanks: Sobre Vista Upper	Booster Pump Stations: Sonoma Mountain Lower	
4E	Booster Pump Stations: Sonoma Mountain Lower	Storage Tanks: Sonoma Mountain Lower	Booster Pump Stations: Sonoma Mountain Upper	Daily and hourly demands could not be calculated because flow and tank level data not sensitive enough for the low demands.
5E	Booster Pump Stations: Sonoma Mountain Upper	Storage Tanks: Sonoma Mountain Upper	None	

Notes:

(a) Only daily flow data available for SCWA turnouts. Therefore hourly demands could not be calculated for Pressure Zones 1, 1A, 2A, 1B, or 1F.
(b) A comparison of historical consumption data vs. calculated daily demand data for Pressure Zone 1B indicated that a significant amount of flow is being conveyed through the Hanna Lower PRV from Zone 1B to Zone 1 on a regular basis.
(c) A comparison of consumption data vs. calculated daily demand data for Pressure Zones 1F indicated that a significant amount of flow was being conveyed through the Eldridge PRV from Zone 1F to Zone 1B on a regular basis until October 2017. After October 2017, Pressure Zones 1F and 1B appear to be isolated (closed PRV), except for short periods of flow from 1F to 1B when the Hanna Turnout was not active.
(d) A comparison of historical consumption data vs. calculated daily demands for Pressure Zones 2D and 3D indicated that a significant amount of flow is being conveyed from Pressure Zone 2D to
(e) The District does not meter flow from the Chestnut Pump Station, so demands could not be calculated separately for Pressure Zone 3D.
(f) Storage in Chestnut and Donald Hydropneumatic Tanks not included in demand calculations.

Table 4-9
Summary of Peaking Factors by Pressure Zone

Pressure Zone	Peaking Factors				
	[1] MMD to ADD (a)	[2] MDD to MMD (b)	[3] PHD to MDD (c)	[4] MDD to ADD (d)	[5] PHD to ADD (e)
1	1.38	1.14	2.0	1.6	3.2
1A	1.42			1.7	3.3
1B	1.48			1.7	3.4
2A	1.53			1.8	3.5
2D	1.51			1.8	3.5
3D	1.58	1.74	3.3	2.8	9.1
1F	1.51	1.26	2.0	2.7	3.9
2B	1.58	1.74	3.3	2.8	9.1
2E	1.46	1.97	2.2	2.9	6.4
3E	1.66			3.3	7.3
5E	1.46			2.9	6.5

Notes:

(a) Calculated based on average FY 2013 and FY 2014 consumption data.

(b) Calculated based on daily demand calculations for FY2017 for Pressure Zones 2B and 3E and between November 2017 to August 2018 for Pressure Zones 1, 1A, 1B, 2A, 2D, and 3D and 1F (i.e., when zone 1F was isolated). Peaking daily demands exclude demands between 8 October 2017 and 16 October 2017 related to the October 2017 fires. Peaking Factor for Pressure Zone 3D assumed to equal the Pressure Zone 2B peaking factor because of similar land use.

(c) Peak hour demands factors calculated for Pressure Zones 2B and 3E are based on the peak hour demands on the maximum demand day (6/18/2018 for Pressure Zone 2B and 7/21/2017 for Pressure Zone 3E). Calculated Pressure Zone 3E peaking factor assumed for Pressure Zones 2E and 5E. PHD to MDD peaking factor of 2.0 assumed for all other pressure zones; for comparison, a peaking factor of 1.67 was calculated for non-isolated Pressure Zones 2D and 3E. Peaking Factor for Pressure Zone 3D assumed to equal the Pressure Zone 2B peaking factor because of similar land use.

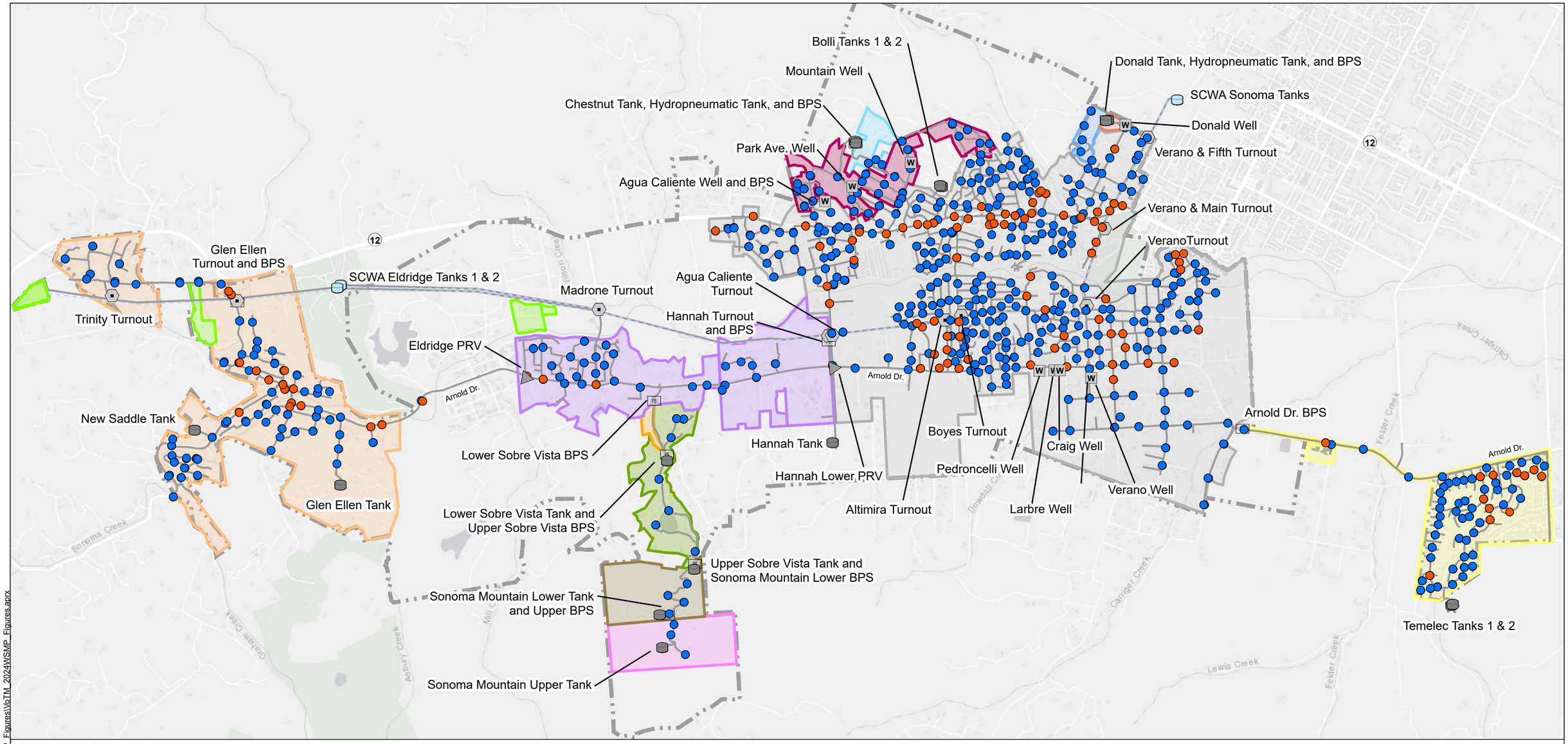
(d) Equals Column [1] x Column [2], rounded up to the nearest tenth.

(e) Equals Column [1] x Column [2] x Column [3], rounded up to the nearest tenth.

Table 4-10
Projected Existing and Future Peak Demands by Pressure Zone

Pressure Zone (a)	Existing Demands								Future Demands							
	Average Day Demand		Maximum Month Deman		Maximum Day Demand		Peak Hour Demand		Average Day Demand		Maximum Month Deman		Maximum Day Demand		Peak Hour Demand	
	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm	1,000 gpd	gpm
1	1,711	1,188	2,359	1,638	2,737	1,901	5,474	3,801	2,070	1,438	2,856	1,983	3,312	2,300	6,625	4,601
1A	200	139	285	198	340	236	660	458	215	149	306	213	366	254	710	493
1B	211	146	312	216	358	249	717	498	361	250	533	370	613	426	1,226	851
1F	230	160	351	244	620	431	896	622	247	172	377	262	667	463	963	669
2A	1.8	1.2	2.7	1.9	3.2	2.2	6.2	4.3	1.9	1.3	2.9	2.0	3.4	2.4	6.6	4.6
2B	18	12	28	19	49	34	159	111	19	13	30	21	53	37	171	119
2D	95	66	143	99	171	118	332	230	102	71	154	107	183	127	357	248
2E	0.3	0.2	0.4	0.3	0.7	0.5	1.6	1.1	0.3	0.19	0.4	0.3	0.8	0.6	1.8	1.2
3D	12	8.7	18.2	12.6	35	24	114	79	13	9.3	19.5	13.6	38	26	122	85
3E	43	30	71	50	142	99	314	218	46	32	77	53	153	106	338	235
5E	0.2	0.1	0.3	0.2	0.6	0.4	1.3	0.9	5.1	3.5	7.4	5.1	14.7	10.2	32.9	22.9
Totals	**2,521**	**1,751**	**3,570**	**2,479**	**4,457**	**3,095**	**8,675**	**6,024**	**3,081**	**2,139**	**4,363**	**3,030**	**5,404**	**3,752**	**10,554**	**7,329**

Notes:
(a) SCWA Zone demands not included because these are supplied directly from the SCWA aqueduct and are not needed for distribution system master planning purposes.



Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV/PSV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Required Fire Flow Availability, gpm

- 1000
- 2500

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 9 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Required Fire Flow Availability Map

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 4-8

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

5 WATER SUPPLY AND STORAGE CAPACITY EVALUATION

This section presents the supply and storage criteria and evaluates the District's water system storage and supply capacity to meet these criteria under existing and future demand scenarios described in Section 4.

5.1 Storage and Supply Capacity Criteria

EKI recommends continuing to use water supply and storage criteria that were updated in the *Evaluation of Storage and Supply Requirements for Glen Ellen* (EKI, 2021b), summarized below for clarity.

5.1.1 Water Supply and Pumping Capacity Requirements

As discussed in Section 4.3, peaking factors were developed to capture varying water use conditions. Higher water demand periods occur during summer months as compared to winter months when irrigation demands are higher. Over the course of the day, usage peaks in the early morning when people are preparing for their day and at night when people return home and begin irrigating their landscapes.

To meet varying demand conditions, EKI recommends a firm supply capacity through the combination of SWCA turnouts, groundwater wells, and booster pump stations in each pressure zone equal to the following:

- For pressure zones with storage to provide operational and fire storage by gravity (all but Pressure Zones 1 & 2A, 2B, and 3D): the sum of (1) maximum day demands of the pressure zones and the upper pressure zones that they supply and (2) the required supply to refill fire storage for the largest single fire flow in the zone (i.e., either residential = 120,000 gallon or commercial = 300,000 gallons) in 12 hours.
- For pressure zones that are only supplied pumped flows (Pressure Zones 2B and 3D): peak hour demands plus one residential fire; and
- For Pressure Zone 1 & 2A that are supplied peak flows by gravity from the aqueduct: the sum of peak hour demands for Pressure Zone 1 & 2A and maximum day demands for the upper pressure zones supplied by Pressure Zone 1.

Firm capacity is defined as follows:

- For SCWA turnouts: The largest turnout in the pressure zone is assumed out of service. For turnouts fed by gravity, capacity is assumed to equal the maximum flow capacity for Cla-Val model 90-01 PRVs.[8] For the Hanna and Glen Ellen Turnouts, which require boosting from their associated pump stations under certain operational conditions (i.e., tank filling), the capacity is equal to the firm capacity of the pump station (i.e., with the largest pump out of service).
- Groundwater wells: The largest well in the pressure zone is assumed to be out of service.
- Booster pump stations: The largest single domestic pump is assumed out of service. For Donald Pump Station, the 300 gallons per minute (gpm) fire pump is assumed in service to supply fire flows to Pressure Zone 2B.

These criteria are recommended to ensure there is sufficient supply capacity distributed throughout the system to meet peak demand conditions. The District has also established a criterion to provide backup power for all pumping facilities (wells and booster pump stations).

[8] Actual flow capacity of each PRV will vary based on system conditions.

5.1.2 Water Storage Capacity Requirements

Treated water storage capacity includes equalization storage, fire storage, and emergency storage. The following sections explain the requirement for each storage component in detail. Existing storage capacity is evaluated by pressure zone to meet the following criteria.

5.1.2.1 Operational Storage

As discussed in Section 5.1.1, the water supply criteria require firm water supply capacity to provide MDD in zones with operational storage. This storage is used to meet peak demand conditions. This storage volume is then refilled during low demand periods when water supply is greater than water demand.

The storage volume used to meet these high demand periods is called operational or equalization storage. Equalization storage is equal to 25% of MDD.

As discussed in Section 5.1.1, operational storage is not required for Zone 1 & 2A because the aqueduct directly supplies peak demands by gravity.

5.1.2.2 Emergency Storage

Emergency storage is required to supply demands during various emergencies, such as natural disasters, pipeline failures, treatment failures, power outages or pump station failure. No standard requirements exist for determining the appropriate amount of emergency storage, and each utility establishes these requirements based on their risk tolerance. The District's emergency storage requirement is 100% of ADD, and can be provided by a combination of sources, including:

- An upstream pressure zone as long as there is a reliable means to transfer the volume to that pressure zone during an emergency.
- Groundwater wells equipped with backup power equal to 18-hours of groundwater supply (approximately 0.25 MG).
- The SCWA Eldridge and Sonoma Tanks, accounting for a portion of the storage reserved for the City of Sonoma.[9] Given that the SCWA Eldridge and Sonoma Tanks could serve the District by gravity under almost all foreseeable emergency conditions, it is appropriate to account for storage in the SCWA tanks in the District's storage evaluation. For conservatism, EKI recommends not accounting for storage in the Annadel Tanks based on the scenario in which a break occurs on the Aqueduct between Annadel Tanks and the District's service area.[10]

5.1.2.3 Fire Storage

As discussed in Section 4.4, fire flow and duration requirements were established for long-term planning purposes by the District and local fire departments. For the larger pressure zones with both residential and commercial land uses (Pressure Zones 1 & 2A, 1A, 1B, and 1F), EKI recommends fire storage to supply a concurrent commercial fire (2,500 gpm for 2 hours) and residential fire (1,000 gpm for 2 hours). This results in a fire storage requirement of 0.42 MG. This concurrent fire storage requirement is recommended to address vulnerabilities identified by the October 2017 Sonoma Fires, during which Glen Ellen Tank was drained to only 3 feet of water remaining and Saddle Tank was ultimately destroyed.

[9] Based on the 2006 Restructured Agreement for Water Supply (SCWA, 2006) the District can reasonably expect approximately 57% of the normal low storage volume in Eldridge and Sonoma Tanks in the event of a supply disruption, with the City of Sonoma retaining the remaining 43%.
[10] Updated from the 2019 WMP to reflect the change in storage requirements from the 2021 Evaluation of Storage and Supply Requirements for Glen Ellen.

For the smaller pressure zones with only residential land uses, EKI recommends fire storage to supply a single residential fire (1,000 gpm for 2 hours), resulting in a fire storage requirement of 0.12 MG.

Fire storage may be located in an upstream pressure zone as long as there is a reliable means to transfer the volume to that pressure zone during an emergency.

5.2 Supply and Pumping Evaluation

The District's existing firm supply capacity for each pressure zone was evaluated against the recommended criteria discussed in Section 5.1.1 under existing and projected future demand conditions. The results of this evaluation are presented in Table 5-1.

Table 5-1 indicates that Pressure Zones 2E, 3E, 2B, 3D, and 1F have supply capacity deficits under existing and future conditions. Pressure Zones 2B and 3D, which only are delivered pumped flows, do not have enough pumping capacity to meet the fire flow requirements. EKI recommends that dedicated fire pumps be added to each pump station that can meet the 1,000 gpm residential fire flow requirement.

Supply deficits (397 gpm and 369 gpm) are shown for Pressure Zone 1F for existing and future demand conditions. However, EKI conservatively did not include capacity for Trinity turnout in the zone supply capacity, which can supply peak demands by gravity in portions of the pressure zone. EKI recommends installation of a new 450 gpm BPS to deliver supply from Pressure Zone 1B to Pressure Zone 1F to meet the supply criteria. This new BPS also improve system resiliency and addresses fire flow concerns along Arnold Drive (see Section 7). Based on discussions with the District, we recommend installing the new Eldridge BPS and relocating the existing Eldridge PRV north of SDC. This location would allow for surface water supplies from SDC to be pumped to Pressure Zone 1F if these facilities are annexed by the District in the future.

As proposed by the District, EKI recommends that Pressure Zones 2E, which only has two service connections, and 3E be consolidated. Consolidation would consist of abandoning Sobre Vista Lower Tank, which is over 100-years-old and presents maintenance challenges, and Sobre Vista Upper Pump Station; connecting the two zones; installing individual service PRVs on the Pressure Zone 2E services; upgrading the main in zone 2E to handle the higher pressure; and upgrading Sobre Vista Lower Pump Station to be able to pump up to Sobre Vista Upper Tank. EKI recommends that as part of the Lower Sobre Vista BPS upgrades, the capacity be expanded to 290 gpm to meet the supply capacity requirements.

EKI also evaluated whether Arnold Drive BPS could be abandoned. During normal operating conditions, operating Arnold Drive BPS is not necessary; there is enough pressure in the system to fill the Temelec Tanks. However, as the District experienced in late 2018, if a portion of the SCWA Aqueduct is shutdown between Eldridge Tanks and Sonoma Tanks, Arnold Drive BPS is needed to move water south through the system and provide enough pressure to fill Temelec Tanks. Due to the existing poor condition and hazardous location along Arnold Drive, EKI recommends replacing Arnold Drive BPS and relocating the new BPS to Orange Avenue, between Solano Avenue and Arnold Drive.

In addition to the supply criteria discussed in Section 5.1.1, the SCWA Restructured Agreement established a goal for each of water contractors including the District to supply and maintain approximately 40% of its maximum month demand through local sources to mitigate against drought, emergencies, and temporary Transmission System outages. As discussed in Section 3.2.2, with the installation of the Pedroncelli, Craig, and new Park Well, the District's projected total groundwater capacity is approximately 1,150 gpm or approximately 46% of the existing maximum month demand and 38% of the projected future maximum month demand of 3,030 gpm (see Section 4.4). Based on available design flow rates and production estimates, the District will meet local supply requirements for existing demands but may need

to increase its local supply slightly as demands increase in the future to meet the 40% maximum month demand supply goal.

These recommended supply improvements are discussed in more detail in Section 8.

Table 5-1
Water Supply Capacity Requirements by Pressure Zone

Pressure Zone(s)	Existing Firm Supply Capacity (gpm)				Required Supply Criteria (d)	Existing Requirements		Future Requirements	
	SCWA Turnouts (a)	Wells (b)	Booster Pump Stations (c)	Total		Required Firm Supply Capacity (gpm)	Firm Supply Capacity Surplus (Deficit) (gpm)	Required Firm Supply Capacity (gpm)	Firm Supply Capacity Surplus (Deficit) (gpm)
1 & 2A	11,600	815	-	12,415	1 & 2A PHD + 1A, 2B, 2D, 3D MDD	4,218	8,197	5,049	7,366
1A	-	-	500	500	1A MDD + Tank Fill	403	97	421	79
2B	-	-	450	450	2B PHD + FF	1,111	-661	1,119	-669
2D	-	-	350	350	2D & 3D MDD	309	41	320	30
3D	-	-	100	100	3D PHD + FF	1,079	-979	1,085	-985
1F	450	-	-	450	1F MDD + Tank Fill	847	-397	880	-430
1B	800	-	-	800	1B, 2E, 3E, 5E MDD + Tank Fill	765	35	959	-159
2E	-	-	130	130	2E, 3E, 5E MDD + Tank Fill	266	-136	284	-154
3E	-	-	100	100	3E, 5E MDD + Tank Fill	266	-166	283	-183
5E	-	-	17	17	5E MDD	0.4	17	10.2	7

Notes:

(a) Firm turnout capacity defined as the maximum rated flow capacity of each turnout with one turnout in each pressure zone offline. For gravity fed turnouts maximum capacity is equal to PRV flow capacity. For pumped turnouts, Hannah and Glen Ellen, capacity is equal to the firm capacity of the associated booster pump station.

(b) Firm well capacity defined as the total well capacity with the largest well offline.

(c) Firm pumping capacity defined as the total capacity of all pumps minus the capacity of one domestic pump.

(d) Required supply criteria for each pressure zone is further described in Section 5.1.1.

5.3 Storage Evaluation

The District's required storage capacity is composed of equalization, fire, and emergency storage described in Section 5.1.2. The District currently has 5.5 MG of storage between its 13 tanks and an additional 7.4 MG of SCWA storage capacity. Table 5-2 provides a summary of existing and future storage requirements and capacity by pressure zone.

Based on the system-wide evaluation presented in Table 5-2, a significant 3.87 MG storage surplus exists. With the District's current storage facilities and accounting for SCWA storage and groundwater supplies, existing emergency storage ranges from 3.5 to 4.2 days of ADD and future available emergency storage is projected to range between 3.2 to 3.7 days of ADD depending on the demand assumptions. This represents a robust volume of emergency storage that should allow for the District and SCWA under most scenarios to address any supply disruption for the storage is depleted.

Pressure Zone 2E, which currently cannot receive transfer of storage from Pressure Zones 3E, does not have enough fire flow storage. This deficiency will be resolved with the proposed Pressure Zones 2E and 3E consolidation, described in Section 5.2. As part of this project, EKI recommends installing a PRV between Pressure Zones 2E and 1B, so that storage in Sobre Vista Upper Tank can be transferred to the lower zones, if needed.

