

Water System Master Plan

PREPARED FOR

City of San Bruno



PREPARED BY



INTRODUCTION (CHAPTER 1)

This Water System Master Plan (WSMP) for the City of San Bruno (City) identifies strategies for maintaining adequate water system service levels for the City and guides capital expenditures for the City's water system. To accomplish these goals, the following key work tasks were performed in this Water System Master Plan:

- Evaluating and summarizing the existing water system facilities;
- Developing water demand projections through 2040;
- Evaluating and summarizing the City's available water supply sources;
- Updating and calibrating the distribution system hydraulic model using the City's geographical information system (GIS) and data collected during fire flow testing;
- Updating performance and operational criteria for evaluating the water system and identifying deficiencies as well as new facility needs;
- Preparing a capacity and operational reliability evaluation for existing and future 2040 water demand conditions to identify the City's water distribution system pipeline and facility needs;
- Evaluating the risk of failure for the City's existing water distribution system pipelines and developing a systematic replacement program which prioritizes the pipelines at highest risk;
- Developing a pipeline, pump station, tank, and groundwater well replacement strategy to address aging asset needs; and
- Developing a comprehensive capital improvement program (CIP) for recommended existing and future water system improvements.

The resulting WSMP CIP developed from these foundational tasks is:

- **Comprehensive** – considers the many facets of water service that are needed for a sustainable and reliable water system;
- **Prioritized** – gives precedence to improvements that are needed most to maintain the City's desired level of service, and efficiently coordinates projects to minimize overlaps; and
- **Balanced** – ensures that the City improves all facets of service using available funding over time.

This WSMP is an update to the City's 2012 WSMP and will provide a comprehensive road map for the City's water system for the next 20 or more years.



Executive Summary

EXISTING WATER SYSTEM INVENTORY (CHAPTER 2)

The City's water service area, which is about 5.4 square miles, is generally contiguous with City Limits. The City is located in San Mateo County, south of the City of South San Francisco, north of the City of Millbrae, and just west of the San Francisco International Airport. The City is primarily an urban residential community with low density residential land uses in the west hillside and higher density residential, commercial, and institutional land uses in the east.

The City's service area includes twelve pressure zones and is served by approximately 116 miles of distribution pipelines, five (5) surface water supply turnouts, four (4) active groundwater wells, eight (8) storage tanks, eight (8) booster pump stations, and 31 pressure regulating stations. Key water system facilities were assessed during site visits conducted in the field on June 30, 2020. Significant findings and recommendations from these site visits are discussed in Chapter 2 and incorporated into rehabilitation and replacement project recommendations.

WATER DEMANDS (CHAPTER 3)

Existing (2019) average daily water production for the City is approximately 3 million gallons per day (mgd). Water use decreased significantly from 2014 to 2016 in response to the drought and state mandated conservation efforts. Although demands have increased in years since 2016, they remain well below pre-2014 levels. Residential use accounts for approximately 75 percent of the City's total water consumption.

This WSMP evaluates system needs through 2040. The City's average daily water use is expected to increase to 4.78 mgd by 2040. Growth within the City is projected to occur due to development projects such as the Bayhill Specific Plan, Transit Corridors Area Specific Plan, and other smaller new developments. Projected water demands from these developments were calculated using land use data and the City's unit water use factors, which were updated as part of this WSMP.

WATER SUPPLY (CHAPTER 4)

The City currently receives water from three supply sources:

- Wholesale surface water from the City and County of San Francisco's Regional Water System (RWS), operated by the San Francisco Public Utilities Commission (SFPUC), served through four connections to the City's system;
- Retail surface water purchased from North Coast County Water District (NCCWD), served through one connection to the City's system in Pressure Zone 13; and,
- Local groundwater from the South Westside Groundwater Basin.



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Prior to 2016, groundwater use comprised about 50 percent of the City's total water supply. In 2016, the City reduced its use of groundwater in accordance with the Regional Groundwater Storage and Recovery Project (Regional GSR). The Regional GSR is an in-lieu groundwater recharge program that balances groundwater and RWS surface water supply to increase drought year water supplies. During wet and average years, water from the RWS is delivered to the City, which reduces the need to pump groundwater and allows the basin to naturally recharge and store additional water supply. In dry years, the City will maximize its use of groundwater and supplement with surface water.

Since 2016, the majority of the City's water supply is surface water from the SFPUC and NCCWD, both of which are supplied through the RWS. The RWS is predominantly supplied from runoff and snowmelt from the Sierra Nevada delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by SFPUC from its local watersheds and facilities in Alameda and San Mateo counties. The City's remaining water supply is produced locally from its groundwater wells. The City currently operates four wells that extract groundwater from the central portion of the 40 square mile Westside Basin.