These recommended storage improvements are discussed in more detail in Section 8.

Table 5-2
Water Storage Capacity Requirements by Pressure Zone

Pressure Zone(s)	Available Storage Capacity (a)				Existing Requirements						Future Requirements				
	District Storage (1,000 gal)	SCWA Storage (1,000 gal)	GW Credit (1,000 gal)	Total Available Storage (1,000 gal)	Notes	Operational Storage (1,000 gal) (b)	Fire Storage (1,000 gal) (c)	Emergency Storage (1,000 gal) (d)	Total Required Storage (1,000 gal)	Storage Capacity Surplus (Deficit) (1,000 gal)	Operational Storage (1,000 gal) (b)	Fire Storage (1,000 gal) (c)	Emergency Storage (1,000 gal) (d)	Total Required Storage (1,000 gal)	Storage Capacity Surplus (Deficit) (1,000 gal)
1F	650	2,908	-	3,558	Can deliver storage to 1 by gravity and can receive storage from 1B (pumped)	155	420	230	805	2,753	167	420	247	834	2,724
2D & 3D	320	-	-	320	Can deliver storage to 1 by gravity	51	120	107	279	41	55	120	115	291	29
2B	200	-	-	200	Can deliver storage to 1 and 2A by gravity	12	120	18	150	50	13	120	19	152	48
1A	1,200	-	-	1,200	Typically operates as single zone with 1 and 2A; can deliver storage to 1 and 2A by gravity	85	420	200	705	495	91	420	215	727	473
4E & 5E	54	-	-	54		0.14	0 (e)	0.20	0.34	54	3.67	0 (e)	5.07	8.74	45
2E & 3E	207.5	-	-	208	Zones 2E and 3E consolidated and SV Lower Tank abandoned; PRV added to deliver storage to 1B by gravity. Note that the Sobre Vista Lower Tank volume has been removed from the total capacity.	36	120	43	199	8	38	120	47	205	2
1B	2,000	-	-	2,000	Can receive storage from 1F, 2E-5E, and 1 (pumped), and deliver to 1 by gravity	90	420	211	720	1,280	153	420	361	934	1,066
1 & 2A	800	4,471	253	5,524	Can receive storage from 1A, 1B, 1F (through 1B), 2E-5E (through 1B), 2B, and 2D by gravity.	685	420	1,712	2,817	2707	829	420	2,072	3,321	2,203
TOTAL	5,432	7,379	253	13,063		1,114	2,040	2,521	5,675	4,635	1,351	2,040	3,081	5,638	3,868

Notes:

(a) Refer to Table 3-6 for existing District storage. Note that the Sobre Vista Lower Tank capacity has been removed based on the recommendation to abandon the tank. For SCWA Storage, per the 2005 Memorandum of Understanding Regarding Water Transmission System Capacity Allocation During Temporary Impairment, Table 1 indicates Valley of the Moon Water District is entitled to 4.9 MGD and Sonoma is entitled to 3.8 MGD. The 2006 Restructured Agreement for Water Supply presents an entitlement of 8.5 MGD for the District and 6.3 MGD for Sonoma. Thus, it is conservatively assumed that the District can expect approximately 50% of the available storage in the Eldridge (8MG) and Sonoma Tanks (10MG) which equates to 6.8 MG. The storage available in the SCWA tanks is based on the normal low level as seen in SCADA data from 2016 to 2018. Storage from the Sonoma Tanks could be fed to Zone 1 or 1B, but are shown here providing storage for only Pressure Zone 1.

(b) Operational storage equal to 25% of max day demands.

(c) Fire storage volume for Pressure Zones 1 & 2A, 1A, 1B, and 1F equal to volume require to supply a concurrent commercial fire (2,500 gpm for 2 hours) and residential fire (1,000 gpm 2 hours). Fire storage volume for other pressure zones equal to volume required to supply a single residential fire (1,000 gpm 2 hours).

(d) Emergency storage volume equal to 100% of ADD.

(e) Fire storage volume requirement for the Sonoma Mountain Homestead area provided by a private irrigation system.

(f) Operational storage for Pressure Zones 1 and 2A is not required because Aqueduct provides peak demands by gravity. While this is also normally true for Pressure Zones 1A and 1B, operational storage is required because pumping is still required under certain operational conditions.

5.4 Summary of Recommended Supply and Storage Facility Improvements

EKI recommends the following improvements to address projected supply and storage deficits:

- Addition of dedicated fire pumps at Donald Pump Station and Chestnut Pump Station with enough capacity to meet the fire flow requirements.
- Installation of a new 450-gpm pump station to supply flow from Pressure Zone 1B to Pressure Zone 1F.
- Consolidation of Pressure Zones 2E and 3E by abandoning Sobre Vista Lower Tank and Sobre Vista Upper Pump Station, replacing the Sobre Vista Lower Pump Station pumps with higher head, 290-gpm pumps.
- Installation of a new developer-funded turnout to feed Pressure Zone 1B as a part of the 810 W. Agua Caliente development.

In addition to these capacity-related improvements, EKI has evaluated the following proposed improvements to simplify operations and improve system resiliency and redundancy:

- Installation of a new PRV between Pressure Zones 3E/2E and 1B to be able to transfer surplus storage to lower zones.
- Replacement and relocation of the Eldridge PRV in conjunction with the new Zone 1F pump station north of SDC.
- Replacement of Arnold Drive Pump Station based on the existing pump station condition and access restrictions.
- Addition of backup generators to remaining critical wells and pump stations currently without backup power.
- Installation of flow meters at each of the SCWA turnout PRVs and SCADA integration.

Table 5-3 and Table 5-4 show that with the improvements discussed above, the District will address its projected supply and storage deficits. These recommended improvements are further investigated based on hydraulic modeling analysis in Section 7 and are integrated into the recommended CIP as discussed in Section 8.

Table 5-3
Water Supply Capacity Requirements by Pressure Zone with Recommended Improvements

Pressure Zone(s)	Proposed Firm Supply Capacity (gpm)				Required Supply Criteria (d)	Future Requirements	
	SCWA Turnouts (a)	Wells (b)	Booster Pump Stations (c)	Total		Required Firm Supply Capacity (gpm)	Firm Supply Capacity Surplus (Deficit) (gpm)
1 & 2A	11,600	555	-	12,155	1 & 2A PHD + 1A, 2B, 2D, 3D MDD	5,049	7,106
1A	-	-	500	500	1A MDD + Tank Fill	421	79
2B	-	-	1125 (e)	1,125	2B PHD + FF	1,119	6
2D	-	-	350	350	2D & 3D MDD	320	30
3D	-	-	1100 (f)	1,100	3D PHD + FF	1,085	15
1F	450	-	450 (g)	900	1F MDD + Tank Fill	880	20
1B	800	-	-	800	1B, 2E/3E, 5E MDD + Tank Fill	959	-159 (h)
2E/3E	-	-	290 (i)	290	2E/3E, 5E MDD + Tank Fill	284	6
5E	-	-	17	17	5E MDD	10.2	7

Notes:

(a) Firm turnout capacity defined as the maximum rated flow capacity of each turnout with one turnout in each pressure zone offline. For gravity fed turnouts maximum capacity is equal to PRV flow capacity. For pumped turnouts, Hannah and Glen Ellen, capacity is equal to the firm capacity of the associated booster pump station.
(b) Firm well capacity defined as the total well capacity with the largest well offline.
(c) Firm pumping capacity defined as the total capacity of all pumps minus the capacity of one domestic pump.
(d) Required supply criteria for each pressure zone is further described in Section 5.1.1.
(e) Proposed Donald BPS upgrades include two 125-gpm domestic pumps and one 1,000-gpm fire pump.
(f) Proposed Chestnut BPS upgrades include two 100-gpm domestic pumps and one 1,000-gpm fire pump.
(g) Capacity accounts for proposed 450-gpm Eldridge BPS.
(h) Deficiency to be addressed by a new turnout installed as a part of the 810 W. Agua Caliente Development.
(i) Capacity accounts for proposed Sobre Vista Lower BPS upgrades, including two 290-gpm pumps.

Table 5-4
Water Storage Capacity Requirements by Pressure Zone with Recommended Improvements

Pressure Zone(s)	Storage Capacity (a) (b)		Future Requirements					
	Existing (1,000 gal)	Notes	Operational Storage (1,000 gal)	Fire Storage (1,000 gal)	Emergency Storage (1,000 gal)	Total Required Storage (1,000 gal)	Available Surplus from Upstream Zone (1,000 gal)	Storage Capacity Surplus (Deficit) (1,000 gal)
1F	3,558	Can deliver storage to 1B by gravity	167	420	247	834	-	**2,724**
2D & 3D	320	Can deliver storage to 1 by gravity	55	120	115	291	-	**29**
2B	200	Can deliver storage to 1 and 2A by gravity	13	120	19	152	-	**48**
1A	1,200	Typically operates as single zone with 1 and 2A; can deliver storage to 1 and 2A by gravity	91	420	215	727	-	**473**
4E & 5E	54		3.67	0 (c)	5.07	8.74	-	**45**
2E & 3E	207.5	Zones 2E and 3E consolidated and SV Lower Tank abandoned; PRV added to deliver storage to 1B by gravity	38	120	47	205	0	**2**
1B	2,000	Can receive storage from 1F and 2E-5E and deliver to 1 by gravity	153	420	361	934	2,726	**3,792**
1 & 2A	5,524	Can receive storage from 1A, 1B, 1F (through 1B), 2E-5E (through 1B), 2B, and 2D by gravity.	0 (d)	420	2,072	2,492	4,343	**7,375**
TOTAL	13,063							

Notes:

(a) Proposed storage capacity includes consolidation of Pressure Zones 2E and 3E and abandonment of Sobre Vista Lower Tank, and installation of new PRVs between 5E and 4E, 4E and 3E/2E, and 3E/2E and 1B.

(b) = denotes improvements

(c) Fire storage volume requirement for the Sonoma Mountain Homestead area provided by a private irrigation system.

(d) Operational storage for Pressure Zones 1 and 2A is not required because Aqueduct provides peak demands by gravity. While this is also normally true for Pressure Zones 1A and 1B, operational storage is required because pumping is still required under certain operational conditions.

6 WATER DISTRIBUTION SYSTEM PERFORMANCE AND SIZING CRITERIA

This section develops recommended water distribution system performance and sizing criteria for water distribution pipelines to be used when evaluating the District's water system under existing and future modeling scenarios described in Section 7.1. These criteria are summarized in Table 6-1.

6.1 Distribution System Pressures

The distribution system's ability to maintain adequate system pressures is the primary indicator of acceptable system performance. Under normal operating conditions, the distribution system is required to maintain a minimum pressure of 35 psi at all service connections based on District standards. A maximum pressure of 80 psi is required at all service connections where there are not individual service PRVs installed. It is understood that the District has agreements with residents at certain far reaches of the distribution system where the system frequently operates below 35 psi. In these locations, some residents have installed and maintain small booster pumps on their service connections to increase pressure as-needed. Further, while 35 psi is acceptable for most uses, fire sprinkler systems may need upwards of 50 psi to function optimally. When new services include fire sprinkler systems, the District reviews the plans and documents whether booster pumps have been deemed necessary.

As discussed in Section 4.4, the system must be able to maintain a minimum of 20 psi throughout the system under fire flow conditions to comply with California Code of Regulations, Title 22 (Title 22) requirements.

6.2 Water Transmission and Distribution Pipeline Sizing Criteria

The following pipeline velocity and head loss criteria are used for sizing new transmission and distribution pipelines. However, when evaluating the existing system, velocity and head loss criteria are secondary to the system pressure criteria (Section 6.1).

For example, if system pressures are satisfied under PHD and MDD plus fire flow (FF) conditions, an existing pipe that exceeds maximum velocity or head loss criteria are not necessarily indicative of a problem that requires system improvements. Any identified exceedances have been reviewed on a case-by-case basis to determine if they are influencing any deficient system pressures or if improving these pipes to meet velocity or head loss criteria would benefit the water movement within the system. In certain cases, upsizing deficient upstream piping near supply sources where flow and headloss are greatest can effectively address multiple downstream pressure deficiencies.

6.3 Velocity Criteria

The following velocity criteria, in conjunction with head loss criteria described below, are recommended for sizing of new water mains:

- PHD conditions: Maximum velocity of 6 feet per second (fps) for all mains
- MDD plus fire flow conditions: Maximum velocity of 10 fps for all mains

As discussed above, for existing infrastructure these criteria are secondary to pressure criteria and are evaluated to identify potential bottlenecks in the system that could be upsized to address pressure deficiencies.

6.4 Headloss Criterion

In addition to velocity criteria, the following head loss criterion must also be met for sizing of new water mains:

- PHD conditions: Maximum head loss of 7 feet per 1,000 feet of pipe (ft/k-ft)

For existing pipelines this criterion is used to identify bottlenecks in the system that if upsized could relieve downstream pressure to meet pressure criteria and improve connectivity of major supply sources and storage facilities to outlying areas.

Table 6-1
Summary of Recommended Potable Water System Performance and Operational Criteria

Component	Criteria
Fire Flow Requirements	
Single Family Residential	1,000 gpm for 2 hours.
General Commercial and Office	2,500 gpm for 2 hours.
Distribution System Pressure Requirements	
Maximum Pressure	80 psi at customer service connections without PRVs on service laterals
Minimum Pressure - Normal Operating Conditions (a)(b)	35 psi at customer service connections excluding fire flow
Minimum Pressure - Max Day Plus Fire Flow Conditions	20 psi (Title 22 requirement for minimum allowable pressure)
Recommended Pipeline Sizing Criteria	
Maximum Velocity (Secondary)	6 ft/s, all system mains, peak hour demand 10 ft/s, all system mains, maximum day plus fire flow
Maximum Head Loss (Secondary)	7 ft per 1,000 ft, peak hour demand
Hazen Williams "C" Factor	New piping = 140 Existing system piping = 80 - 150 per model calibration
New Distribution Main Diameter	General: 8-inch diameter or larger Cul-de-sacs and dead end runs: 6-inch diameter acceptable within cul- de-sacs and dead end runs of less than 500 feet where future extensions will not occur and no fire hydrants are located. Commercial: 10-inch diameter or larger.

Notes:

(a) Title 22 CCR Section 64602 requires that water distribution systems maintain a minimum of 40 psi in each expansion of the distribution system that expands the existing system service connections by more than 20 percent. No developments of this magnitude are currently planned.
The District maintains individual agreements with customers where the minimum pressure cannot be maintained due to elevation.

(b) Customers may need to provide booster pumps to increase pressure for fire suppression systems.

7 WATER DISTRIBUTION SYSTEM MODELING EVALUATION

The following sections describe the modeling scenarios, approach, and results.

7.1 Modeling Scenarios

The District's water system was evaluated under the existing demand and projected future demand condition discussed in Section 4. As a part of the streamlined approach to this plan update, demands were not spatially re-allocated in the hydraulic model based on billing data. Instead, for the existing scenario the 2019 allocations have been scaled proportionally across the District and for the future scenario the demands for the planned new development were spatially allocated with the remaining demand scaled proportionally across the District.

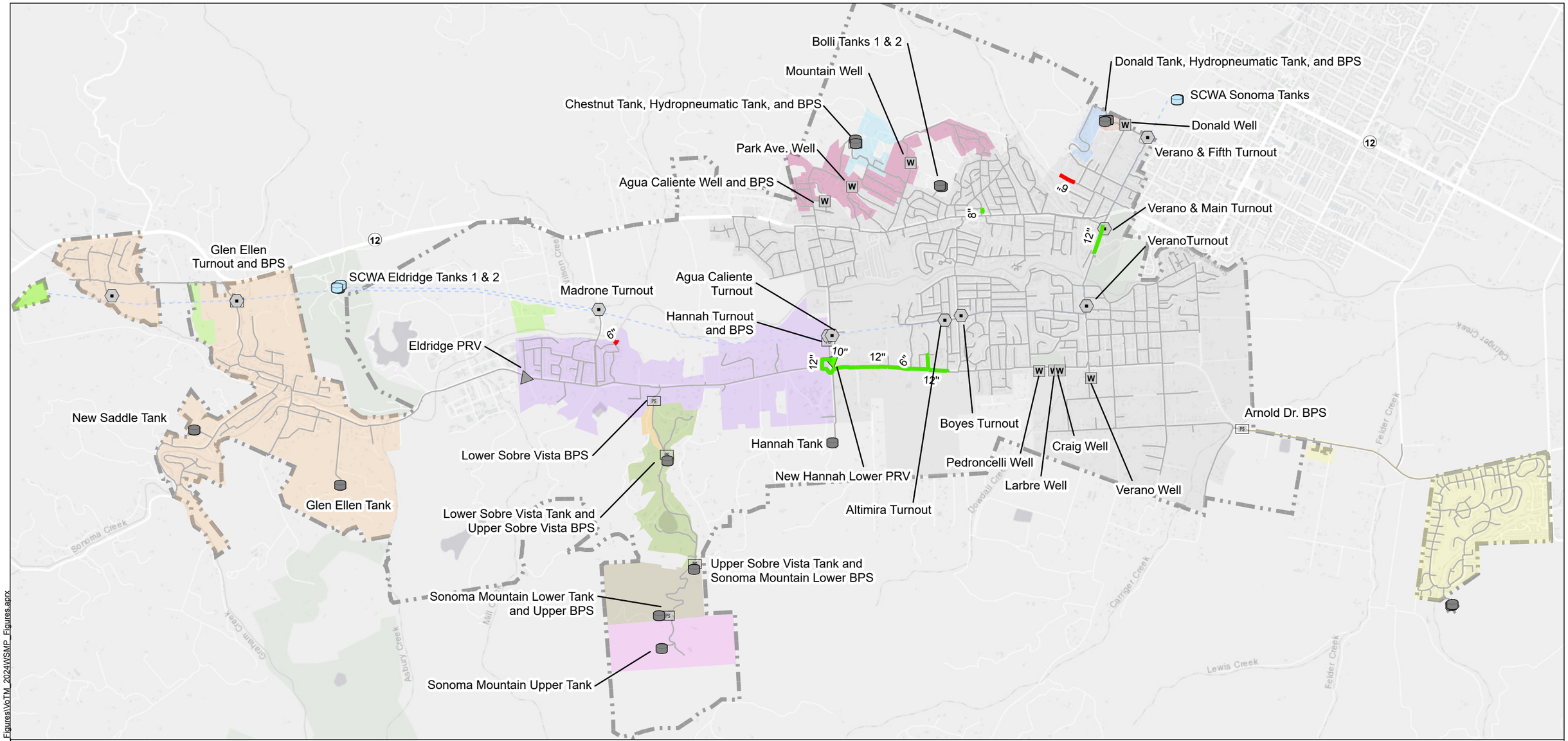
These scenarios were evaluated under the modeling simulations described further described in Section 7 to identify existing and projected future capacity deficiencies.

Several updates were made to the existing scenario, including:

- The addition of Saddle Tank and incorporation of other CIP and development projects completed since the 2019 WMP, as discussed in Section 3;
- Scaling of previously allocated demands and allocation of new development demands to reflect changes in demands, as discussed in Section 4.2.2; and
- Adjustments to PRV set points per District operators logs dated 20 September 2024 as shown in Table 3-5;

As shown in Figure 7-1, the future scenario includes upcoming CIP and development projects currently in design or construction, including:

- The Brookview and Riddle Road Easement Steel Replacement Project;
- Altimira Fire Flow Improvement Project;
- Verano Hotel Frontage Public Water Main Improvements;
- 18661 Lomita Avenue New Water Main Project; and,
- Boyes Food Center Mixed Use Development Water Main Improvement Project.



Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

1	2D
1A	2E
1B	3D
SCWA	3E
1F	4E
2A	5E
2B	

Future District Infrastructure

- Future PRV

Pipeline Projects Included

- Lomita Steel Water Main Replacement Project
- Altimira Fire Flow, Verano Hotel, and Boyes Food Center Mixed Use Water Main Improvement Projects (Currently In Design or Construction)

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
PSI = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 14 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Projects In Development Included in Future Modeling Scenario

Valley of the Moon Water District
Sonoma County, CA
January 2025
C40120.00

Figure 7-1

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7.2 Modeling Approach

To evaluate distribution system performance against performance criteria, EKI conducted steady-state model simulations of (1) PHD and (2) MDD+FF for both the Existing, Future, and Future with CIPs Scenarios.

As a part of this modeling analysis, the District identified three areas in the system which could benefit from the installation of new pressure regulating stations to reduce pressures. These three areas have been included in the Future with CIPs scenario to ensure no unintended effects occurred with the re-zoning of these portions of the system.

7.2.1 PHD Simulations

The followings operating conditions were assumed under the PHD model runs to represent normal "worst-case" operating conditions:

- All groundwater wells were out of service;[11]
- Donald and Chestnut BPSs operating at firm domestic capacity (i.e., with the largest pump out of service) with all fire pumps offline;
- All other BPSs offline;
- All PRVs set at the recommended PRV settings listed in Table 3-5;
- All tanks (including Eldridge and Sonoma SCWA Tanks) filled to their normal low levels;
- Eldridge Tank and Sonoma Tank filling at 2,700 gpm and 500 gpm, respectively, which represent the average fill rates according to an analysis of available SCADA data; and
- The hydraulic grade level in the SCWA Aqueduct as it enters the District set at approximately the average level.

Results from these simulations provided information on junction pressures and pipeline head loss and velocity under PHD conditions.