Chapter 4 presents an assessment of the City's projected supply and demand. The supply and demand assessment conservatively assumes that the Bay-Delta Plan Amendment, adopted by the State Water Resources Control Board (SWRCB) in 2018, will be implemented. Results indicate that the City's projected available supplies during a single dry year are not adequate to meet projected single dry year demands by as early as 2035. Similarly, during multiple dry years the City's projected available supplies are not adequate to meet projected demands by as early as 2030. This shortfall is primarily due to significant cutbacks in the City's supply from SFPUC which is significantly reduced in dry years due to the Bay-Delta Plan Amendment. In years with a supply shortfall, the City can implement its Water Shortage Contingency Plan (WSCP) to reduce demands to the level of available supply. Without the Bay-Delta Plan Amendment, supply shortfalls would be nearly eliminated.

HYDRAULIC MODEL UPDATE (CHAPTER 5)

The City's distribution system hydraulic model was updated using the City's GIS and Light Detection and Ranging (LiDAR) elevation data. West Yost allocated existing (2019) water demands by using spatially located customer billing information to distribute demands within the model, and calibrated the model using results from a hydrant testing program conducted in September 2020. In updating the model, West Yost worked closely with the City's Water Division staff to assure accuracy of the model. Based on the results of the model calibration, it can be concluded that the hydraulic model provides a reasonable representation of the City's water distribution system and can be used as a tool for master planning purposes.

SYSTEM PERFORMANCE AND OPERATIONAL CRITERIA (CHAPTER 6)

Chapter 6 defines the recommended performance and operational criteria for the City's water system, including allowable distribution system pressures, fire flow criteria, booster pump station capacity, water storage capacity, pressure regulating station capacity, and maximum pipeline velocity and head loss. Recommended performance and planning criteria frame the City's objectives for facility sizing and water distribution system performance and were developed based on key water system design criteria and operational standards presented in the 2012 WSMP. However, some of the previous water system design and operational criteria have been revised for this WSMP to reflect changes in water system operations.



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EVALUATION OF EXISTING WATER SYSTEM (CHAPTER 7) AND FUTURE WATER SYSTEM (CHAPTER 8)

In summary, the technical evaluations identified the following key findings:

- **System Capacity and Operational Performance Evaluation:** While the City's existing distribution system has adequate capacity and reliability for normal operational needs, the City's most significant capacity needs are new pipelines and regulating stations to address fire flow needs. Most of the system was built when less stringent fire flow standards were in effect. While the system is generally well reinforced and many areas meet current standards, there is a need for new distribution system infrastructure to improve system capacity, particularly in older areas near the downtown area, where most pipelines are 2-inch and 4-inch diameter. Replacement of pipelines for fire flow purposes also supports the need to replace aging pipelines at high risk of failure. The system capacity analysis also found that additional storage capacity is needed.
- **Pipeline and Facility Renewal and Rehabilitation Program.** The City should prioritize replacing pipelines near the downtown areas. These pipelines are aging, contain many small diameter segments, and are at high risk of failure. The City should continue its ongoing well, pump station, tank, and regulating station rehabilitation programs, as well as plan for longer-term replacement of the remaining tanks.

These findings are discussed in greater detail below.

System Capacity Improvement Program

The system capacity analysis evaluates the City's water system facilities and their ability to meet the City's recommended performance and planning criteria under existing and buildout water demand conditions. This analysis, documented in Chapter 7 and Chapter 8, evaluates system storage, peak pumping capacity and peak valve station capacity needs to meet system requirements. The analysis found that additional storage capacity and pressure regulating station capacity are required to meet existing and future demands.

The analysis also evaluates system hydraulic performance under peak hour and maximum day plus fire flow conditions. Using the updated and calibrated hydraulic model, system flow and pressure were evaluated under normal and emergency operations and used to identify facility improvements required to meet the City's performance criteria. This analysis evaluated the City's water system under both existing and 2040 water demand conditions. The analysis found that while the City's water system generally meets the performance criteria under normal operations, a large portion of the City's system cannot provide sufficient fire flow to satisfy the City's fire flow criteria, since the system was designed to different standards in effect at the time of construction.

Therefore, a majority of the improvements identified from the system capacity and reliability analysis are required to meet existing fire flow criteria. These projects include replacement of existing pipelines or pressure reducing valves with new facilities of a larger diameter, or installation of new pressure reducing valves to increase supply to deficient pressure zones. These projects also support the City's renewal and replacement of aging pipelines.



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Rehabilitation and Replacement Program

To develop a pipeline rehabilitation and replacement program, a risk assessment was performed to prioritize pipelines with the highest risk of failure for replacement. Pipeline properties used to perform the risk assessment include age, material, historical leak data, geologic conditions, criticality, diameter, and location. The risk assessment found that the majority of high-risk pipelines are in the City's Pressure Zone 1/4, consistent with the City's existing pipeline replacement workplan. High risk pipelines in the City's Pressure Zone 1/4 were then grouped into ten areas and prioritized for replacement.

A rehabilitation and replacement analysis was performed for water system facilities using facility age, condition data, and site visit results to assess replacement needs based on typical design useful life of each facility. In addition to the pipeline and facility rehabilitation and replacement projects, other miscellaneous rehabilitation and replacement projects were identified to further improve the operations and/or reliability of the City's water system.