7.2.2 MDD + FF Simulations

The MDD + FF scenarios were run under the same operational conditions as the PHD simulations with the following exceptions:

- Fire pumps are available as-needed; and
- BPSs controls were set such that pumps switched on (up to firm capacity) when upstream pressures dropped below normal levels, representing the District's ability to manually turn pumps on if needed during an emergency.

The fire flow simulations determine the fire flow availability at each hydrant while maintaining a minimum of 20 psi everywhere in the system. These results were compared to required fire flows to determine which hydrants do not meet the required criteria. To address observed fire flow deficiencies, additional fire flow analyses were conducted under MDD+FF conditions on a case by case basis by manually applying

[11] As shown in Appendix C of the 2019 WMP, Figure C-1, identified peak hour and fire flow deficiencies are largely the same with groundwater wells in service, indicating the wells have minimal influence on the fire flow availability. Groundwater wells have been assumed to be offline to best represent the worst-case scenario.

fire demands on individual hydrant nodes to assess pipeline head loss and velocity under fire flow conditions.

7.3 Existing Scenario Evaluation

Existing scenario model simulations were evaluated to identify existing system deficiencies, as are discussed in the following sections.

7.3.1 PHD Results

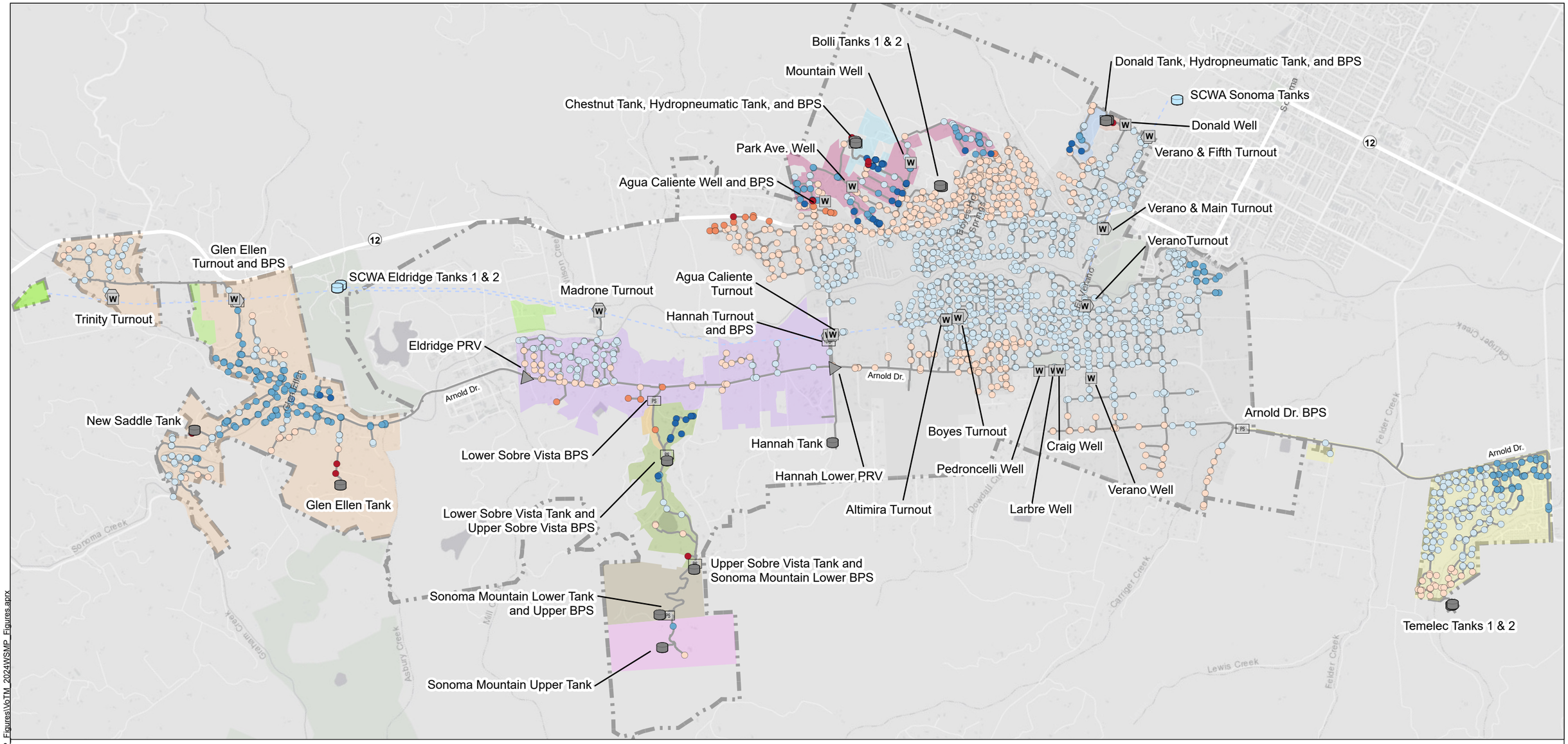
Model results indicate that the existing system cannot meet the minimum pressure criteria of 35 psi system-wide under PHD conditions. Modeled system pressures at service connections ranged from approximately 27 psi to 138 psi, as shown on Figure 7-2. The locations of the lowest pressures were observed at similar locations to the 2019 analysis, including high elevation service connections near the Chestnut Tank, the Sobre Vista Upper Tank, Glen Ellen Tank, and prior to the Agua Caliente Well and pump station along East Aqua Caliente Road. Areas east of Agua Caliente Turnout have been observed to have higher pressures than the 2019 WMP due to modifications to the District's PRV settings, however, a few locations are still below 35 psi.

Analysis of pipeline head losses and velocities indicates that the system is generally able to meet the required criteria. The highest headloss of 28 ft/k-ft is experienced on the 4-inch main on Railroad Avenue between El Dorado Drive and Boyes Boulevard and the 4-inch main on Los Banos Drive between Altimira Circle and Boyes Boulevard, which exceeds the criteria of 7 ft/k-ft. Headloss is a secondary criterion, this section of pipeline likely does not need replacement based on modifications to the system pressure zones discussed further in Section 7.6.

7.3.2 MDD Plus Fire Flow Results

Modeled fire flow availability is shown on Figure 7-3. Several hydrants cannot meet fire flow requirements, including:

- Multiple hydrants in the Trinity Oaks residential area in Pressure Zone 1F.
- Multiple hydrants in the residential areas along Warm Springs Road in Pressure Zone 1F.
- Three hydrants in the Glen Ellen along Arnold Drive in Pressure Zone 1F.
- One hydrant in Eldridge residential neighborhood in Pressure Zone 1B.
- Multiple hydrants with significant deficiencies throughout Sobre Vista and Sonoma Mountain in Pressure Zones 2E, 3E, 4E, and 5E.
- Multiple hydrants in commercial areas proximate to Highway 12 Pressure Zone 1.
- Three hydrants around the Altimira Middle School in Pressure Zone 1.
- Three hydrants in residential areas east of Arnold Drive in southern Pressure Zone 1.
- Two hydrants in residential neighborhoods of Pressure Zone 2D.
- Multiple hydrants in residential neighborhoods of Pressure Zone 3D.
- All hydrants in Pressure Zone 2B.



Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Junction Pressure, psi

- Less than 35 (Not Meeting Criteria)
- 35 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- Greater than 100

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 7 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Existing Water System Performance Evaluation
Peak Hour Demand - System Pressures

Valley of the Moon Water Distrt
Sonoma County, CA
February 2025
C40120.00

Figure 7-2

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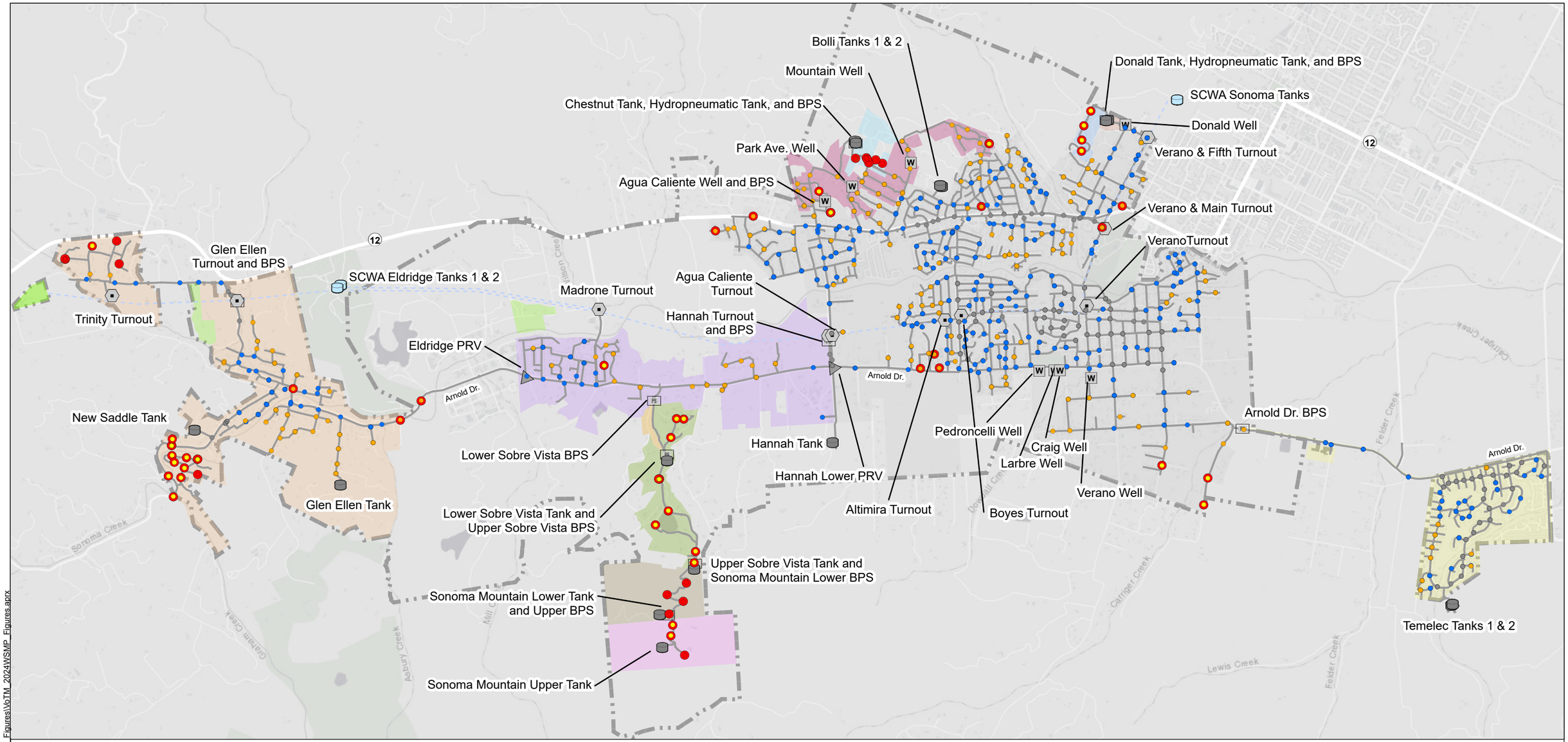

Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Available Fire Flow, Gallons per Minute

- Less than 500
- 500 - 1000
- 1000 - 2500
- 2500 - 4000
- Greater than 4000

Hydrant Residual Pressure Not Meeting Criteria

- Residual Pressure Below Requirement

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 7 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Existing Water System Performance Evaluation
Max Day Demands - Available Fire Flow

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 7-3

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7.4 Future Scenario Evaluation

Modeled results for the Future scenario were evaluated to anticipate system deficiencies under future demand conditions. As discussed in Section 7.1, the Future scenario includes projects currently in planning or design phases, such as the Steel Replacement Project and the Altimira Fire Flow Improvement Project.

7.4.1 PHD Results

Model results for the Future scenario are similar to the Existing scenario, indicating that the planned development and increase in future demands do not significantly impact system pressures. Modeled system pressures at service connections under PHD ranged from approximately 24 psi to 136 psi, as shown on Figure 7-4. The lowest pressures experienced are located at similar locations as discussed in Section 7.3.1, and low-pressure areas have expanded slightly.

7.4.2 MDD Plus Fire Flow Results

Modeled fire flow availability is shown on Figure 7-5. Fire flow deficiencies in the Future scenario are generally similar to the Existing scenario, with exception of the three fire flow deficiencies near the Altimira School, which are modeled to be addressed by the Altimira Fire Flow Improvement Project.

7.5 Recommended Distribution System Capacity Improvements

Projects were developed to solve each hydraulic capacity deficiency identified in the hydraulic modeling evaluation. EKI first modeled the proposed facility improvement projects discussed in Section 5.4. For the remaining deficiencies, EKI identified pipeline projects to improve system pressures. In general, supply source and storage tank transmission pipelines that exhibited higher velocities and head losses in modeling results were targeted first, because upsizing these pipelines can significantly assist downstream pressure issues. Remaining fire flow deficiencies were addressed by upsizing distribution mains, adding new pipe connections, or by replacing the hydrant with a larger lateral. Lastly, transmission mains were identified for upsizing which could assist pressure deficiencies.

EKI modeled the remaining proposed improvements from 2019 under future demand conditions to confirm that the identified deficiencies had been addressed. Generally, the remaining projects identified in the 2019 WMP have been carried forward without any modifications, indicating that they are still appropriate solutions to the identified deficiencies. However, one project, the Agua Caliente Road Transmission Improvement, has been removed from the CIP list due to the proposed new pressure zone in the Agua Caliente Knolls area, as discussed below in Section 7.6, which also addresses the fire flow deficiencies identified in this area.

7.6 District Metered Areas

In addition to the recommended distribution system improvements above, EKI has incorporated three new pressure zone modifications identified by the District as new District Metered Areas (DMAs). The three DMAs are in (1) Glen Ellen in Pressure Zone 1F, (2) the Agua Caliente Knolls area in Pressure Zone 1, and (3) in the southern portion of Temelec in Zone 1A. The three new DMAs can be seen in Figure 7-6 as Pressure Zones 1G, 1H, and 1I, respectively. These new DMAs would be created by adding new PRV stations at the following locations:

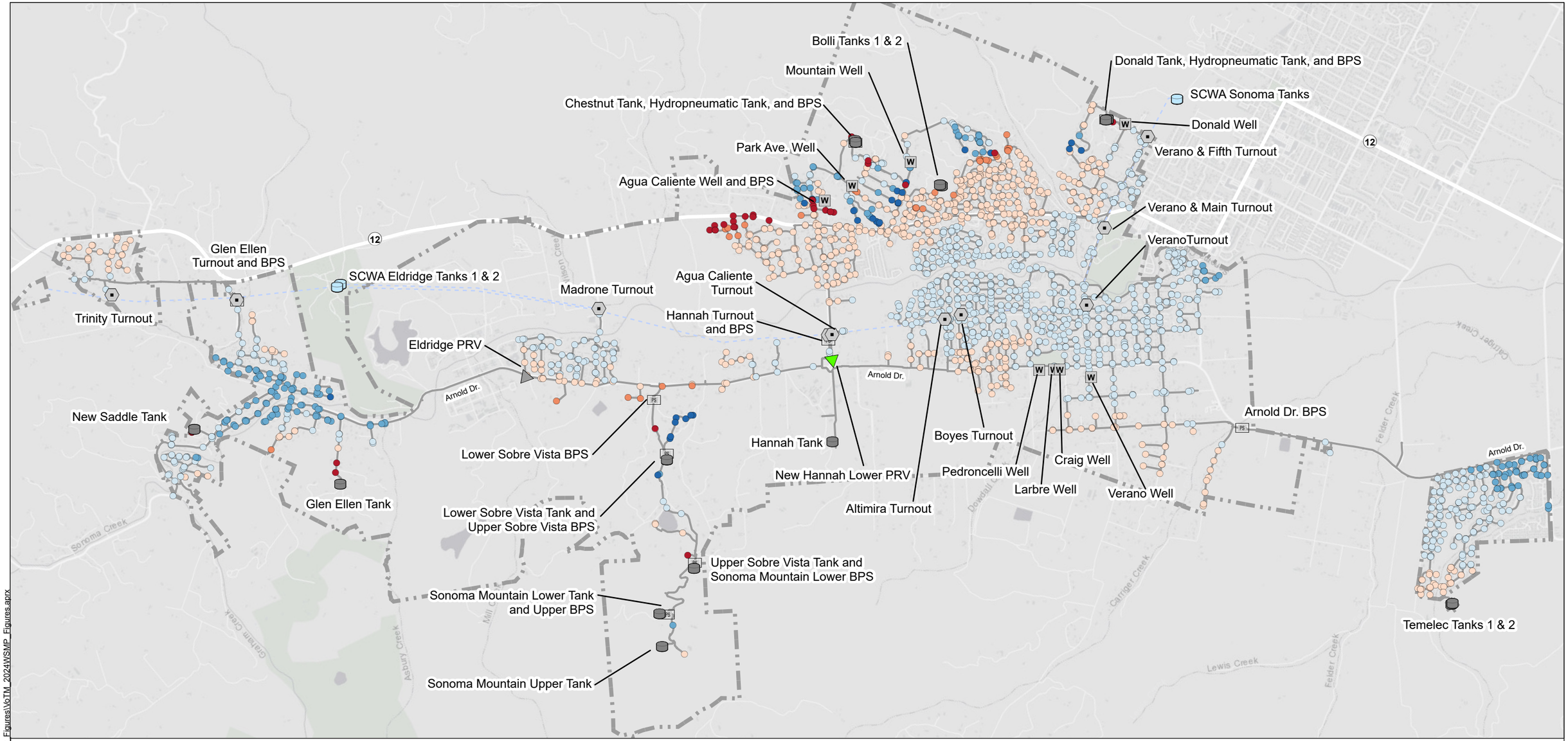
- Pressure Zone 1G (Glen Ellen): New 6-inch PRV Station at the intersection of Arnold Drive and Carmel Avenue
- Pressure Zone 1H (Agua Caliente Knolls): New 8-inch PRV Station at the intersection of Kearney Avenue and East Agua Caliente Road, running parallel to the existing zone separating closed valve,

and new 12-inch PRV Stations (1) on West Agua Caliente Road east of the roundabout (2) on Highway 12 between Vailetti Drive and Sunnyside Avenue

- Pressure Zone 1I (Temelec): New 6-inch PRV Stations (1) on Avenida Sebastiani between Via Colombard and Avenida Barbera and (2) on Arnold Drive between Mission Drive and Avenida Sebastiani, and close the valve on South Temelec Circle between Mission Drive and Herbazal Street.

Modeled results for the Future scenario with the recommended water system capacity improvements and the new pressure zones were evaluated. As seen in Figure 7-6, the new DMAs reduce pressures from above 100 psi in the new Glen Ellen and Temelec DMAs to approximately 60 psi and increase pressure to above 35 psi in the Agua Caliente Knolls DMA to better meet system performance criteria. As seen in Figure 7-7, the new DMAs do not cause any new fire flow deficiencies and improve fire flow availability in the Agua Caliente Knolls Area.

These recommended hydraulic capacity projects are discussed in Section 8.



Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Junction Pressure, psi

- Less than 35 (Not Meeting Criteria)
- 35 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- Greater than 100

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 9 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Future Water System Performance Evaluation
Peak Hour Demand - System Pressures

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 7-4

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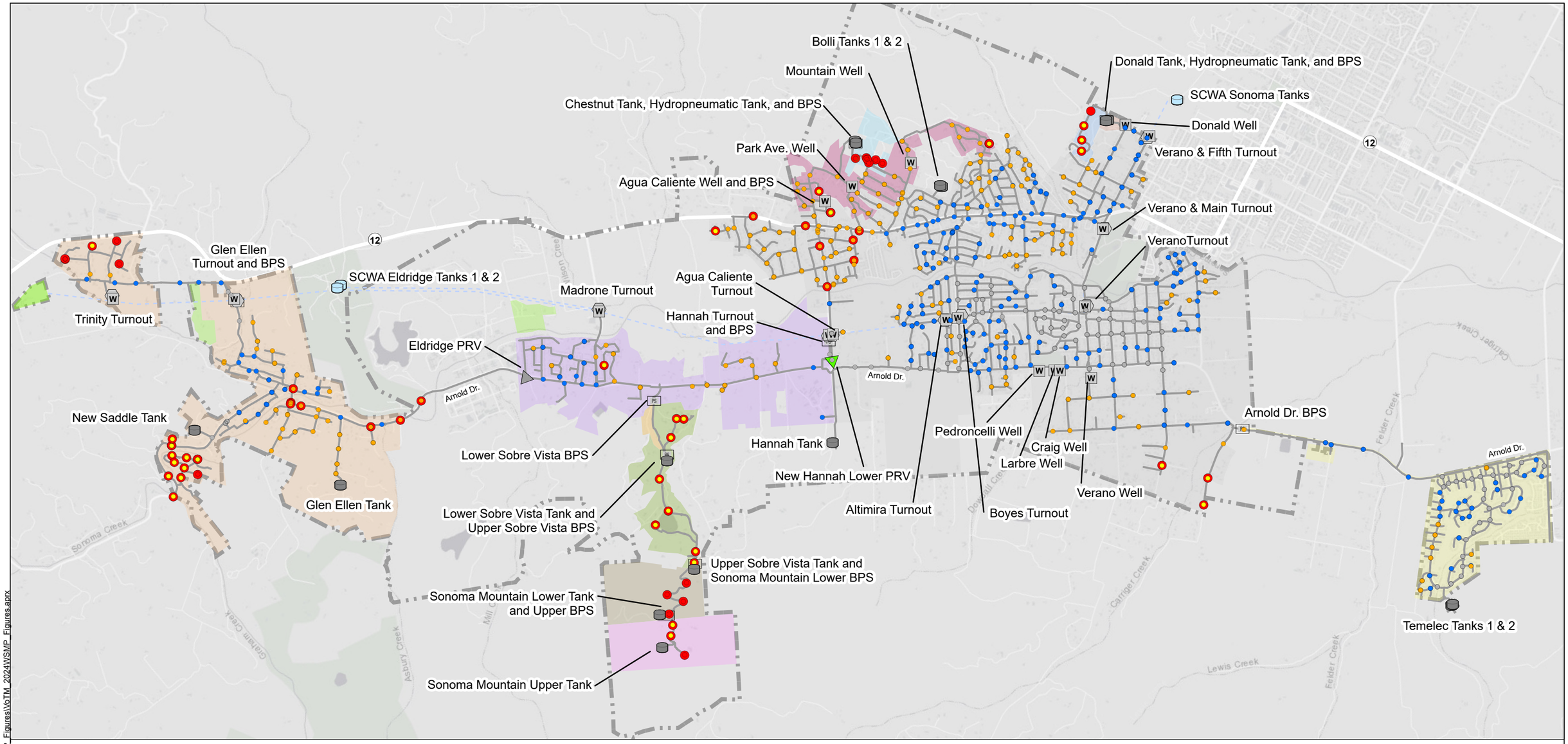

Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Available Fire Flow, Gallons per Minute

- Less than 500
- 500 - 1000
- 1000 - 2500
- 2500 - 4000
- Greater than 4000

Hydrant Residual Pressure Not Meeting Criteria

- Residual Pressure Below Requirement

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 9 January 2025.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Future Water System Performance Evaluation
Max Day Demands - Available Fire Flow

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 7-5

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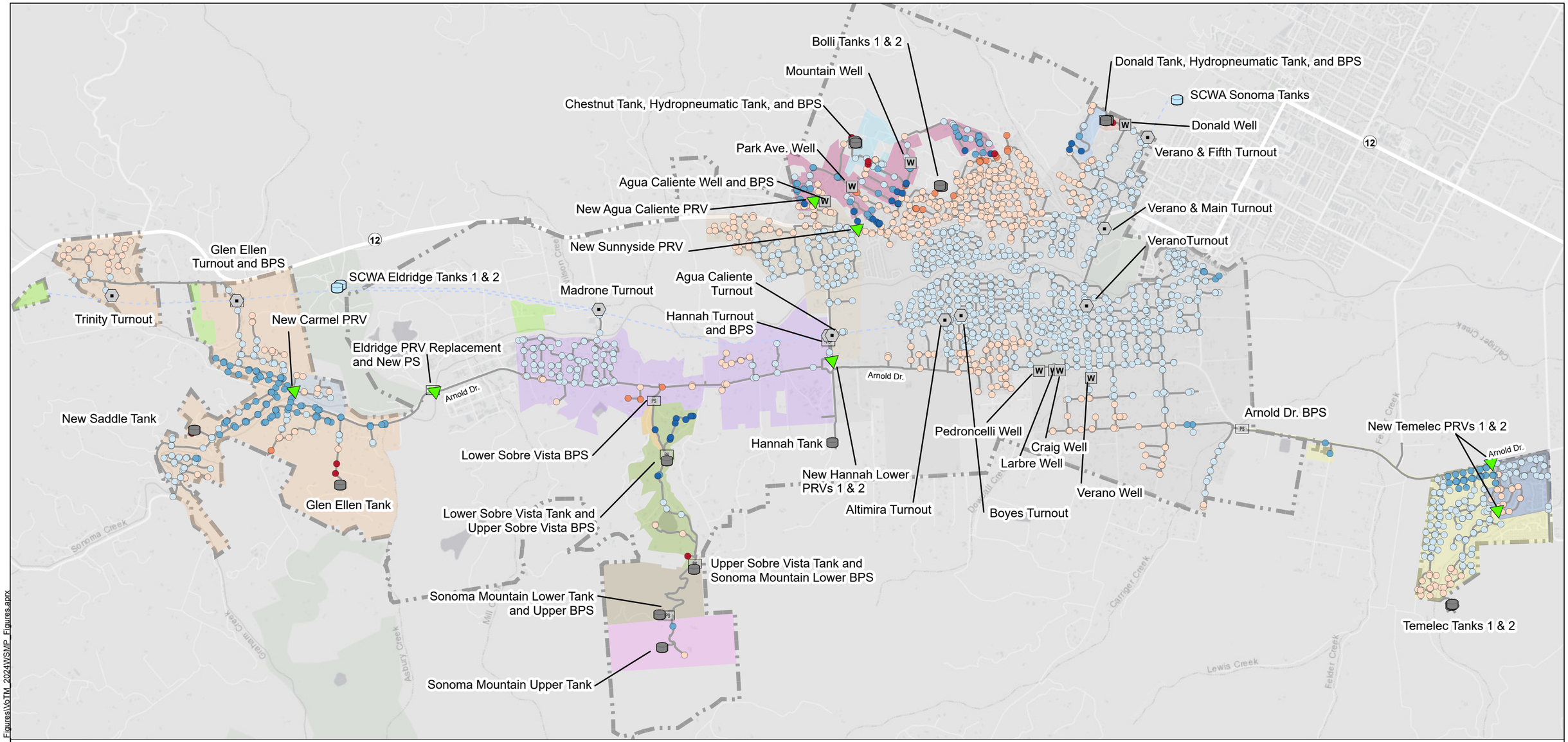

Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 1G
- 1H
- 1I
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Future District Infrastructure

- Future Pressure Reducing Valve Station

Junction Pressure, psi

- Less than 35 (Not Meeting Criteria)
- 35 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- Greater than 100

Abbreviations

BPS = booster pump station
CIP = Capital Improvement Program
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.
4. Pressure Zones 1G, 1H, and 1I are district metered areas.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000
Feet

Future Water System Performance Evaluation
Peak Hour Demands - Junction Pressure
With CIPs

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 7-6

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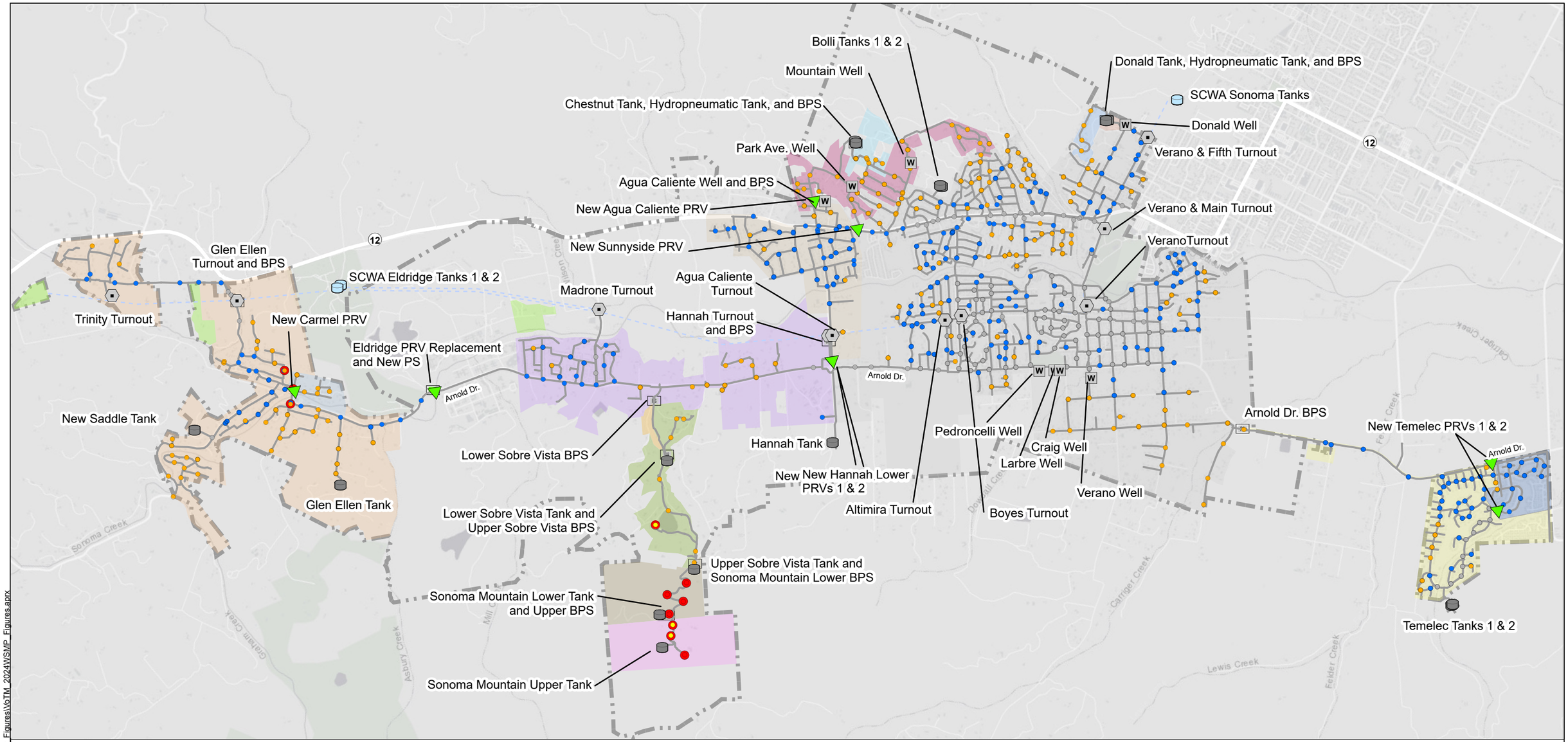

Legend

- Sphere of Influence
- SCWA Enclose Storage Facility
- SCWA Aqueduct

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Pressure Zones

- 1
- 1A (See Note 2)
- 1B
- SCWA (See Note 3)
- 1F
- 1G
- 1H
- 1I
- 2A
- 2B
- 2D
- 2E
- 3D
- 3E
- 4E
- 5E

Future District Infrastructure

- Future Pressure Reducing Valve Station

Available Fire Flow, Gallons per Minute

- Less than 500
- 500 - 1000
- 1000 - 2500
- 2500 - 4000
- Greater than 4000

Hydrant Residual Pressure Not Meeting Criteria

- Residual Pressure Below Requirement

Abbreviations

BPS = booster pump station
CIP = Capital Improvement Program
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.
2. Pressure Zone 1A can be isolated with boosted pressure from Arnold Dr. PS.
3. Pressure Zone 1C served directly by SCWA aqueduct.
4. Pressure Zones 1G, 1H, and 1I are district metered areas.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online.
2. Pressure zone information adapted from Water System Map, January 2015.

N

0 3,000 6,000

Feet

Future Water System Performance Evaluation
Max Day Demands - Available Fire Flow
With CIPs

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 7-7

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8 RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

This section summarizes the recommended update to the 2019 CIP that reprioritizes the remaining projects and includes additional newly identified projects to (1) rezone portions of the District as discussed in Section 7.6, and (2) additional pipeline condition projects to replace pipelines that have reached the end of their useful lives. EKI has developed opinions of probable cost (OPCs) and recommended priorities for each project.

8.1 CIP Costs

Costs for improvement projects have been estimated for both construction completed by District staff based on recent cost data provided by the District and by construction contractors based on recent bid results and EKI's experience with similar projects.

These costs are conceptual level estimates, considered to have an estimated accuracy range of -30% to +50%, suitable for use for budget forecasting, CIP development, and project evaluations, with the understanding that refinements to the project details and costs would be necessary as projects proceed to design and construction. An OPC for construction of each project has been developed using unit cost factors discussed below and are presented in December 2024 dollars based on an Engineering News Record (ENR) Construction Cost Index (CCI) of 15,400.54 (San Francisco).

The total project OPCs also include an additional 50-60% of the construction OPC to account for contingency, design, construction management, permitting, regulatory compliance, CEQA, and project implementation:

- Project Construction Contingency: 25% for pipeline replacements and 30% for all other projects
- Design: 10% for pipeline replacements and 15% for all other projects
- Construction Management: 5%
- Permitting, Regulatory Compliance, CEQA: 5%
- Project Implementation: 5%

8.1.1 Pipeline Project Costs

Unit costs for water pipeline projects are presented in Table 8-1. These costs vary by diameter both for installations by District staff and construction contractors. These cost factors assume open-trench construction and installation of C900 PVC pipe for all projects. The unit construction costs presented below generally include pipeline materials, trenching, placing and joining pipe, placing imported pipe bedding and backfill material, and partial asphalt pavement replacement, if required. These costs are representative of pipeline construction under normal conditions and would be higher for difficult cases.

Table 8-1. Unit Construction Cost for Pipeline Projects

Pipe Diameter (inches)	Estimated Cost ($/linear foot)	
	Constructed by District Staff	Constructed by Contractor
6	192	275
8	230	332
10	275	396
12	332	473

In addition to the unit construction cost for length of pipe installed, Table 8-2 presents additional unit costs that have been included to better estimate total project costs.

Table 8-2. Miscellaneous Costs for Pipeline Projects

Item	Estimated Cost ($/ea)	
	Constructed by District Staff	Constructed by Contractor
Hydrant Replacements	6,500	18,000
Service Replacements	2,000	5,000
Main Connections	2,500	10,000

EKI assumes that additional fire hydrants, if requested by the Fire Department, would be funded by the Fire Department.

8.1.2 Treated Water Storage Tank Costs

Treated water storage tank costs are based on unit-volume cost factors which include the installation of above-grade steel storage tank, site piping, earthwork, paving, instrumentation, and all related sitework. Note that these costs are representative of construction conducted under normal excavation and foundation conditions and would be significantly higher for special or difficult foundation requirements.

8.1.3 Booster Pump Station Costs

The BPS OPCs conservatively assume full replacement the BPSs at the flow rates specified. This assumption has been made to capture the potential need for major BPS upgrades due to increased electrical loading or for condition-based replacements. Costs include installation of the booster pumps, pump station building, site piping, earthwork, paving, on-site backup/standby power generator, SCADA, and related sitework.

8.1.4 Groundwater Supply Well Costs

The new groundwater supply well OPC assumes the project will consistent of pilot hole drilling, e-logging, water quality/soil sampling, pilot hole reaming, well construction, well development, and installation of the necessary housing, pump, motor, electrical equipment, backup generator, SCADA equipment, discharge piping, and disinfection equipment. The construction OPC for a new 100 to 350 gpm well is estimated to be approximately $1.0M to $1.3M based on the costs for the recent installation of Well 5A, Park Well, and Chestnut Exploratory Well. The OPC assumes that no wellhead treatment is required besides chlorination.

8.1.5 Miscellaneous Costs

In addition to the costs presented above, other cost factors are presented in Table 8-3.

Table 8-3. Miscellaneous Costs

Item	Estimated Cost ($/ea)	
	District Staff	Contractor
PRV Installation	90,000	120,000
PRV Abandonment	--	15,000
Tank Demolition	--	65,000
BPS Removal	--	65,000
Flow Meter	48,000	65,000

PRV Station cost assumes a pre-assembled packaged PRV station that includes a 6-inch PRV and a 2-inch low-flow bypass PRV, a precast utility vault, and required connection piping, valves, and fittings.

8.1.6 Recommended Priorities

EKI has developed recommended priorities for each of the proposed improvements. Generally, EKI developed three levels of prioritization, described below:

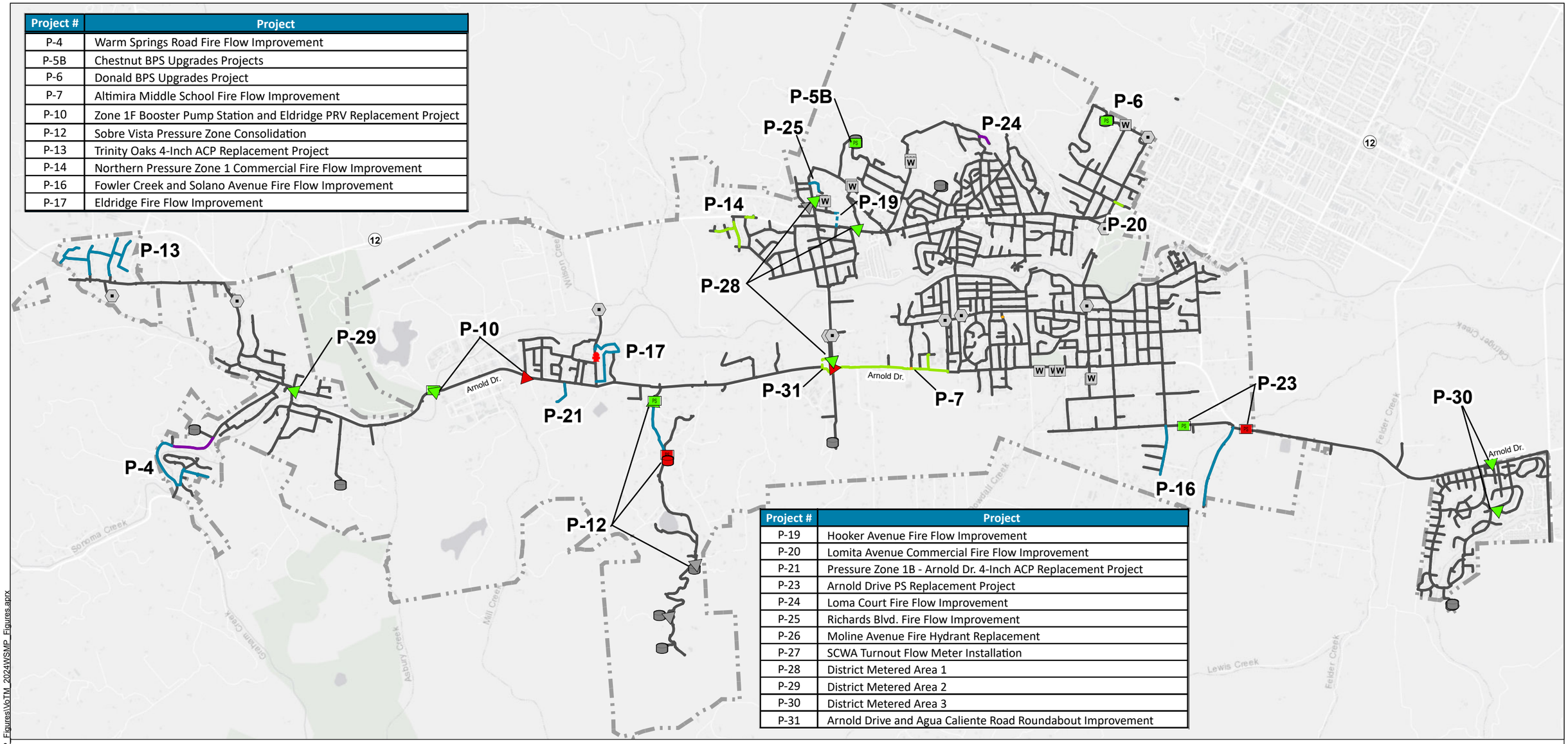
- **Priority 1** – Critical projects that should be initiated as soon as possible and completed over the next 5 years, including:
  - Projects to address significant fire flow deficiencies in sensitive areas (e.g., areas adjacent to urban-wildland boundary or a school);
  - Condition related projects identified by the District;
  - Projects to create new District Metered Areas to address pressure deficiencies or fire flow deficiencies;
- **Priority 2** – Near-term projects that should be implemented in the next five to ten years, including:
  - Remaining projects that address significant fire flow deficiencies (i.e., greater than 40% deficient);
  - Projects to create new District Metered Areas to reduce excessive pressures;
  - Projects that address remaining storage and supply deficiencies; and
  - Projects that address minimum pressure deficiencies during normal operations.
- **Priority 3** – Long-term projects that should be implemented after priority two projects, including:
  - Projects that address the remaining fire flow deficiencies;
  - Replacement of aging 4-inch ACP; and
  - Other identified operational improvement.

8.2 Capital Improvement Projects

Figure 8-1 shows an overview of the recommended improvements P-2 through P-30. A summary of the recommended improvements, as well as the CIPs included in the District's existing 5-year CIP budget, are presented in Table 8-4. As shown in Table 8-4, the total OPC for the proposed CIP in December 2024 dollars is approximately $26.6 million to $34.3 million (depending on whether the pipeline projects will be constructed by the District or a construction contractor). It should be noted that the recommended CIP only identifies improvements at a master plan level and does not constitute a design of such improvements. Subsequent detailed design is required to determine the exact sizes and locations of these proposed improvements.

Project summary sheets are provided for each project in Appendix A. Each summary sheet includes a location map, a description of and justification for the proposed improvements, recommended priority, and estimated planning level OPC.