Summary of Recommended Improvements

A summary of the recommended improvement projects to address the water system capacity and renewal and replacement needs is provided in Table ES-1. Many projects are recommended for both capacity and renewal and replacement reasons.



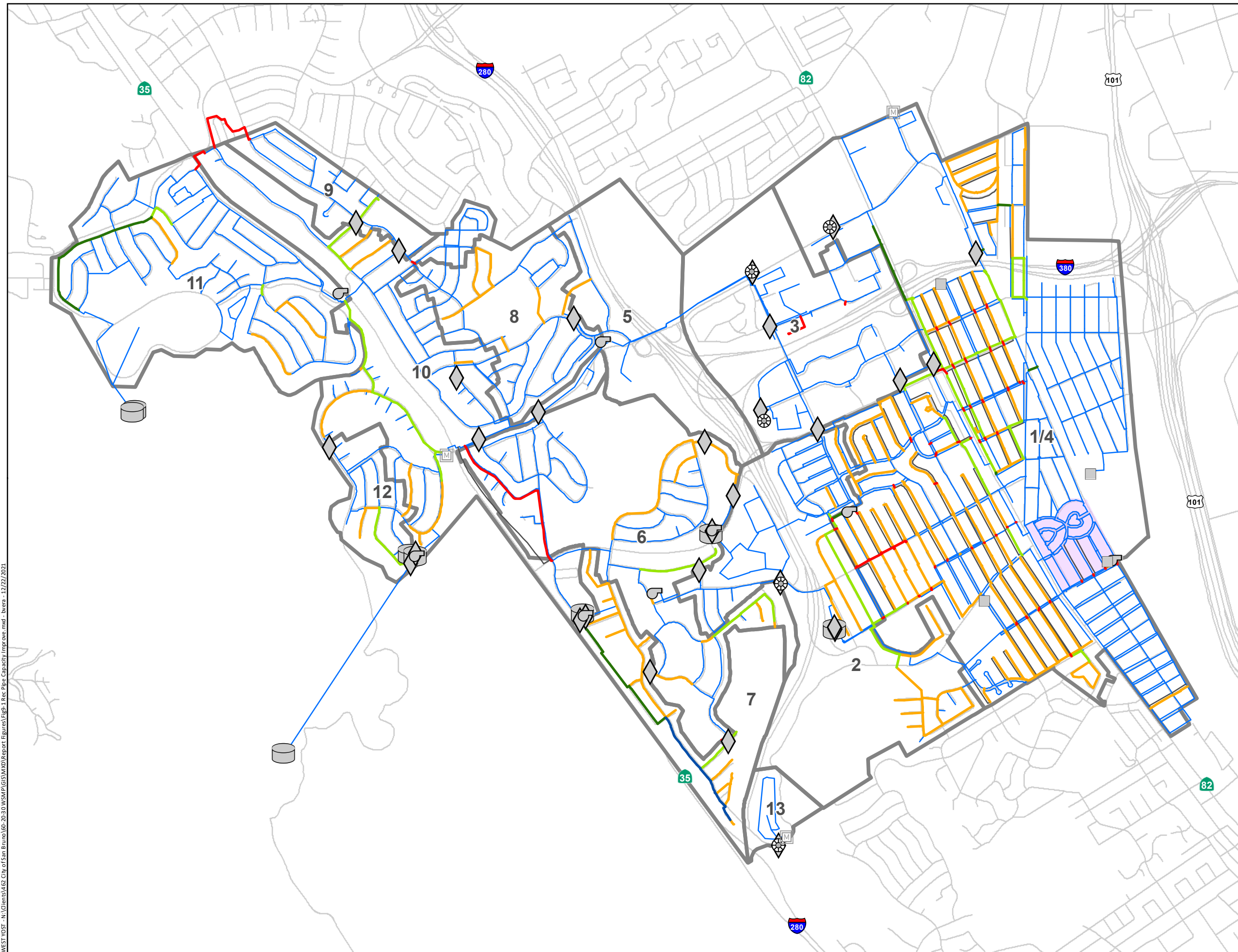
Executive Summary

Table ES-1. Summary of Recommended Capital Improvement Projects

Improvement Group	Reasons	Capital Cost, \$M ^(a)
Pipeline Improvements	Fire Flow – provide additional hydraulic capacity to meet fire flows. Failure Risk – replace aging pipelines at high risk of leaking or breaking.	\$204.6
Well, Storage and Pumping Facility Improvements	Capacity – provide adequate supply and storage capacity to more reliably supply customers. Failure Risk – replace aging storage tanks vulnerable to seismic events. Reliability – install additional emergency generators to improve system reliability. Asset Maintenance – maintain existing facilities.	\$86.9
Pressure Regulating Station Improvements	Fire Flow – provide additional supply capacity to meet fire flows. Asset Maintenance – maintain existing facilities.	\$15.5
Miscellaneous Improvements	Fire Flow – maintain acceptable pressures at customer services during an emergency. Data and Instrumentation – improve City’s ability to monitor customer water use. Seismic Risk – update City’s seismic risk evaluation and perform recommended improvements. Security Risks – improve City’s water system facility physical and cyber security. Emergency Preparedness – prepare plans and purchase equipment to better prepare City for emergency operations.	\$10.7
Total		\$318
(a) Costs shown are based on the January 2021 San Francisco ENR CCI of 13,098. Costs include base construction costs plus mark-ups equal to 62.5 percent for construction contingencies and project implementation.		