Project #	Project
P-4	Warm Springs Road Fire Flow Improvement
P-5B	Chestnut BPS Upgrades Projects
P-6	Donald BPS Upgrades Project
P-7	Altimira Middle School Fire Flow Improvement
P-10	Zone 1F Booster Pump Station and Eldridge PRV Replacement Project
P-12	Sobre Vista Pressure Zone Consolidation
P-13	Trinity Oaks 4-Inch ACP Replacement Project
P-14	Northern Pressure Zone 1 Commercial Fire Flow Improvement
P-16	Fowler Creek and Solano Avenue Fire Flow Improvement
P-17	Eldridge Fire Flow Improvement



Project #	Project
P-19	Hooker Avenue Fire Flow Improvement
P-20	Lomita Avenue Commercial Fire Flow Improvement
P-21	Pressure Zone 1B - Arnold Dr. 4-Inch ACP Replacement Project
P-23	Arnold Drive PS Replacement Project
P-24	Loma Court Fire Flow Improvement
P-25	Richards Blvd. Fire Flow Improvement
P-26	Moline Avenue Fire Hydrant Replacement
P-27	SCWA Turnout Flow Meter Installation
P-28	District Metered Area 1
P-29	District Metered Area 2
P-30	District Metered Area 3
P-31	Arnold Drive and Agua Caliente Road Roundabout Improvement

Legend

- Sphere of Influence

Existing District Infrastructure

- PRV
- Pump Station
- Enclosed Storage Facility
- Turnout and PRV
- Production Well
- Pipe

Recommended CIPS

- Replace existing hydrant with 6-inch hydrant & lateral
- Future PRV
- Future/Upgraded Pump Station
- Abandon Valve
- Abandon Pump Station
- Abandon Enclosed Storage Facility

Replacement Pipe, inches

- 6
- 8
- 10
- 12

New Pipe, inches

- 6
- 8
- 10
- 12

Abbreviations

BPS = booster pump station
PRV = pressure reducing valve
psi = pounds per square inch
SCWA = Sonoma County Water Agency

Notes

1. All locations are approximate.

Sources

1. Aerial basemap provided by ESRI's ArcGIS Online, 5 February 2025.

N

0 3,000 6,000

Feet

Recommended Capacity-Related Water System Improvements

Valley of the Moon Water District
Sonoma County, CA
February 2025
C40120.00

Figure 8-1

Path: X:\B80082.00\Maps\Water Master Plan\2024-11\VoTM_2024WSMP_Figures\VoTM_2024WSMP_Figures.aprx

Table 8-4
Summary of Recommended Water System Capital Improvement Projects

Project #	Project	Improvement Description	Priority	Recommended Pipe Diameter (in)	Pipe Length (Linear Feet)	Total Project OPC (a)(b)	
						District Staff	External Contractor
Facilities and Maintenance Projects							
P-29	District Metered Area 2 (PZ-1G)	Install new 8-inch PRV station with flow metering at the intersection of Kearney Avenue and East Agua Caliente Road, running parallel to the existing zone separating closed valve, and new 12-inch PRV stations with flow metering (1) on West Agua Caliente Road east of the roundabout (2) on Highway 12 between Vailetti Drive and Sunnyside Avenue to create new pressure zone 1G in the Agua Caliente Knolls area.	1	--	--	$670,000	$920,000
P-27	SCWA Turnout Flow Meter Installation	Install flow meters at each of the SCWA turnout PRVs and integrate with SCADA system.	2	--	--	$770,000	$1,040,000
P-28	District Metered Area 1 (PZ-1H)	Install new 6-inch PRV station with flow metering at the corner of Arnold Drive and Carmel Ave and create new pressure zone in Glen Ellen.	2	--	--	$230,000	$330,000
P-30	District Metered Area 3 (PZ-1I)	Install new 6-inch PRV stations with flow metering on (1) Avenida Sebastiani between Via Colombard and Avenida Barbera and (2) on Arnold Drive between Mission Drive and Avenida Sebastiani, and close the valve on South Temelec Circle between Mission Drive and Herbazal Street to create new pressure zone 1I in the Temelec Area.	2	--	--	$450,000	$620,000
Pipeline Projects							
P-4	Warm Springs Road Fire Flow Improvement	Replace existing 6-inch PVC, ACP, and DIP water mains with new 8-inch and 10-inch PVC water mains, replace 47 existing service connections, and replace four existing fire hydrants.	1	8 10	3,400 1,500	$1,990,000	$3,120,000
P-7	Altimira Middle School Fire Flow Improvement	Replace existing 6-inch and 8-inch PVC and ACP water mains with new 12-inch PVC water mains along Arnold Drive, replace existing 6-inch pipe with new 8 and 12-inch pipe adjacent to Altimira Middle School, replace 15 existing service connections, and replace three existing fire hydrants. This project could be combined with P-31 for efficiency.	1	10 12	50 4,235	$2,210,000	$3,290,000
P-13	Trinity Oaks 4-Inch ACP Replacement Project	Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace 49 existing service connections, and replace six existing fire hydrants in the Trinity Oaks area. District to coordinate with Fire Department to determine if additional hydrants are needed. These hydrants would be funded by the Fire Department.	1	8	6,000	$2,280,000	$3,550,000
P-17	Eldridge Fire Flow Improvement	Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace 49 existing service connections, and replace three existing fire hydrants in the Eldridge area. Abandon the 4-inch ACP water main on Madrone Avenue and reconnect services to existing 8-inch water main. This project has been identified as high priority due to the condition of the ACP water mains in this zone.	1	8	3,900	$1,540,000	$2,470,000
P-31	Arnold Drive and Agua Caliente Road Roundabout Improvement	Replace existing 8-inch ACP water mains with new 12-inch PVC water mains and relocate the existing Hannah Lower PRV out of the center of the new roundabout. This project has been identified as high priority due to the safety concerns with operating this PRV. This project could be combined with P-7 for efficiency.	1	12	2,000	$1,230,000	$1,760,000
P-14A	Northern Pressure Zone 1 Commercial Fire Flow Improvement - La Grama	Replace existing 6-inch water mains with new 12-inch PVC water mains, replace 3 existing service connections, and replace three existing fire hydrants.	2	12	1,425	$760,000	$1,150,000
P-16	Fowler Creek and Solano Avenue Fire Flow Improvement	Replace existing 6-inch ACP water mains with new 8-inch PVC water mains, replace ten existing service connections, and replace five existing fire hydrants.	2	8	4,200	$1,550,000	$2,380,000
P-14B	Northern Pressure Zone 1 Commercial Fire Flow Improvement - HWY 12	Replace existing 8-inch ACP water mains with new 12-inch PVC water mains, replace one existing service connections, and replace one existing fire hydrants. Based on discussions with the District, the commercial areas along HWY 12 have been vacant in this area for an extended period. This project is only recommended if new development occurs here.	3	12	280	$160,000	$260,000

Table 8-4 (cont.)
Summary of Recommended Water System Capital Improvement Projects

Project #	Project	Improvement Description	Priority	Recommended Pipe Diameter (in)	Pipe Length (Linear Feet)	Total Project OPC (a)(b)	
						District Staff	External Contractor
Pipeline Projects							
P-19	Hooker Avenue Fire Flow Improvement	Install new 8-inch PVC water main between Highway 12 and Hooker Ave.	3	8	550	$200,000	$300,000
P-20	Lomita Avenue Commercial Fire Flow Improvement	Replace existing 6-inch ACP water main with new 12-PVC water main along Lomita Avenue, replace two service connections, and replace one hydrant.	3	12	300	$170,000	$280,000
P-21	Pressure Zone 1B - Arnold Dr. 4-Inch ACP Replacement Project	Replace existing 4-inch ACP water main with new 8-inch PVC water main in Pressure Zone 1B west of Arnold Drive, and replace three existing service connections.	3	8	800	$290,000	$440,000
P-24	Loma Court Fire Flow Improvement	Replace existing 6-inch with new 8-inch PVC along Loma Court, replace 11 existing service connections, and replace one existing fire hydrant.	3	8	500	$220,000	$370,000
P-25	Richards Blvd. Fire Flow Improvement	Replace existing 6-inch ACP and DIP water main with 8-inch PVC water main along Richards Blvd, replace four existing service connections, and one existing hydrant.	3	8	300	$130,000	$240,000
Pump Stations, Tanks, and Wells							
P-5B	Chestnut BPS Upgrades Projects	Replace existing Chestnut BPS with two (2) 100-gpm domestic pumps and one (1) 1,000 gpm fire pump at 60 ft total dynamic head (TDH).	1	--	--	--	$2,600,000
P-6	Donald BPS Upgrades Project	Replace existing Donald BPS with two (2) 115-gpm domestic pumps and one (1) 1,000 gpm fire pump at 220 ft TDH.	1	--	--	--	$2,600,000
P-10	Zone 1F Booster Pump Station and Eldridge PRV Replacement Project	Install new PRV and BPS with a firm capacity of 450 gpm at 275 ft TDH. Abandon existing Eldridge PRV.	2	--	--	--	$2,130,000
P-12	Sobre Vista Pressure Zone Consolidation	Replace Lower Sobre Vista BPS with a firm capacity of 290 gpm at 270 ft TDH; demolish Lower Sobre Vista Tank and Upper Sobre Vista BPS; connect PZ-2E and 3E; install individual service PRVs in former PZ-2E area; Replace existing 8-inch ACP water mains with new 8-inch PVC water mains.	2	--	--	--	$2,650,000
P-23	Arnold Drive PS Replacement Project	Install new BPS with a firm capacity of 500 gpm along Orange Avenue. Demolish existing Arnold Drive BPS.	3	--	--	--	$1,800,000
					TOTAL WATER DISTRIBUTION SYSTEM IMPROVEMENTS OPC (c)	**$26,630,000**	**$34,300,000**

Notes:
(a) Costs shown are presented in December 2024 dollars based on an ENR CCI of 15,400.54 (20-city average), with totals rounded to the nearest $10,000.
(b) Costs for pipeline projects include construction contingency (25%), design (10%), construction management (5%), permitting (5%), and Project Implementation (5%). Costs for other projects (i.e. BPS installations) include construction contingency (30%), design (15%), construction management (5%), permitting (5%), and Project Implementation (5%).
(c) Total district constructed OPC includes contractor costs for pump station, tanks, wells, and other projects not anticipated to be constructed by the District.

9 REFERENCES

SWCA, 2006. Restructured Agreement for Water Supply by and between Sonoma County Water Agency, City of Cotati, City of Petaluma, et al and Valley of the Moon Water District, 23 June 2006.

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EKI, 2024b. Chestnut Exploratory Borehole Data Review Chestnut Water Storage Tank Site, 9 April 2024. EKI Environment & Water, Inc.

Appendix A

CIP Project Detail Sheets

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-4

Project ID: P-4 **Project Priority Level:** 1

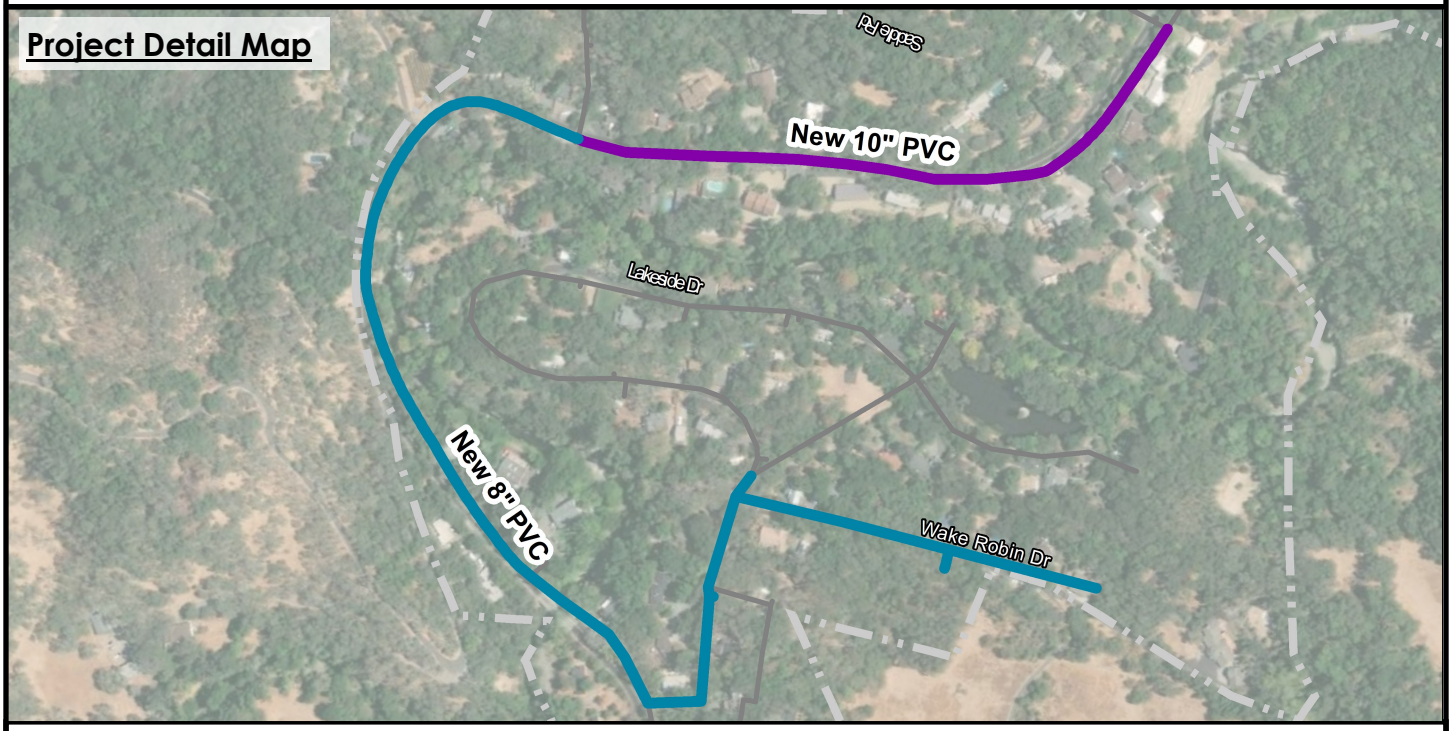
Description: Warm Springs Road Fire Flow Improvement

Location: Warm Springs Rd, Lakeside Rd, and Wake Robin Dr.

Improvement Details: Replace existing 6-inch PVC, ACP, and DIP water mains with new 8-inch and 10-inch PVC water mains, replace 47 existing service connections, and replace four existing fire hydrants.

Justification: Addresses significant fire flow deficiencies in residential areas near the wildland-urban interface.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity	Construction by District		Construction by Contractor	
			Unit Cost	Total Cost	Cost Factor	Total Cost
Warm Springs Road Fire Flow Improvement						
Replacement Pipeline	8	3,400 LF	$230	$782,300	$332	$1,128,800
Replacement Pipeline	10	1,500 LF	$275	$412,200	$396	$594,400
Hydrant Replacement	--	4 EA	$6,500	$26,000	$18,000	$72,000
Service Connection Replacement	--	47 EA	$2,000	$94,000	$5,000	$235,000
Main Tie-ins	--	5 EA	$2,500	$12,500	$10,000	$50,000
Construction Contingency (25%)				$331,800		$520,100
Construction OPC				$1,658,800		$2,600,300
Engineering, Administration, and Permitting Costs (25%)				$331,800		$520,100
Total OPC				**$1,990,000**		**$3,120,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-5B

Project ID: **P-5B** **Project Priority Level:** 1

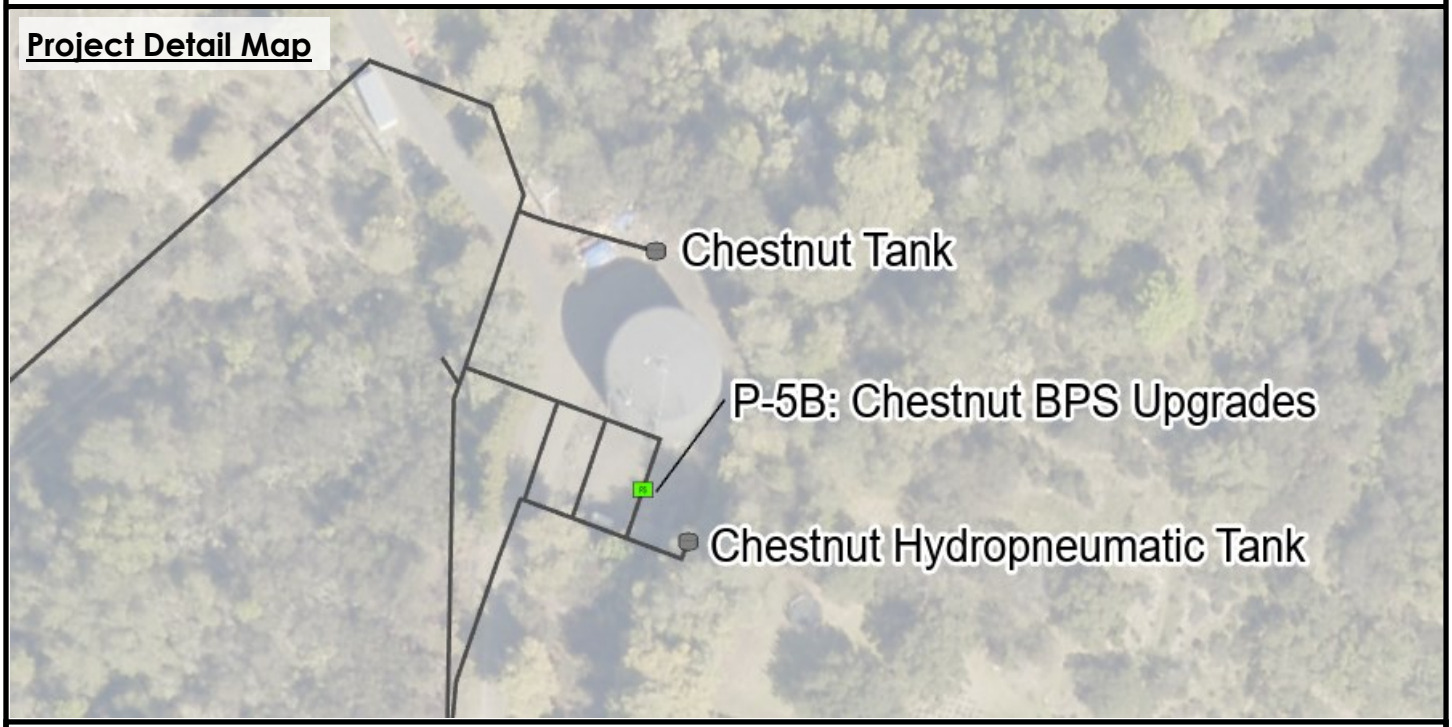
Description: Chestnut BPS Upgrades Projects

Location: Pressure Zone 3D BPS

Improvement Details: Replace existing Chestnut BPS with two (2) 100-gpm domestic pumps and one (1) 1,000 gpm fire pump at 60 ft total dynamic head (TDH).

Justification: Addresses supply deficiency and significant fire flow deficiencies in residential areas near the wildland-urban interface and replaces aging pump station facility.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity	Construction by District		Construction by Contractor	
			Unit Cost	Total Cost	Cost Factor	Total Cost
Chestnut BPS Upgrades Projects						
BPS Improvement - Fire Pump Installation	--	1 LS	--	--	$1,625,900	$1,625,900
Construction Contingency (30%)				--		$487,800
Construction OPC				--		$2,113,700
Engineering, Administration, and Permitting Costs (30%)				--		$487,800
Total OPC				--		**$2,600,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-6

Project ID: P-6 **Project Priority Level:** 1

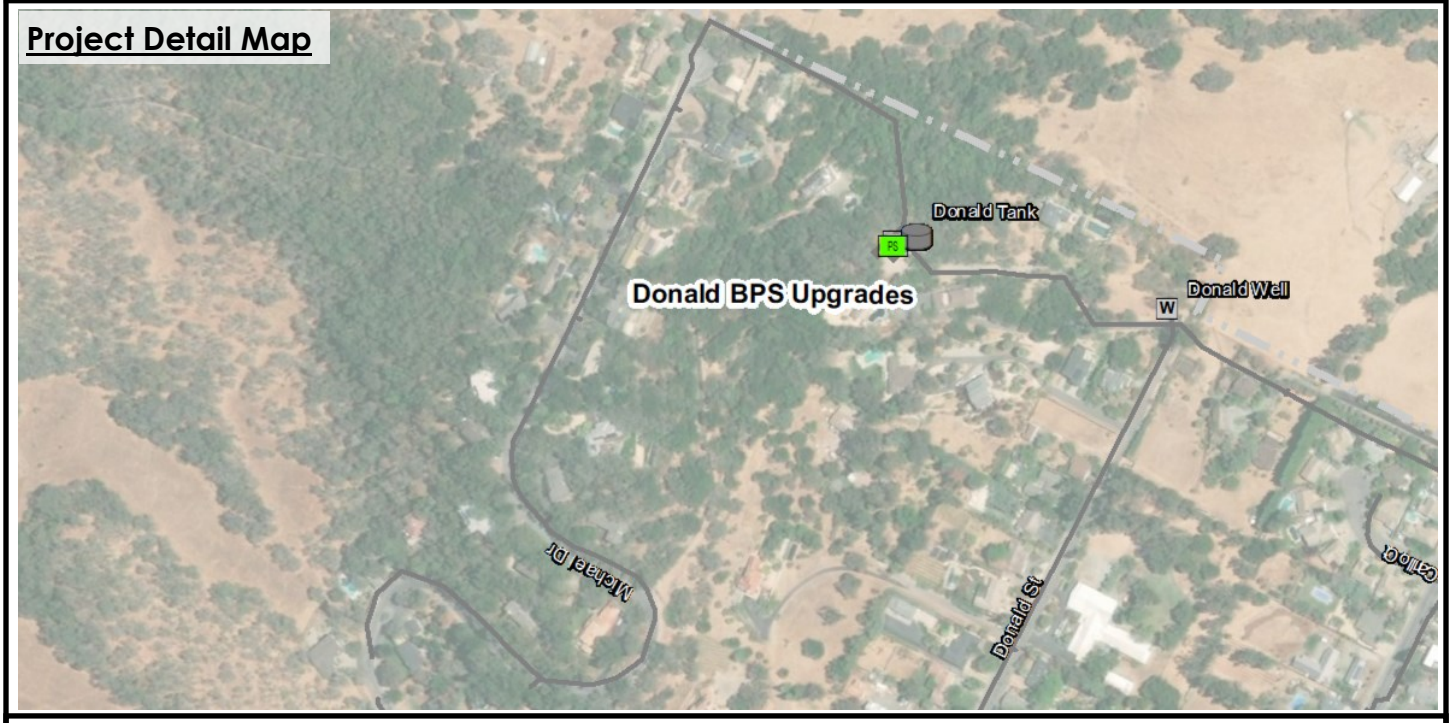
Description: Donald BPS Upgrades Project

Location: Pressure Zone 2B BPS

Improvement Details: Replace existing Donald BPS with two (2) 115-gpm domestic pumps and one (1) 1,000 gpm fire pump at 220 ft TDH.

Justification: Addresses supply deficiency and significant fire flow deficiencies in residential areas near the wildland-urban interface and replaces aging pump station facility.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity	Construction by District		Construction by Contractor	
			Unit Cost	Total Cost	Cost Factor	Total Cost
Donald BPS Upgrades Project						
BPS Improvement - Fire Pump Replacement	--	1 LS	--	--	$1,625,900	$1,625,900
Construction Contingency (30%)				--		$487,800
Construction OPC				--		$2,113,700
Engineering, Administration, and Permitting Costs (30%)				--		$487,800
Total OPC				--		**$2,600,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-7

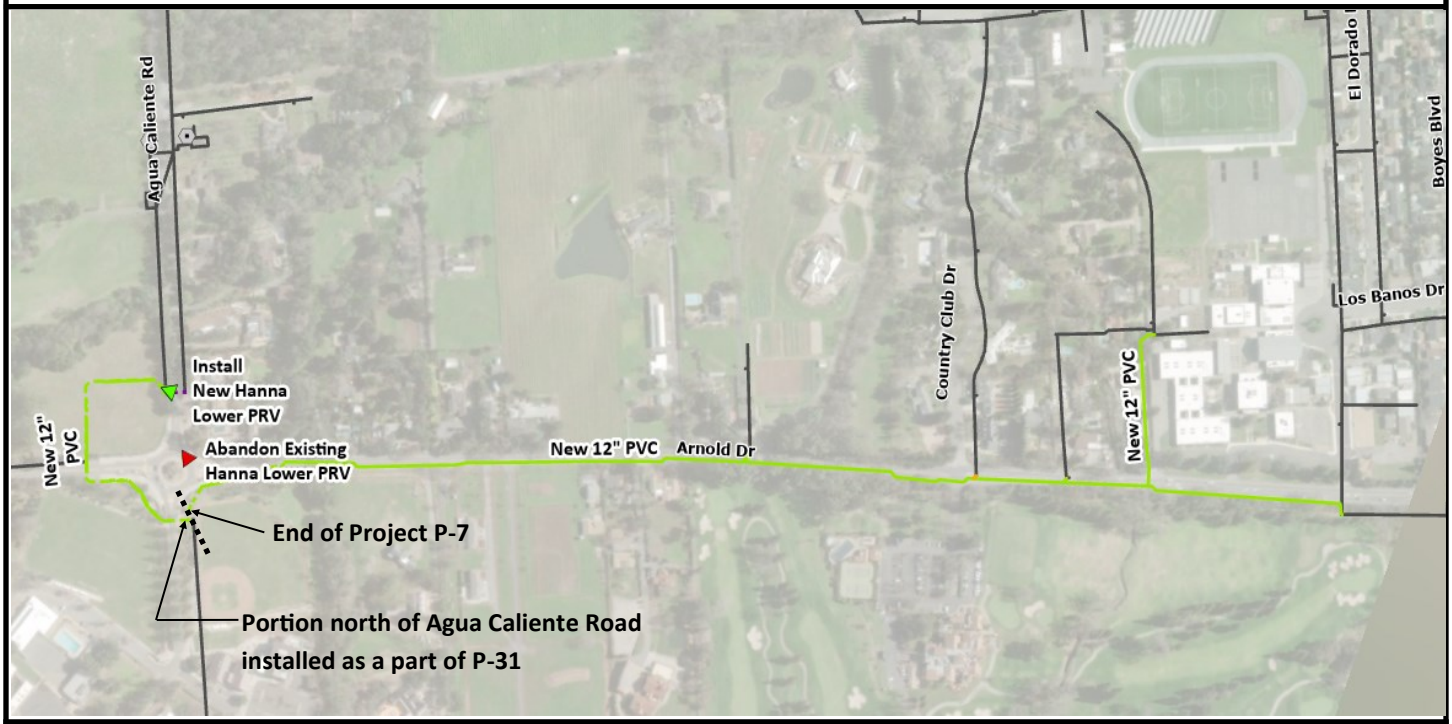
Project ID: P-7 **Project Priority Level:** 1

Description: Altimira Middle School Fire Flow Improvement

Location: Arnold Dr between Agua Caliente Rd and Boyes Blvd.

Improvement Details: Replace existing 6-inch and 8-inch PVC and ACP water mains with new 10-inch and 12-inch PVC water mains along Arnold Drive, replace existing 6-inch pipe with new 12-inch pipe adjacent to Altimira Middle School, replace 15 existing service connections, and replace three existing fire hydrants. This project could be combined with project P-31 for efficiency.

Justification: Addresses significant fire flow deficiency near Altimira Middle School and increases PZ-1 transmission capability.



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Altimira Middle School Fire Flow Improvement							
Replacement Pipeline	12	4,235	LF	$332	$1,407,500	$473	$2,002,900
Hydrant Replacement	--	3	EA	$6,500	$19,500	$18,000	$54,000
Service Connection Replacement	--	15	EA	$2,000	$30,000	$5,000	$75,000
Main Tie-ins	--	6	EA	$2,500	$15,000	$10,000	$60,000
Construction Contingency (25%)					$368,000		$548,000
Construction OPC					$1,840,000		$2,739,900
Engineering, Administration, and Permitting Costs (25%)					$368,000		$548,000
Total OPC					**$2,210,000**		**$3,290,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-10

Project ID: P-10 **Project Priority Level:** 2

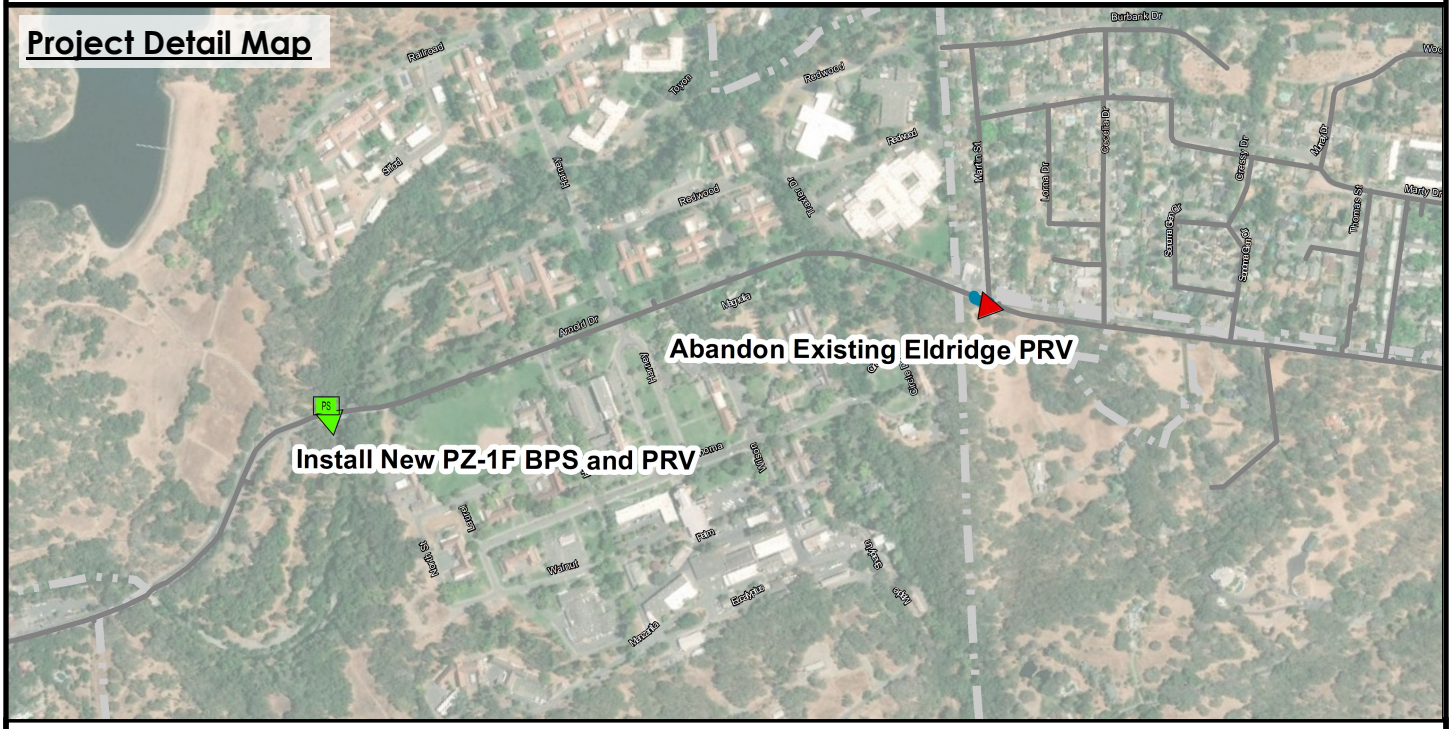
Description: Zone 1F Booster Pump Station and Eldridge PRV Replacement Project

Location: Near 14500 Arnold Dr.

Improvement Details: Install new PRV and BPS with a firm capacity of 450 gpm at 275 ft TDH. Abandon existing Eldridge PRV.

Justification: Addresses supply deficiency and fire flow deficiencies in PZ-1F and improves system redundancy.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Zone 1F Booster Pump Station and Eldridge PRV Replacement Project							
BPS Improvement	--	1	LS	--	--	$1,262,900	$1,262,900
PRV Installation	--	1	EA	--	--	$120,000	$120,000
Main Tie-ins	--	2	EA	--	--	$10,000	$20,000
Abandonment of Existing PRV		1	EA	--	--	$15,000	$15,000
Construction Contingency (25%)					--		$354,500
Construction OPC					--		$1,772,400
Engineering, Administration, and Permitting Costs (25%)					--		$354,500
Total OPC					--		**$2,130,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-12

Project ID: P-12 **Project Priority Level:** 2

Description: Sobre Vista Pressure Zone Consolidation

Location: Lower Sobre Vista BPS and Tank

Improvement Details: Replace Lower Sobre Vista BPS with a firm capacity of 265 gpm at 270 ft TDH; demolish Lower Sobre Vista Tank and Upper Sobre Vista BPS; connect PZ-2E and 3E; replace existing 8-inch ACP pipes with 8-inch PVC pipe; install individual service PRVs in former PZ-2E area; install new PRV station between Pressure Zones 2E/3E and 1B.

Justification: Addresses supply and storage deficiencies in PZ-2E and PZ-3E, decommissions aging Lower Sobre Vista Tank, and improves system operations and redundancy.

Project Detail Map

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Sobre Vista Pressure Zone Consolidation							
Replacement BPS - 265 gpm	--	1	LS	--	--	$1,041,300	$1,041,300
Tank Removal	--	1	LS	--	--	$65,000	$65,000
Replacement Pipeline	8	1,260	LF	$230	$289,900	$332	$418,300
PRV Installation	--	1	EA	--	--	$120,000	$120,000
Main Tie-ins	--	4	EA	--	--	$2,500	$10,000
Construction Contingency (30%)					--		$496,400
Construction OPC					--		$2,151,000
Engineering, Administration, and Permitting Costs (30%)					--		$496,400
Total OPC					--		**$2,650,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-13

Project ID: P-13 **Project Priority Level:** 2

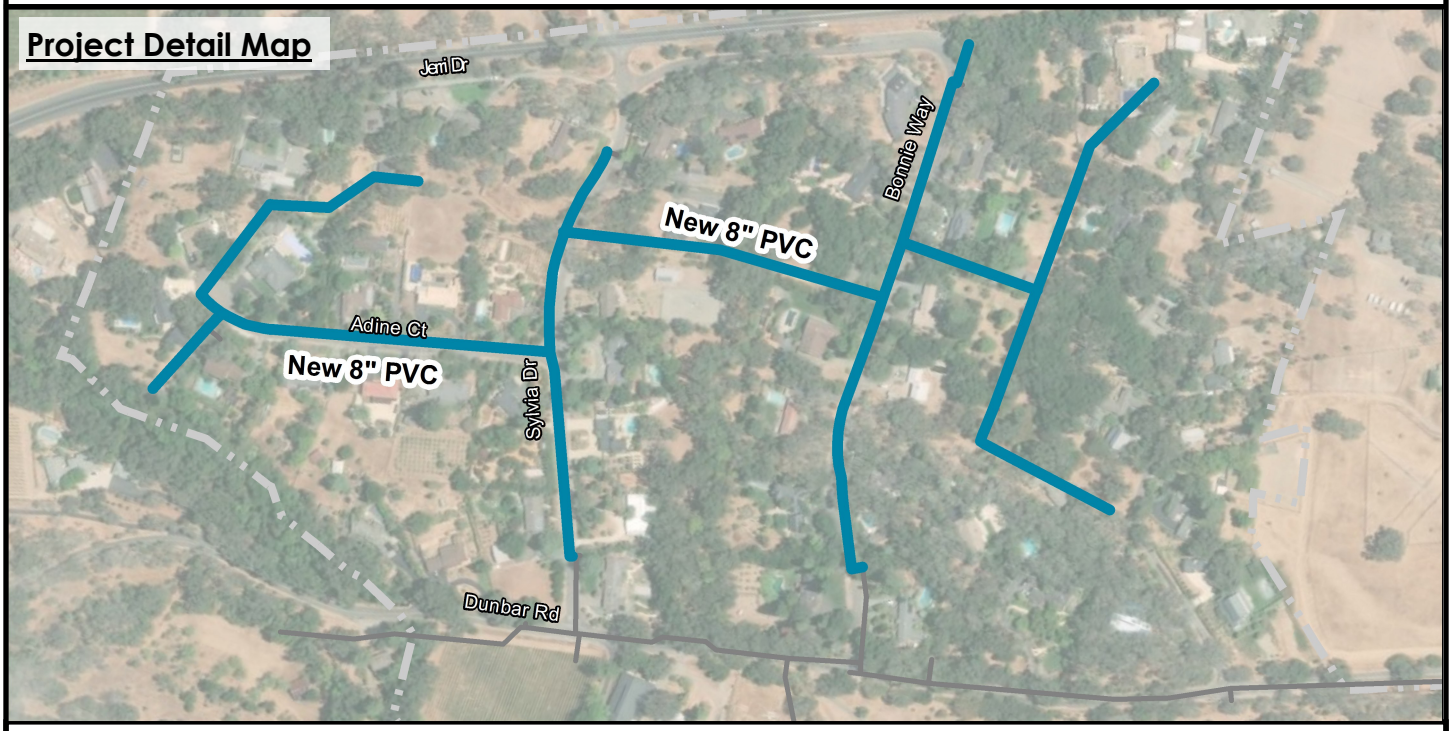
Description: Trinity Oaks 4-Inch ACP Replacement Project

Location: Bonnie Way, Sylvia Dr, Adine Ct.

Improvement Details: Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace existing service connections, and replace existing fire hydrants in the Trinity Oaks area. District to coordinate with Fire Department to determine if additional hydrants are needed. These hydrants would be funded by the Fire Department.

Justification: Addresses fire flow deficiencies in the area and replaces aging 4-inch ACP.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Trinity Oaks 4-Inch ACP Replacement Project							
Replacement Pipeline	8	6,000	LF	$230	$1,380,500	$332	$1,992,000
Hydrant Replacement	--	6	EA	$6,500	$39,000	$18,000	$108,000
Service Connection Replacement	--	49	EA	$2,000	$98,000	$5,000	$245,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (25%)					$380,600		$591,300
Construction OPC					$1,903,100		$2,956,300
Engineering, Administration, and Permitting Costs (25%)					$380,600		$591,300
Total OPC					**$2,280,000**		**$3,550,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-14A

Project ID: **P-14A** **Project Priority Level:** 2

Description: Northern Pressure Zone 1 Commercial Fire Flow Improvement

Location: La Grama Dr

Improvement Details: Replace existing 6-inch ACP water mains with new 12-inch PVC water mains, replace 2 existing service connections, and replace one existing fire hydrants.

Justification: Addresses significant commercial fire flow deficiencies on a dead-end water main.

Project Detail Map

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Northern Pressure Zone 1 Commercial Fire Flow Improvement - La Grama							
Replacement Pipeline	12	1,425	LF	$332	$473,600	$473	$674,000
Hydrant Replacement	--	3	EA	$6,500	$19,500	$18,000	$54,000
Service Connection Replacement	--	2	EA	$2,000	$4,000	$5,000	$10,000
Main Tie-ins	--	3	EA	$2,500	$7,500	$10,000	$30,000
Construction Contingency (25%)					$126,200		$192,000
Construction OPC					$630,800		$960,000
Engineering, Administration, and Permitting Costs (25%)					$126,200		$192,000
Total OPC					**$760,000**		**$1,150,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-14B

Project ID: **P-14B** **Project Priority Level:** 3

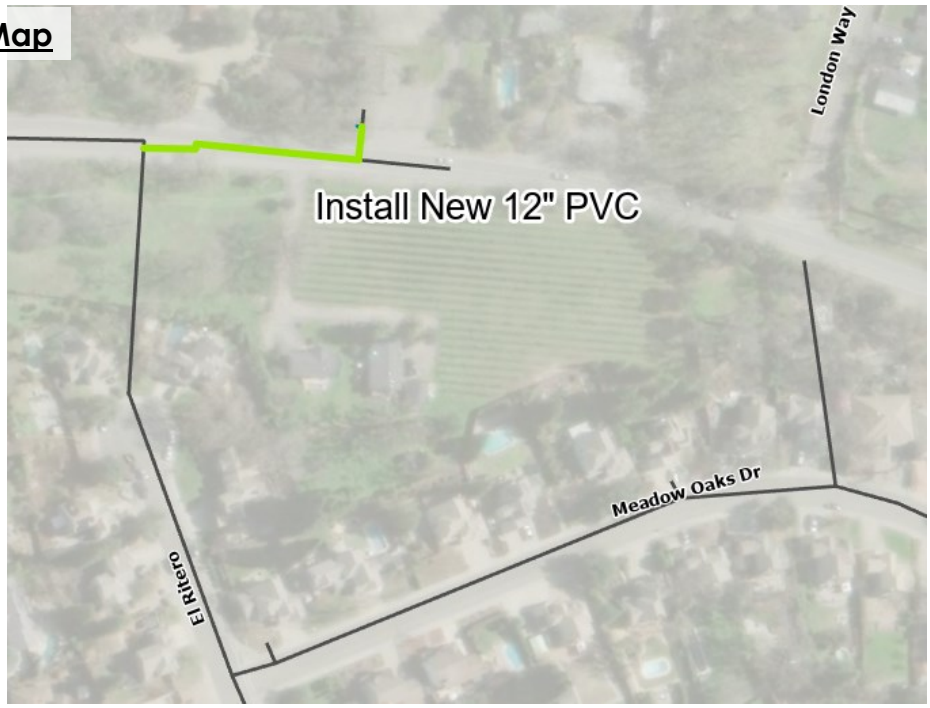
Description: Northern Pressure Zone 1 Commercial Fire Flow Improvement

Location: Highway 12

Improvement Details: Replace existing 8-inch ACP water mains with new 12-inch PVC water mains, replace one existing service connections, and replace one existing fire hydrant. Based on discussions with the District, the commercial businesses along HWY 12 have been vacant in this area and the southeastern portion of this project could be removed from this Project.

Justification: Addresses significant commercial fire flow deficiencies.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Northern Pressure Zone 1 Commercial Fire Flow Improvement - HWY 12							
Replacement Pipeline	12	280	LF	$332	$93,100	$473	$132,400
Hydrant Replacement	--	1	EA	$6,500	$6,500	$18,000	$18,000
Service Connection Replacement	--	1	EA	$2,000	$2,000	$5,000	$5,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (25%)					$26,700		$43,900
Construction OPC					$133,300		$219,300
Engineering, Administration, and Permitting Costs (25%)					$26,700		$43,900
Total OPC					**$160,000**		**$260,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-16

Project ID: P-16 **Project Priority Level:** 2

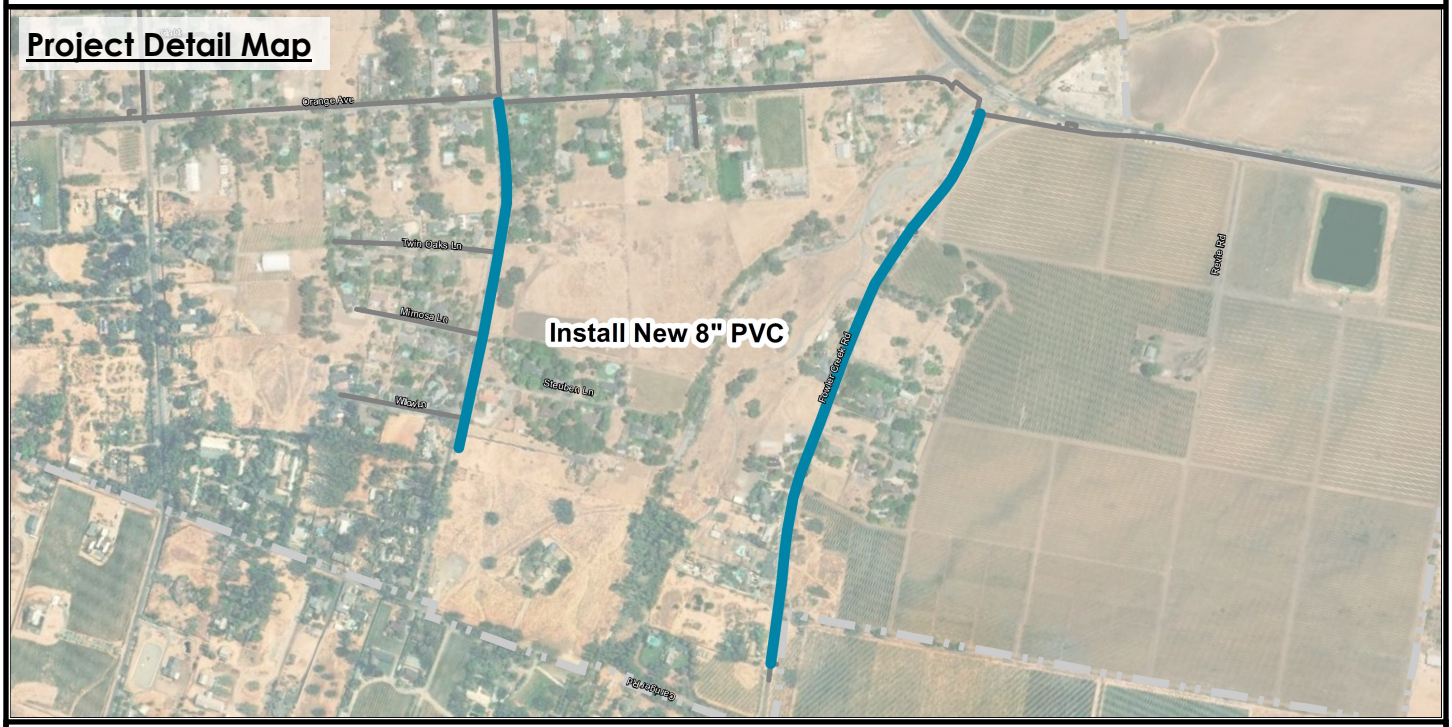
Description: Fowler Creek and Solano Avenue Fire Flow Improvement

Location: Fowler Creek Rd and Solano Ave.