CAPITAL IMPROVEMENT PROGRAM (CHAPTER 9)

The recommended water system CIP totals \$318M, as shown in Table ES-1, and on the chart below. Figures ES-1, ES-2, ES-3, ES-4 and ES-5 illustrate the locations of the recommended CIP improvement projects. With the implementation of improvements identified in the existing system evaluation, no additional improvements are required to meet future system demands. However, 1.0 MG of the storage capacity for the new 3.5 MG Tank 1 replacement project is allocated to provide storage for future development. Similarly, 0.8 MG of the storage capacity for the recommended 1.8 MG Zone 3 tank is to accommodate future demands.



- Proposed 8-inch Upsize
- Proposed 10-inch Upsize
- Proposed 12-inch Upsize
- Proposed 14-inch Upsize
- Proposed New Pipeline
- Proposed Abandoned Pipeline
- Existing Pipeline
- Turnout
- Existing Active Well
- Ex. Pressure Reg. Sta. (RS)
- Ex. Booster Pump Station (PS)
- Existing Storage Tank
- Emergency Connection
- Avenues 1-3
- Pressure Zone Boundary

- Notes:
1. Avenues 1-3 pipeline replacement project will be completed in 2021 and will resolve local fire flow deficiencies.
 2. Capacity improvement projects are integrated into the pipeline capacity improvement projects shown on Figure 9-2.



Figure ES-1
Recommended Pipeline Capacity Improvements
City of San Bruno
Water System Master Plan