Improvement Details: Replace existing 6-inch ACP water mains with new 8-inch PVC water mains, replace ten existing service connections, and replace five existing fire hydrants.

Justification: Addresses significant fire flow deficiencies on dead-end residential streets.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Fowler Creek and Solano Avenue Fire Flow Improvement							
Replacement Pipeline	8	4,200	LF	$230	$966,400	$332	$1,394,400
Hydrant Replacement	--	5	EA	$6,500	$32,500	$18,000	$90,000
Service Connection Replacement	--	10	EA	$2,000	$20,000	$5,000	$50,000
Main Tie-ins	--	5	EA	$2,500	$12,500	$10,000	$50,000
Construction Contingency (25%)					$257,900		$396,100
Construction OPC					$1,289,300		$1,980,500
Engineering, Administration, and Permitting Costs (25%)					$257,900		$396,100
Total OPC					**$1,550,000**		**$2,380,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-17

Project ID: P-17 **Project Priority Level:** 1

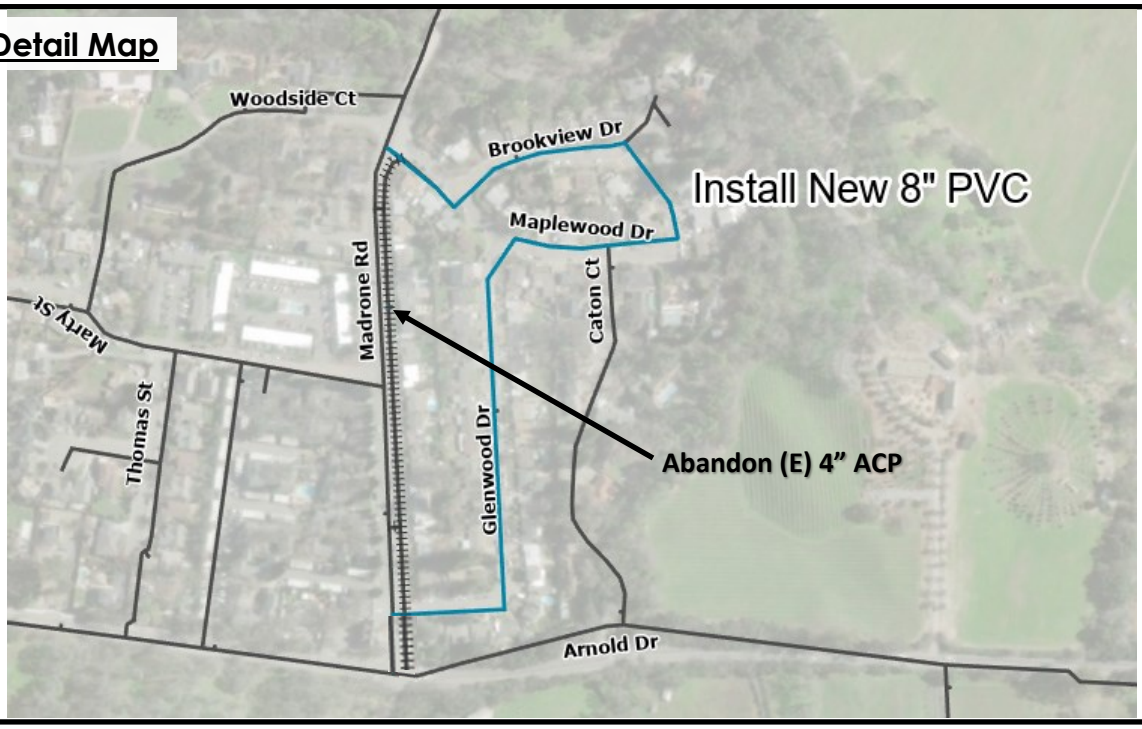
Description: Eldridge Fire Flow Improvement

Location: Madrone Rd, Glenwood Dr, Maplewood Dr, and Oakwood Dr.

Improvement Details: Replace existing 4-inch ACP water mains with new 8-inch PVC water mains, replace 49 existing service connections, and replace three existing fire hydrants in the Eldridge area. Abandon the 4-inch ACP water main on Madrone Avenue and reconnect services to existing 8-inch water main. This project has been upgraded to level 1 priority since the 2019 WMP due to the deteriorating condition of the ACP water mains in this zone.

Justification: Addresses fire flow deficiencies in the residential area and replaces aging 4-inch ACP.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Eldridge Fire Flow Improvement							
Replacement Pipeline	8	3,900	LF	$230	$897,300	$332	$1,294,800
Hydrant Replacement	--	3	EA	$6,500	$19,500	$18,000	$54,000
Service Connection Replacement	--	49	EA	$2,000	$98,000	$5,000	$245,000
Main Tie-ins	--	5	EA	$2,500	$12,500	$10,000	$50,000
Construction Contingency (25%)					$256,800		$411,000
Construction OPC					$1,284,100		$2,054,800
Engineering, Administration, and Permitting Costs (25%)					$256,800		$411,000
Total OPC					**$1,540,000**		**$2,470,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-19

Project ID: P-19 **Project Priority Level:** 3

Description: Hooker Avenue Fire Flow Improvement

Location: Between Highway 12 and Hooker Ave.

Improvement Details: Install new 8-inch PVC water main between Highway 12 and Hooker Ave.

Justification: Addresses residential fire flow deficiencies.

Project Detail Map

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity	Construction by District		Construction by Contractor	
			Unit Cost	Total Cost	Cost Factor	Total Cost
Hooker Avenue Fire Flow Improvement						
New Pipeline Installation	8	550 LF	$230	$126,500	$332	$182,600
Main Tie-ins	--	2 EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (25%)				$32,900		$50,700
Construction OPC				$164,400		$253,300
Engineering, Administration, and Permitting Costs (25%)				$32,900		$50,700
Total OPC				**$200,000**		**$300,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-20

Project ID: P-20 **Project Priority Level:** 3

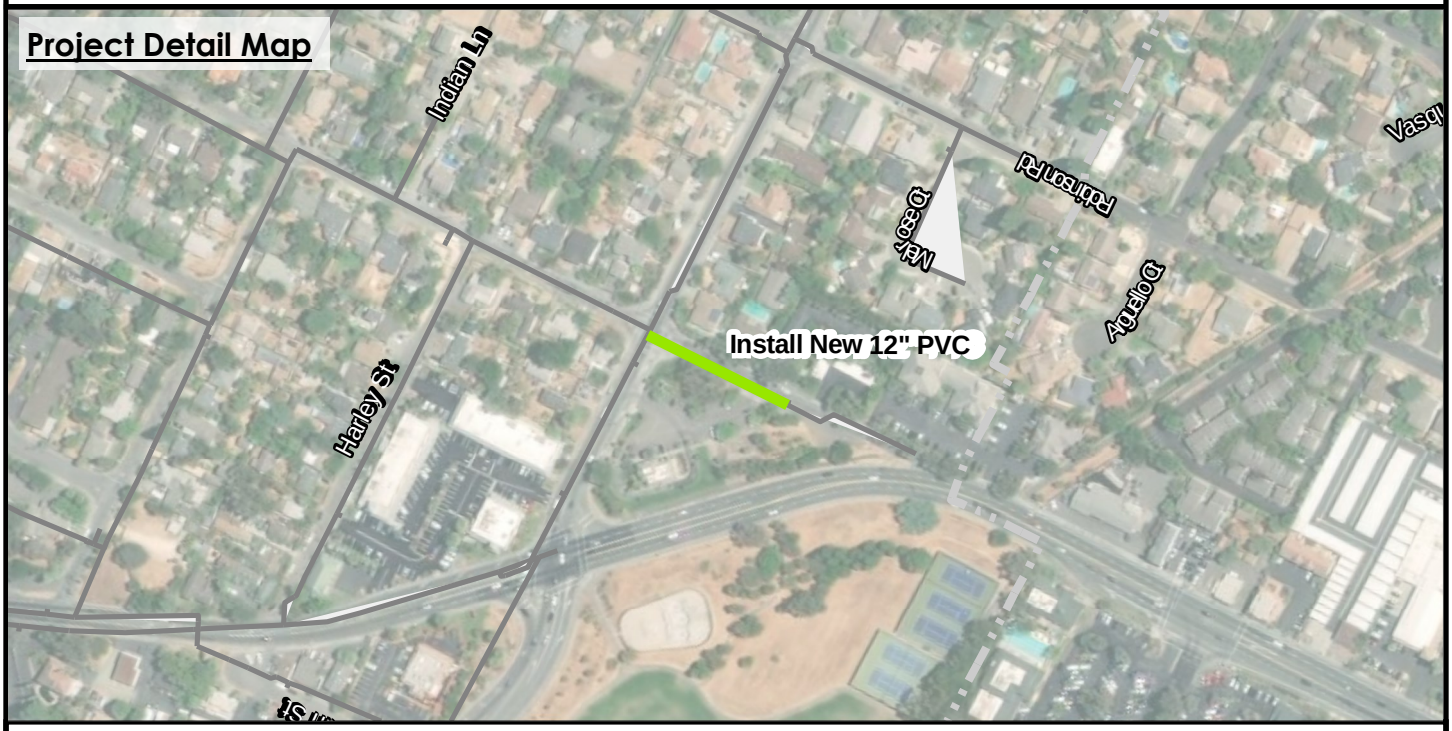
Description: Lomita Avenue Commercial Fire Flow Improvement

Location: Lomita Ave.

Improvement Details: Replace existing 6-inch ACP water main with new 12-PVC water main, replace two service connections, and replace one hydrant.

Justification: Addresses commercial fire flow deficiencies.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Lomita Avenue Commercial Fire Flow Improvement							
Replacement Pipeline	12	300	LF	$332	$99,700	$473	$141,900
Hydrant Replacement	--	1	EA	$6,500	$6,500	$18,000	$18,000
Service Connection Replacement	--	2	EA	$2,000	$4,000	$5,000	$10,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (25%)					$28,800		$47,500
Construction OPC					$144,000		$237,400
Engineering, Administration, and Permitting Costs (25%)					$28,800		$47,500
Total OPC					**$170,000**		**$280,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-21

Project ID: P-21 **Project Priority Level:** 3

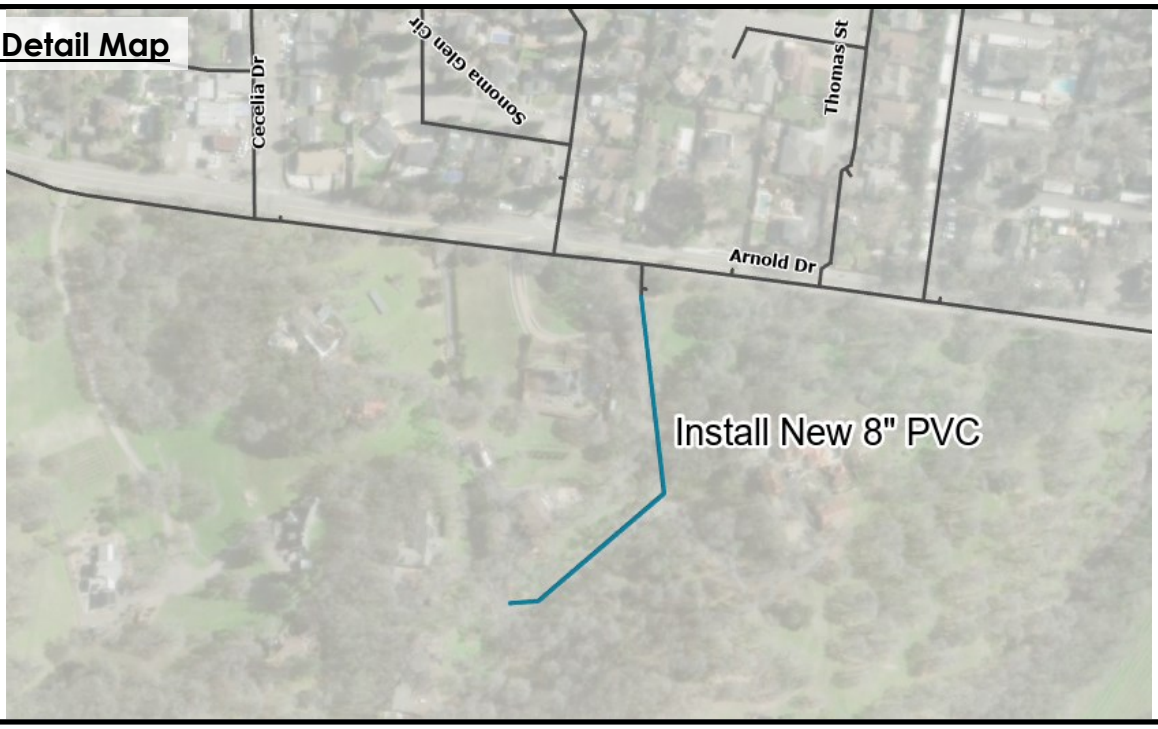
Description: Pressure Zone 1B - Arnold Drive 4-Inch ACP Replacement Project

Location: Private road near 15263 Arnold Dr.

Improvement Details: Replace existing 4-inch ACP water main with new 8-inch PVC water main in Pressure Zone 1B west of Arnold Drive and replace three existing service connections.

Justification: Replaces aging 4-inch ACP.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Pressure Zone 1B - Arnold Dr. 4-Inch ACP Replacement Project							
Replacement Pipeline	8	800	LF	$230	$184,100	$332	$265,600
Service Connection Replacement	--	3	EA	$2,000	$6,000	$5,000	$15,000
Main Tie-ins	--	1	EA	$2,500	$2,500	$10,000	$10,000
Construction Contingency (25%)					$48,200		$72,700
Construction OPC					$240,800		$363,300
Engineering, Administration, and Permitting Costs (25%)					$48,200		$72,700
Total OPC					**$290,000**		**$440,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-23

Project ID: P-23 **Project Priority Level:** 3

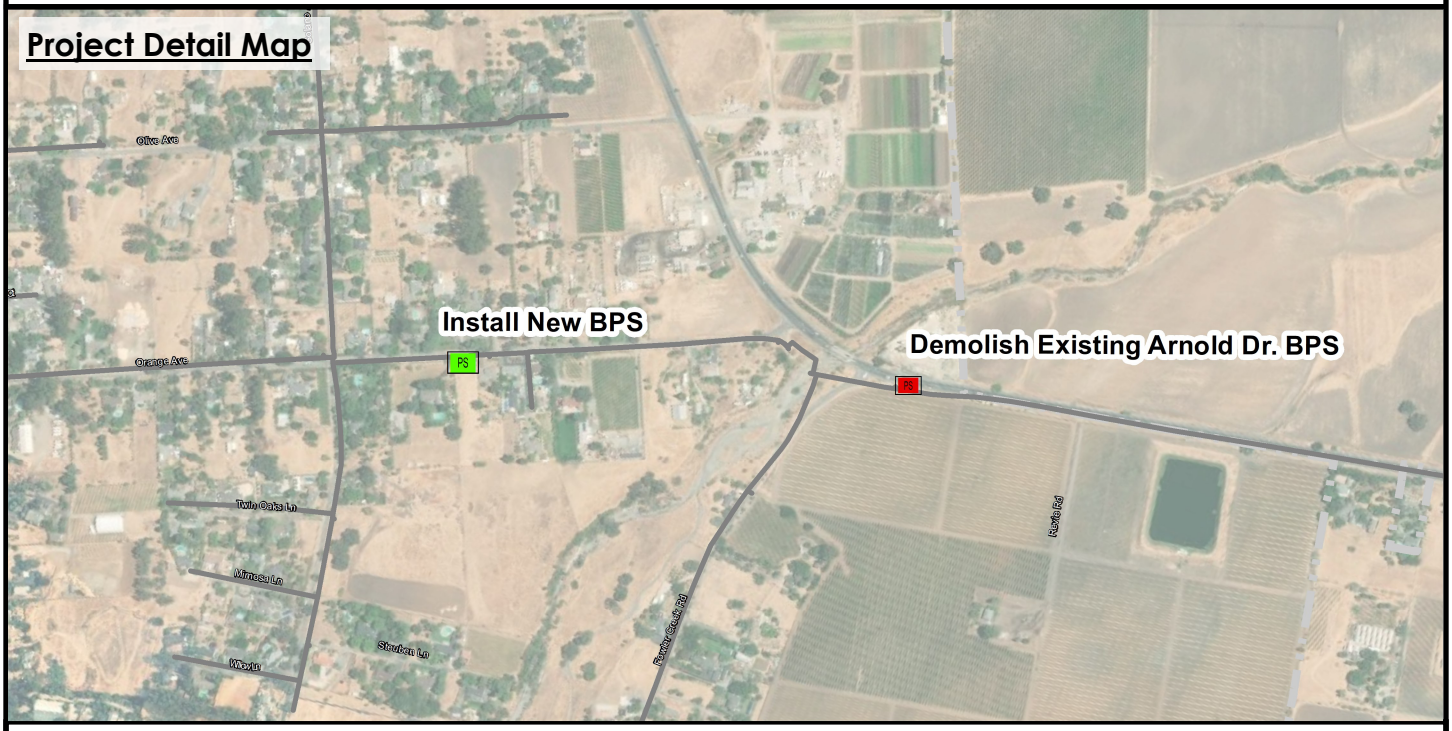
Description: Arnold Drive PS Replacement Project

Location: Near 19328 Orange Ave.

Improvement Details: Install new BPS with a firm capacity of 500 gpm along Orange Avenue. Demolish existing Arnold Drive BPS.

Justification: Replaces aging infrastructure and improves operations and maintenance for a facility needed for operational flexibility.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Arnold Drive PS Replacement Project							
Replacement BPS - 500 gpm	--	1	LS	--	--	$1,312,400	$1,041,300
Decommission PS	--	1	EA	--	--	$65,000	$65,000
Main Tie-ins	--	2	EA	--	--	$10,000	$20,000
Construction Contingency (30%)					--		$337,900
Construction OPC					--		$1,464,200
Engineering, Administration, and Permitting Costs (30%)					--		$337,900
Total OPC					--		**$1,800,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-24

Project ID: P-24 **Project Priority Level:** 3

Description: Loma Court Fire Flow Improvement

Location: Loma Ct.

Improvement Details: Replace existing 6-inch with new 8-inch PVC along Loma Court, replace 11 existing service connections, and replace one existing fire hydrant.

Justification: Addresses minor fire flow deficiency.

Project Detail Map

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Loma Court Fire Flow Improvement							
Replacement Pipeline	8	500	LF	$230	$115,000	$332	$166,000
Hydrant Replacement	--	1	EA	$6,500	$6,500	$18,000	$18,000
Service Connection Replacement	--	11	EA	$2,000	$22,000	$5,000	$55,000
Main Tie-ins	--	1	EA	$2,500	$2,500	$10,000	$10,000
Construction Contingency (25%)					$36,500		$62,300
Construction OPC					$182,500		$311,300
Engineering, Administration, and Permitting Costs (25%)					$36,500		$62,300
Total OPC					**$220,000**		**$370,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-25

Project ID: P-25 **Project Priority Level:** 3

Description: Richards Blvd Fire Flow Improvement

Location: Richards Blvd.

Improvement Details: Replace existing 6-inch ACP and DIP water main with 8-inch PVC water main along Richards Blvd, replace four existing service connections, and one existing hydrant.

Justification: Addresses minor fire flow deficiency.