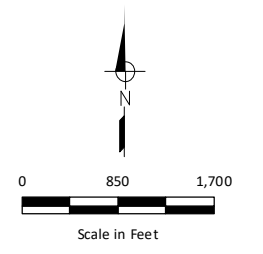
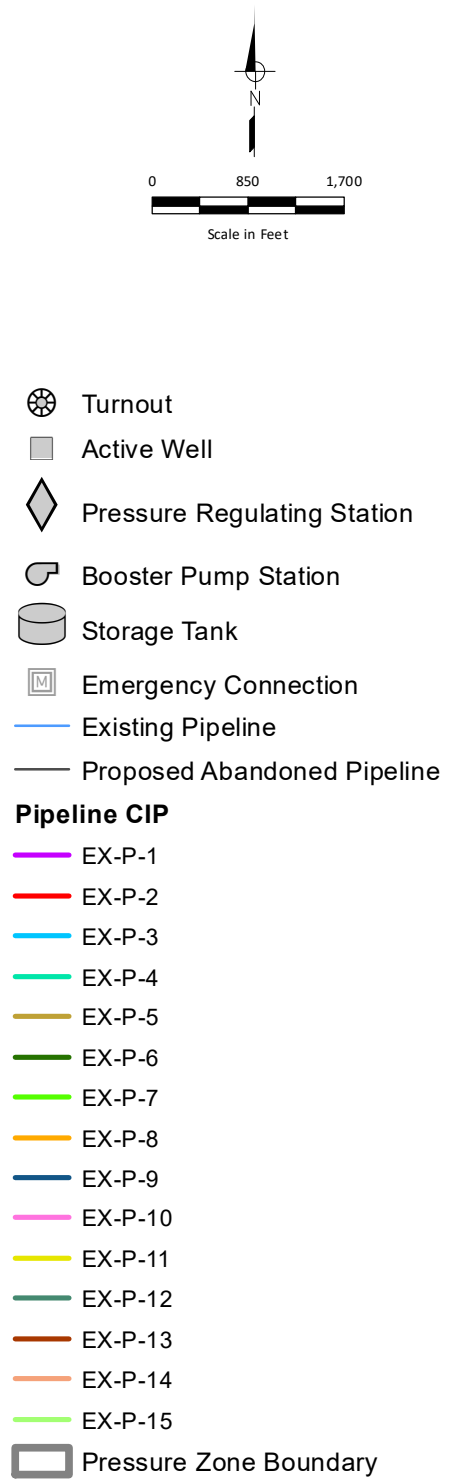
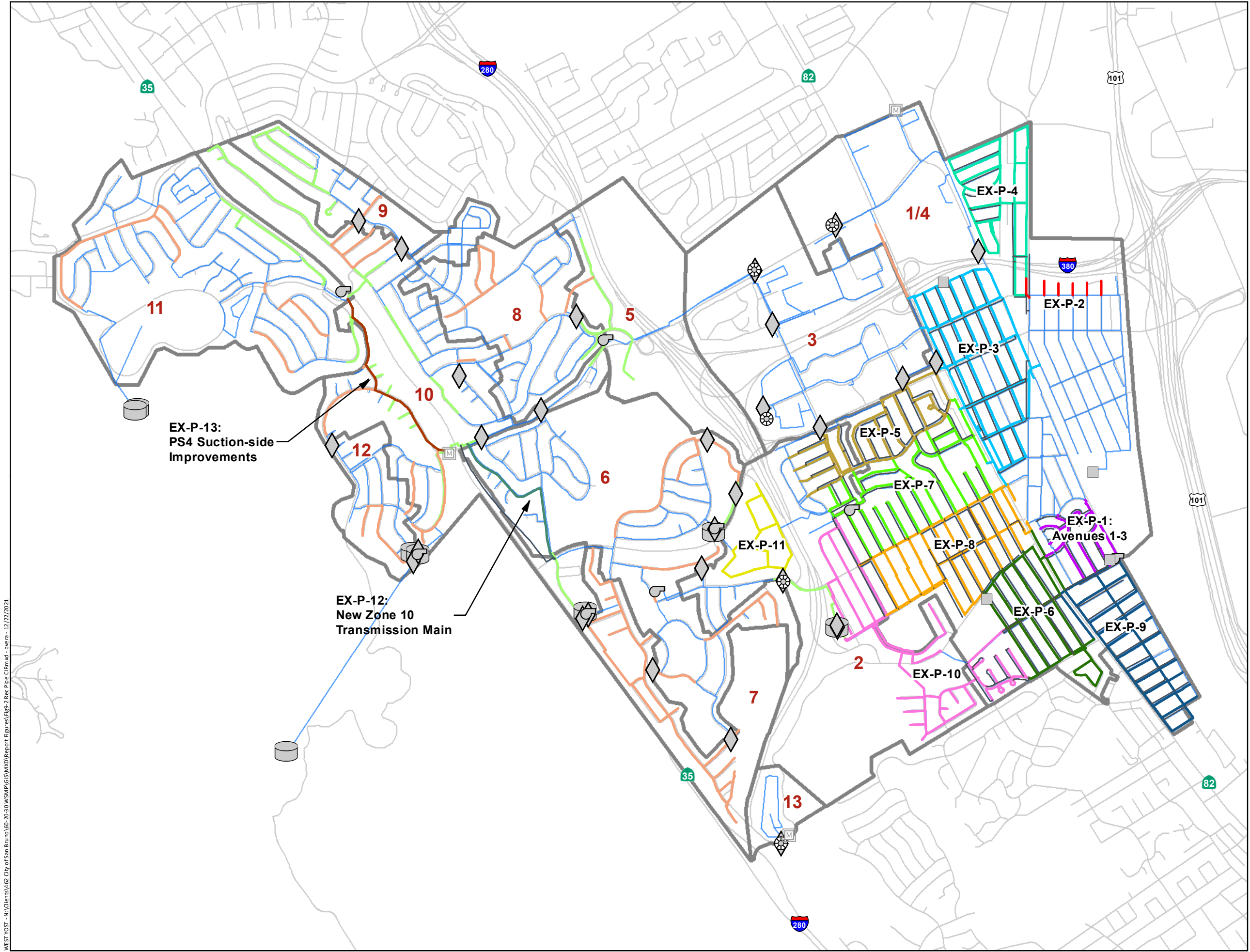
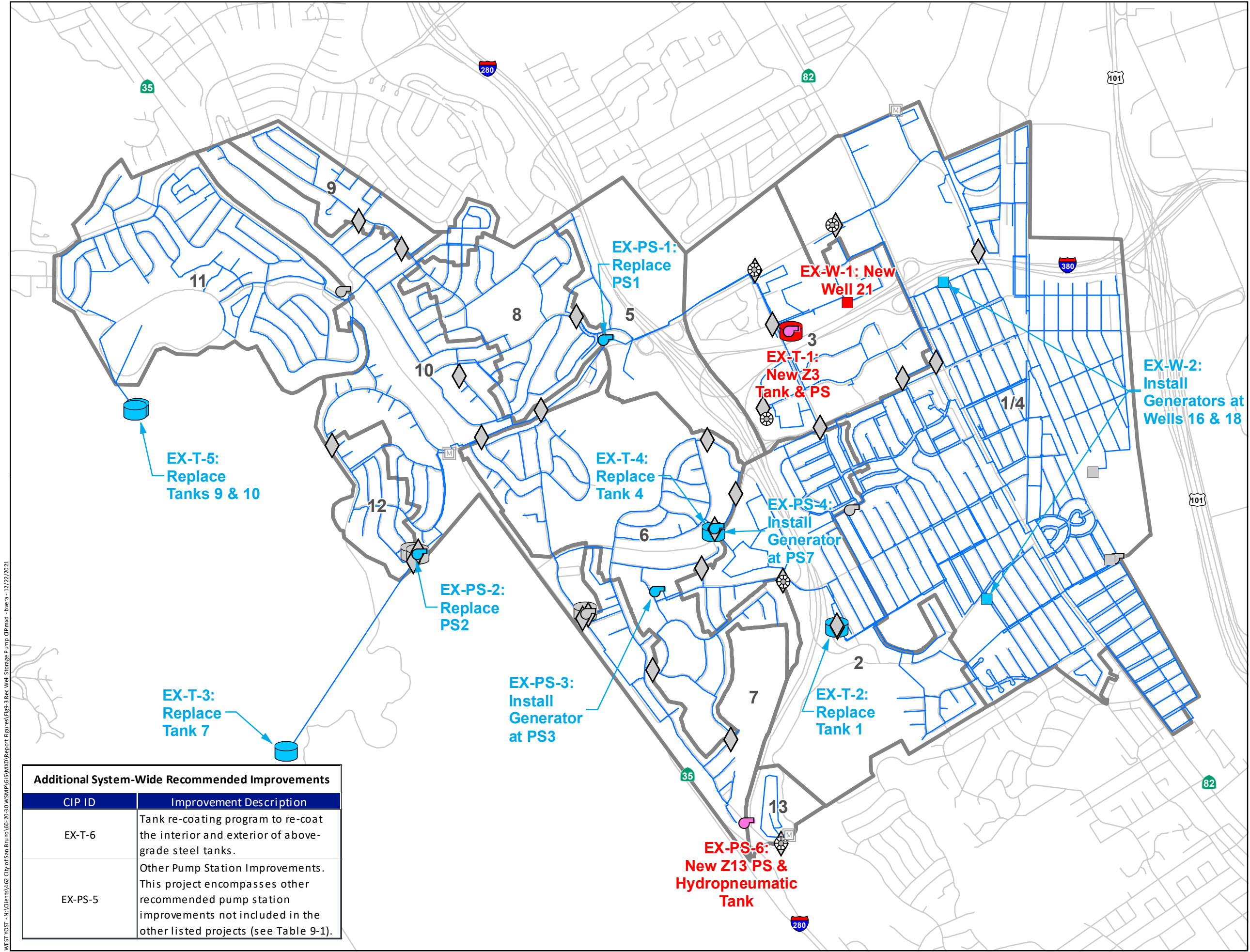