Project Detail Map

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Richards Blvd. Fire Flow Improvement							
Replacement Pipeline	8	300	LF	$230	$69,000	$332	$99,600
Hydrant Replacement	--	1	EA	$6,500	$6,500	$18,000	$18,000
Service Connection Replacement	--	4	EA	$2,000	$8,000	$5,000	$20,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (25%)					$22,100		$39,400
Construction OPC					$110,600		$197,000
Engineering, Administration, and Permitting Costs (25%)					$22,100		$39,400
Total OPC					**$130,000**		**$240,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-27

Project ID: **P-27** **Project Priority Level:** 2

Description: SCWA Turnout Flow Meter Installation

Location: Various (Each SCWA Turnout PRV Station)

Improvement Details: Install flow meters at each of Turnout PRV Stations and integrate with SCADA system.

Justification: Provides District ability to verify SCWA billing and perform zonal demand analyses.

Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity	Construction by District		Construction by Contractor	
			Unit Cost	Total Cost	Cost Factor	Total Cost
SCWA Turnout Flow Meter Installation						
Install Flow Meters at Turnouts	--	10 EA	$48,000	$480,000	$65,000	$650,000
Construction Contingency (30%)				$144,000		$195,000
Construction OPC				$624,000		$845,000
Engineering, Administration, and Permitting Costs (30%)				$144,000		$195,000
Total OPC				**$770,000**		**$1,040,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-28

Project ID: **P-28** **Project Priority Level:** 2

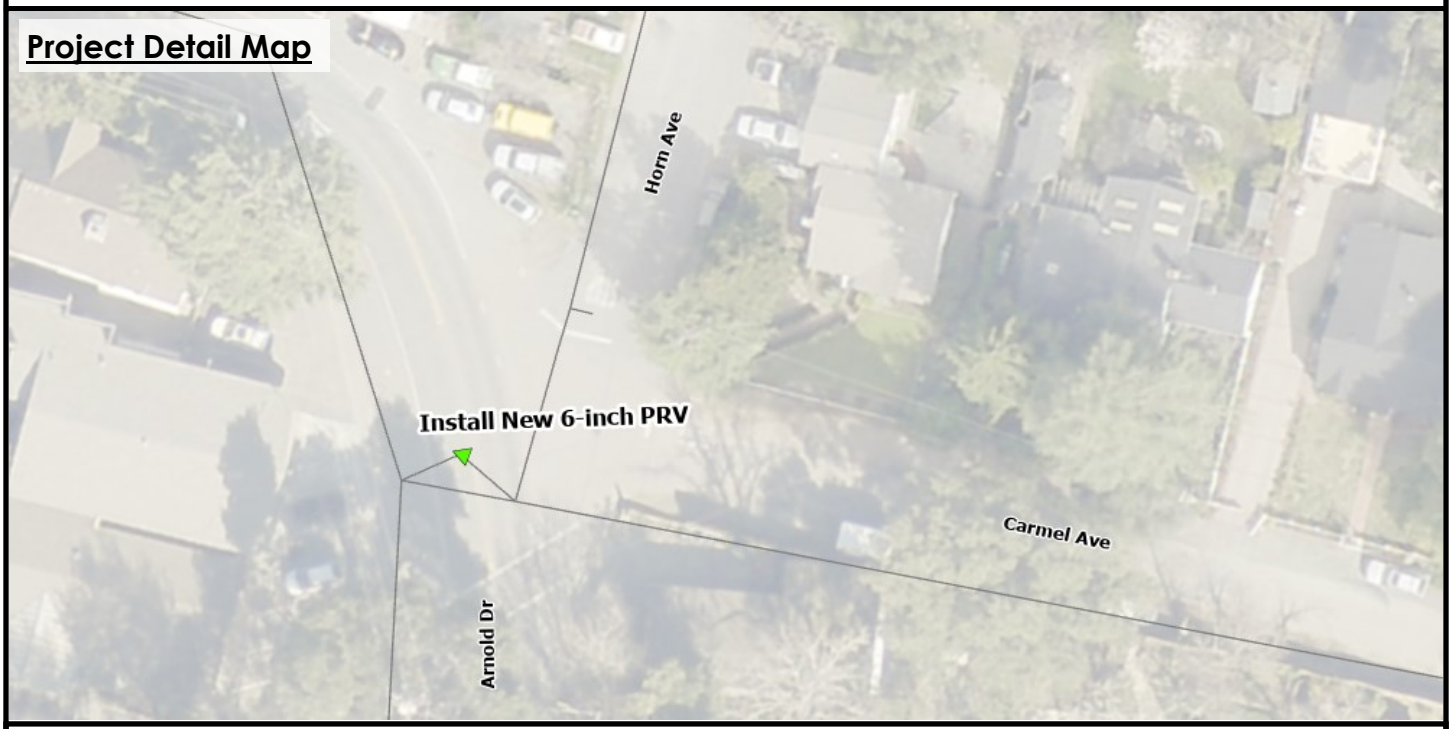
Description: District Metered Area 1

Location: the corner of Horn and Carmel Ave in Glen Ellen.

Improvement Details: Install new 6-inch PRV station with flow metering at the corner of Arnold Drive and Carmel Ave and create new pressure zone in Glen Ellen.

Justification: Reduces excessive pressures in this area.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
District Metered Area 1 (PZ-1H)							
PRV Installation	6	1	LS	$90,000	$90,000	$120,000	$120,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Flow Meter Install	--	1	LS	$48,000	$48,000	$65,000	$65,000
Construction Contingency (30%)					$42,900		$61,500
Construction OPC					$185,900		$266,500
Engineering, Administration, and Permitting Costs (30%)					$42,900		$61,500
Total OPC					**$230,000**		**$330,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-29

Project ID: P-29 **Project Priority Level:** 1

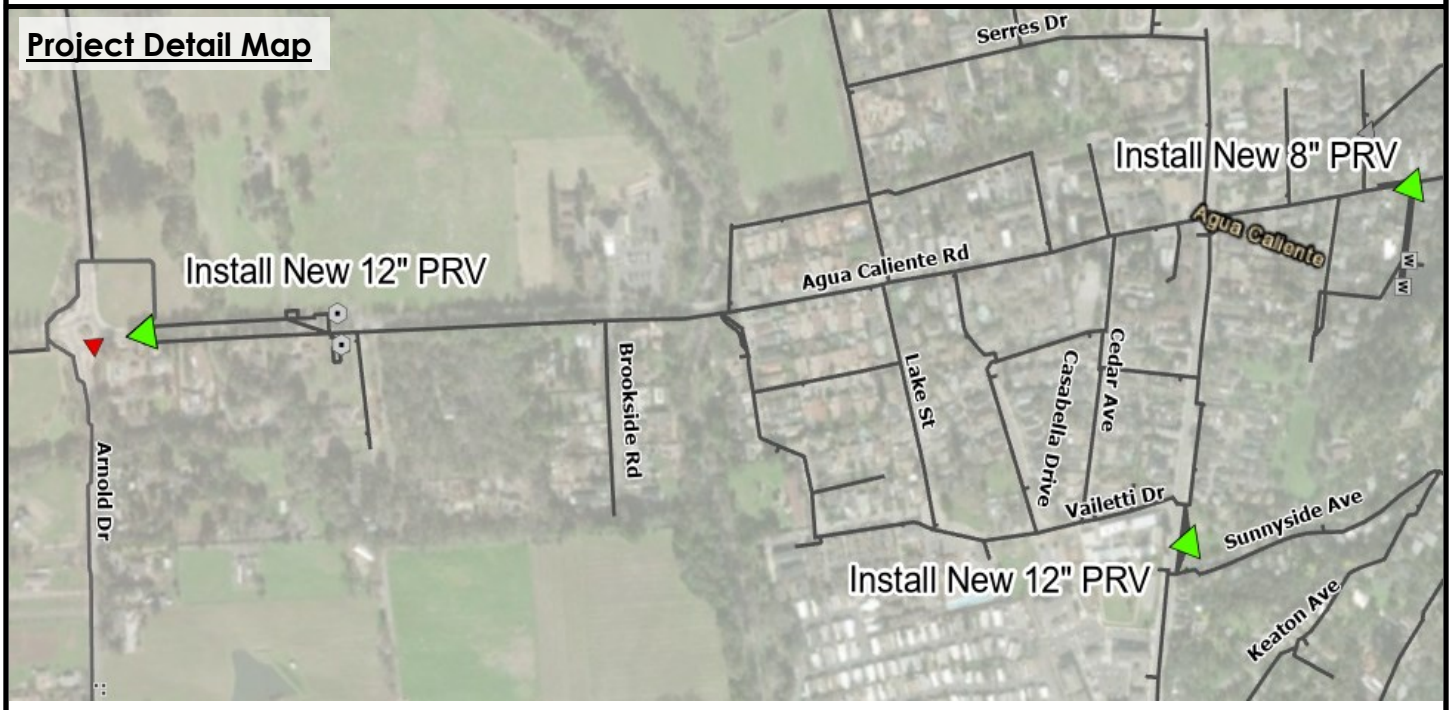
Description: District Metered Area 2

Location: Agua Caliente Knolls

Improvement Details: Install new 8-inch PRV station with flow metering at the intersection of Kearney Avenue and East Agua Caliente Road, running parallel to the existing zone separating closed valve, and new 12-inch PRV stations with flow metering (1) on West Agua Caliente Road east of the roundabout (2) on Highway 12 between Vailetti Drive and Sunnyside Avenue to create new pressure zone 1G in the Agua Caliente Knolls area.

Justification: Increase pressure to above 35 psi and increase fire flow availability for multiple hydrants in the Agua Caliente Knolls area to better meet system performance criteria

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
District Metered Area 2 (PZ-1G)							
PRV Installation	6	3	LS	$90,000	$270,000	$120,000	$360,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Flow Meter Install	--	3	LS	$48,000	$144,000	$65,000	$195,000
Construction Contingency (30%)					$125,700		$172,500
Construction OPC					$544,700		$747,500
Engineering, Administration, and Permitting Costs (30%)					$125,700		$172,500
Total OPC					**$670,000**		**$920,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-30

Project ID: P-30 **Project Priority Level:** 2

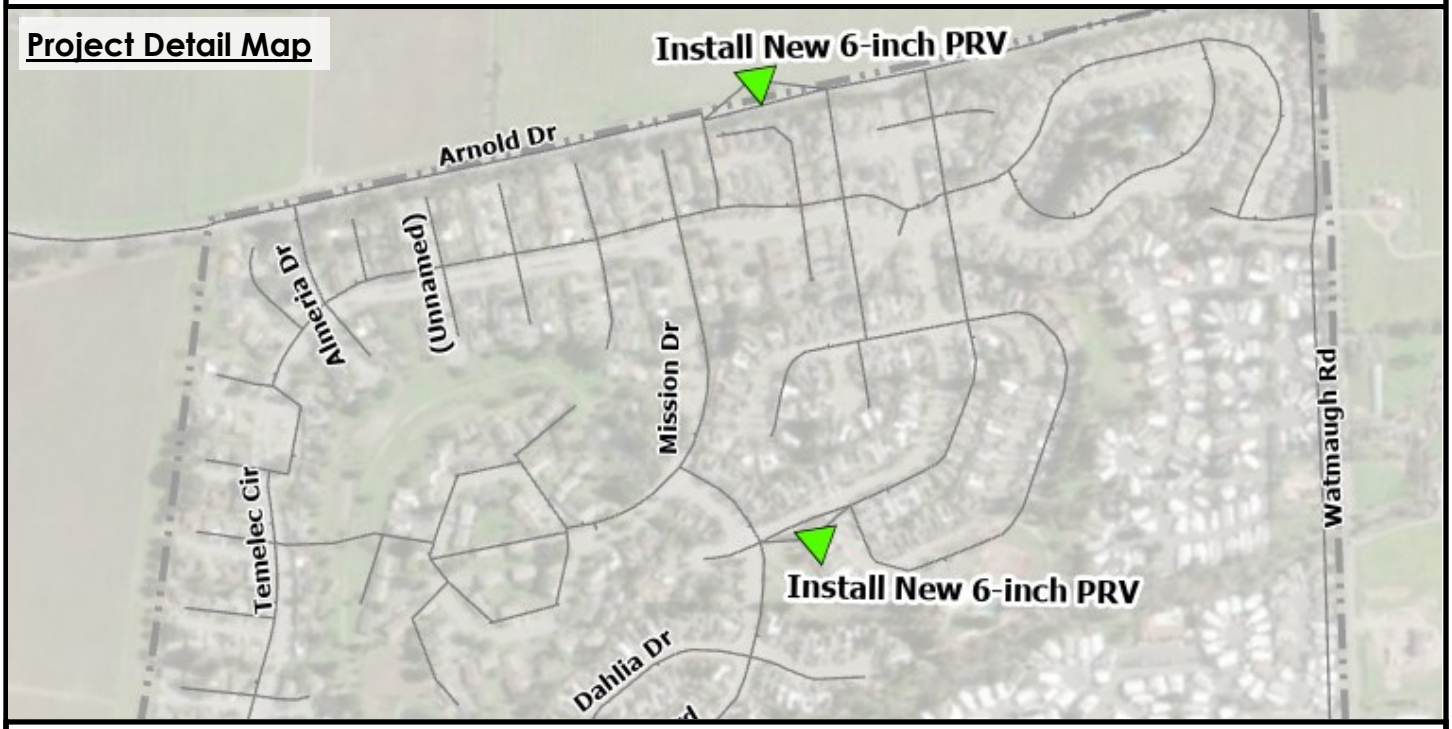
Description: District Metered Area 3

Location: Temelec

Improvement Details: Install new 6-inch PRV stations with flow metering on (1) Avenida Sebastiani between Via Colombard and Avenida Barbera and (2) on Arnold Drive between Mission Drive and Avenida Sebastiani, and close the valve on South Temelec Circle between Mission Drive and Herbazal Street to create new pressure zone 1I in the Temelec Area.

Justification: Reduce excessive pressures from above 100 psi down to 60 psi in the southern portions of PZ-1A.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
District Metered Area 3 (PZ-1I)							
PRV Installation	6	2	LS	$90,000	$180,000	$120,000	$240,000
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Flow Meter Install	--	2	LS	$48,000	$96,000	$65,000	$130,000
Construction Contingency (30%)					$84,300		$117,000
Construction OPC					$365,300		$507,000
Engineering, Administration, and Permitting Costs (30%)					$84,300		$117,000
Total OPC					**$450,000**		**$620,000**

Valley of the Moon Water District
Water Master Plan
CAPITAL IMPROVEMENT PROJECT P-31

Project ID: P-31 **Project Priority Level:** 1

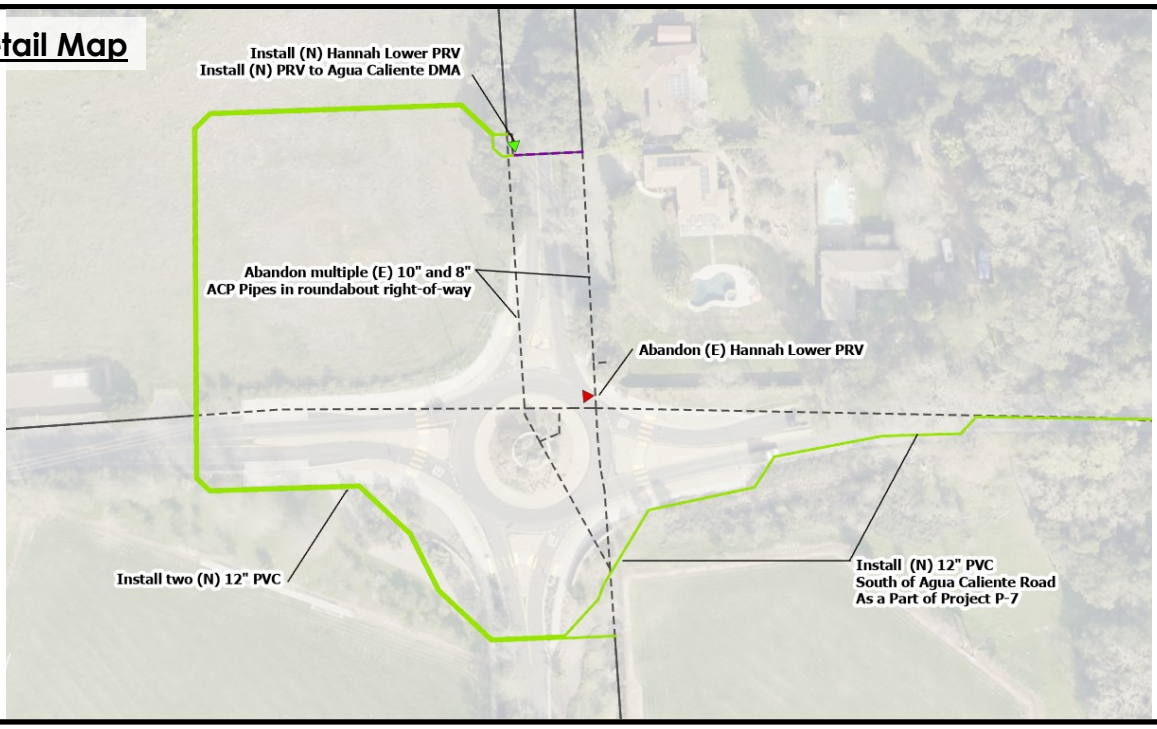
Description: Arnold Drive and Agua Caliente Road Roundabout Improvement

Location: Intersection of Arnold Drive and Agua Caliente Road

Improvement Details: Replace existing 8-inch ACP water mains with new 12-inch PVC water mains and relocate the existing Hannah Lower PRV out of the center of the new roundabout.

Justification: This project has been identified as high priority due to the safety concerns with operating the Hannah Lower PRV in the center of a intersection with high traffic flow. This project could be combined with P-7 for efficiency.

Project Detail Map



Total Opinion of Probable Cost

Improvement Type	Recommended Diameter	Quantity		Construction by District		Construction by Contractor	
				Unit Cost	Total Cost	Cost Factor	Total Cost
Arnold Drive and Agua Caliente Road Roundabout Improvement							
PRV Installation	--	1	LS	$90,000	$90,000	$120,000	$120,000
Replacement Pipeline	8	50	LF	$230	$11,500	$332	$16,600
Replacement Pipeline	12	2,000	LF	$332	$664,700	$473	$945,900
Main Tie-ins	--	2	EA	$2,500	$5,000	$10,000	$20,000
Construction Contingency (30%)					$231,400		$330,800
Construction OPC					$1,002,600		$1,433,300
Engineering, Administration, and Permitting Costs (30%)					$231,400		$330,800
Total OPC					**$1,230,000**		**$1,760,000**

Date: March 4, 2025
Agenda Item: 4.A

M E M O R A N D U M

TO: Valley of the Moon Water District Board of Directors

FROM: Matt Fullner, General Manager

SUBJECT: Board Discussion Regarding the Timing of Expending Funds on SDC-Related Studies

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Background:

The redevelopment of the former SDC campus has been a major topic of discussion for more than five years, not only here at the District, but also in the community at large. Until the shutdown of SDC in 2019, the District maintained an intertie for emergency water supply with SDC. Before the facilities shut down, SDC operated the only independent, large-scale water source in the Sonoma Valley that was not reliant on groundwater. The system relied upon two lakes on the campus in conjunction with a surface water treatment plant. The plant was capable of producing 1.8 million gallons per day (or 1,250 GPM) of drinking water. The loss of this source of emergency water puts the residents of the valley at higher risk of source interruption were something to happen to the Sonoma County Water Agency source, transmission aqueduct, storage tanks, booster stations, or mainline valves.

As a result of the above, the District was the subject of three Civil Grand Jury Reports in 2020 and 2022. These reports outlined findings that the closure of SDC, and its water system, materially affected the District's ability to respond in emergencies involving the loss of water supply, and set forth recommended actions for the District to take, that would help mitigate those effects. Among those recommendations were an evaluation of District operations of the water facilities at the former SDC, influencing the County's SDC Specific Plan, and local collaboration for water supply resiliency between the District, the City of Sonoma, the County of Sonoma, and the State DGS.

Due to the potential for an increase in population in the Sonoma Valley to numbers near the peak of SDC operation, several citizen groups have opposed the redevelopment of SDC. Two of those groups (Sonoma Community Advocates for a Livable Environment [SCALE] and Sonoma Valley Next 100) have gone so far as to bring lawsuits against the County's EIR and DGS respectively, over the development plans.

Raising the capital needed to bring the SDC water facilities up to current standards, and in acceptable condition for the District to ultimately take over the operation (and liability) of the water

system components, will require working with a developer. Given the community opposition and recent lawsuits, there has been some question as to the realistic timing of any redevelopment at the site, and if it still makes sense to expend District funds on understanding the complexities of revitalizing the water system there at this time, or wait until the future of SDC is more clear. Staff is therefore bringing this discussion item before the Board to facilitate a discussion with that end in mind.

Several considerations to bear in mind include (but are by no means limited to):

1. The lawsuits, particularly the more recent Next 100 suit, may or may not be successful in slowing the development. If they are not successful, development may begin on a relatively short timeline, and the District would need to have a very good understanding of the actions that would be required, the costs involved, and the structure of payment/repayment for any capital outlay on that short timeline.
2. If the lawsuits are successful at slowing the redevelopment by a number of years, the information gathered in doing our due diligence would still be extremely useful, albeit potentially somewhat out of date. However, adjusting the opinion of probable cost figures for any inflation or other market conditions at that time is a relatively simple matter, and the majority of the information would still be valid.
3. Using District time, energy, and funds to evaluate the SDC water system proactively shows a deep commitment by the District to eventually own and operate the water facilities there. It also shows that the District is committed to doing the job right, and fully understanding what will be needed before it takes on the system and responsibilities.
4. If the District does decide that now is not the time to expend funds on understanding the SDC site, facilities and conditions, and the development ends up moving along faster than anticipated, the District would start off relatively blind to the needs and may neglect some critical aspect of the water system redevelopment as a result.

Recommendation:

Hold a Board discussion on the above subject matter.