Figure ES-2

Recommended Existing Water System Pipeline CIP

City of San Bruno
Water System Master Plan

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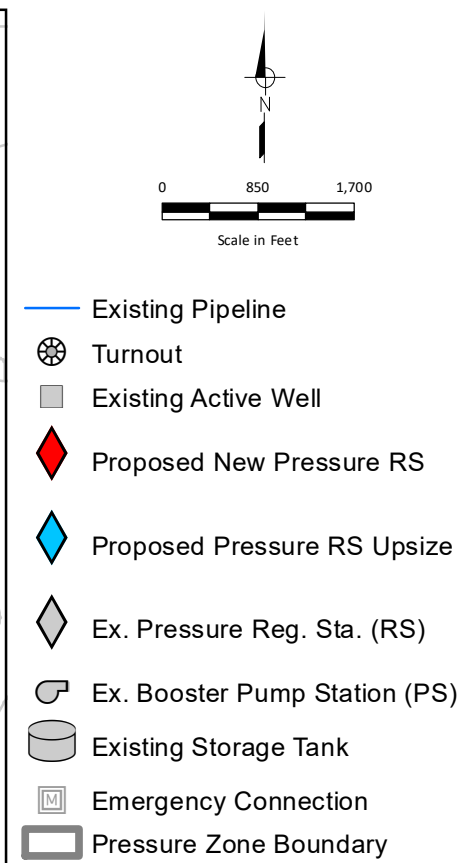
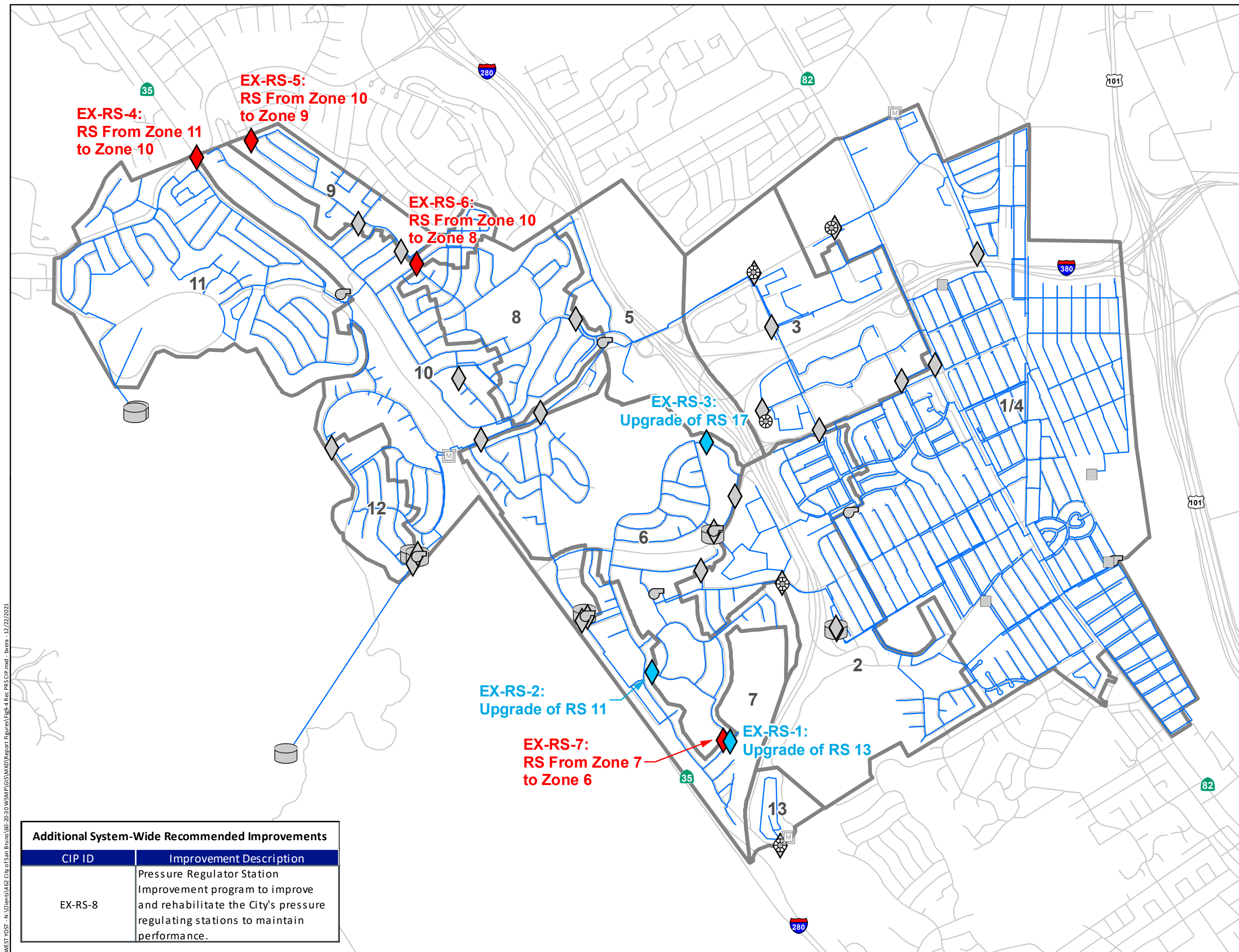


- Scale in Feet
- Existing Pipeline
 - Turnout
 - Proposed New Well
 - Proposed Well Upgrade
 - Existing Active Well
 - Proposed New Booster PS
 - Proposed Booster PS Upgrade
 - Ex. Booster Pump Station (PS)
 - Proposed New Storage Tank
 - Proposed Storage Tank Upgrade
 - Existing Storage Tank
 - Ex. Pressure Reg. Sta. (RS)
 - Emergency Connection
 - Pressure Zone Boundary

Additional System-Wide Recommended Improvements	
CIP ID	Improvement Description
EX-T-6	Tank re-coating program to re-coat the interior and exterior of above-grade steel tanks.
EX-PS-5	Other Pump Station Improvements. This project encompasses other recommended pump station improvements not included in the other listed projects (see Table 9-1).

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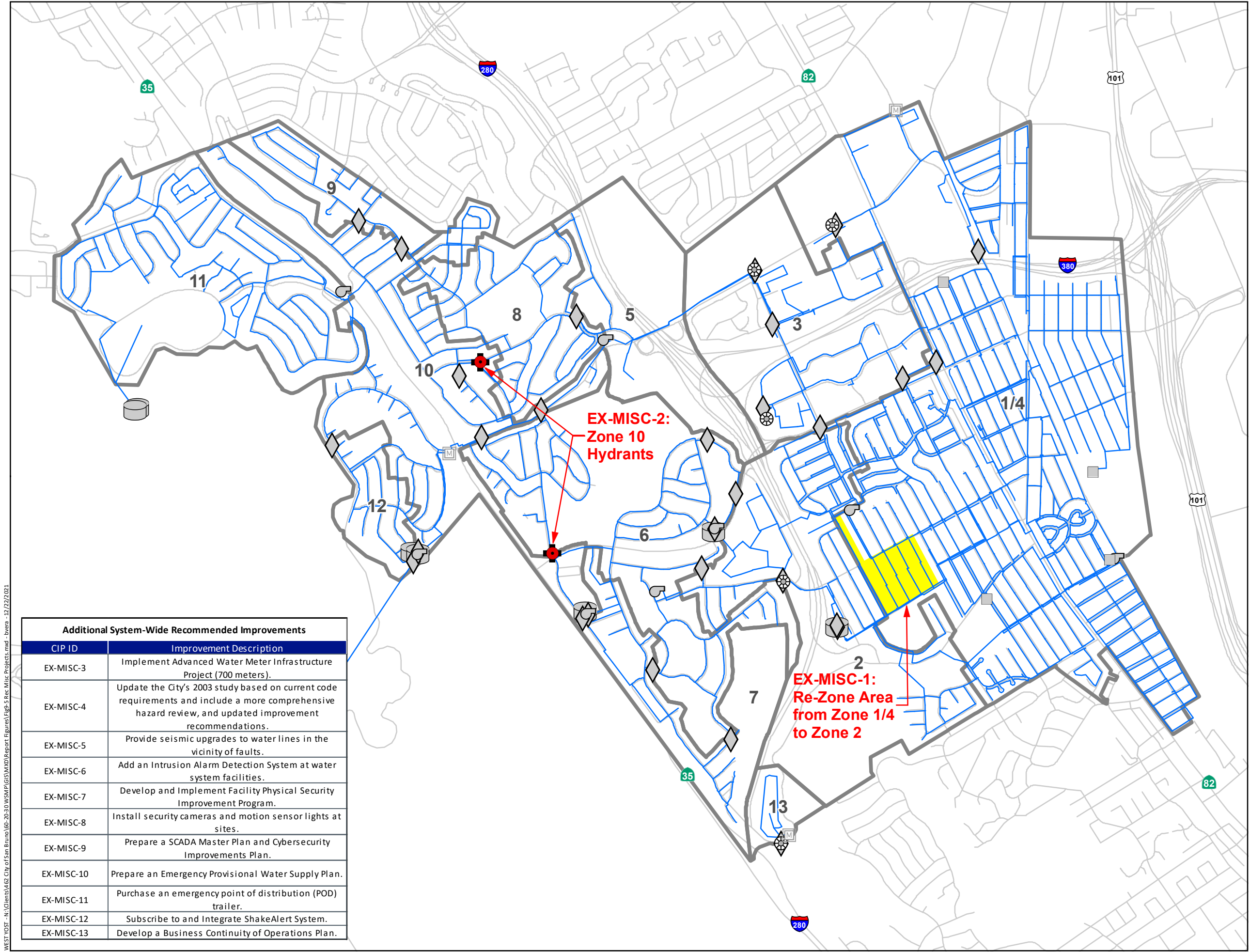


Additional System-Wide Recommended Improvements	
CIP ID	Improvement Description
EX-RS-8	Pressure Regulator Station Improvement program to improve and rehabilitate the City's pressure regulating stations to maintain performance.

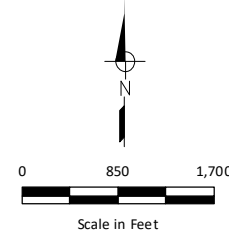


Figure ES-4

Recommended Pressure
Regulating Station
Capital Improvement Projects



- Existing Pipeline
- Turnout
- Existing Active Well
- Ex. Pressure Reg. Sta. (RS)
- Ex. Booster Pump Station (PS)
- Existing Storage Tank
- Proposed Fire Hydrant
- Emergency Connection
- Proposed Area for Re-zoning
- Pressure Zone Boundary



Additional System-Wide Recommended Improvements	
CIP ID	Improvement Description
EX-MISC-3	Implement Advanced Water Meter Infrastructure Project (700 meters).
EX-MISC-4	Update the City's 2003 study based on current code requirements and include a more comprehensive hazard review, and updated improvement recommendations.
EX-MISC-5	Provide seismic upgrades to water lines in the vicinity of faults.
EX-MISC-6	Add an Intrusion Alarm Detection System at water system facilities.
EX-MISC-7	Develop and Implement Facility Physical Security Improvement Program.
EX-MISC-8	Install security cameras and motion sensor lights at sites.
EX-MISC-9	Prepare a SCADA Master Plan and Cybersecurity Improvements Plan.
EX-MISC-10	Prepare an Emergency Provisional Water Supply Plan.
EX-MISC-11	Purchase an emergency point of distribution (POD) trailer.
EX-MISC-12	Subscribe to and Integrate ShakeAlert System.
EX-MISC-13	Develop a Business Continuity of Operations Plan.



Figure ES-5
Recommended
Miscellaneous Projects
City of San Bruno
Water System Master Plan

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Executive Summary

West Yost and the City reviewed the capital improvement program and developed a prioritized list of projects and implementation timeframe based on the results from the distribution system analysis, and the City's identified needs. Projects are placed on the schedule based on their priority, to address most critical needs first. Table ES-2 shows the recommended CIP implementation schedule in current dollars. Sequencing is generally based on the relative priorities of projects, with some adjustments to balance project implementation dollars with available funding. Sequencing also considers providing a mix of projects to provide a more balanced CIP.

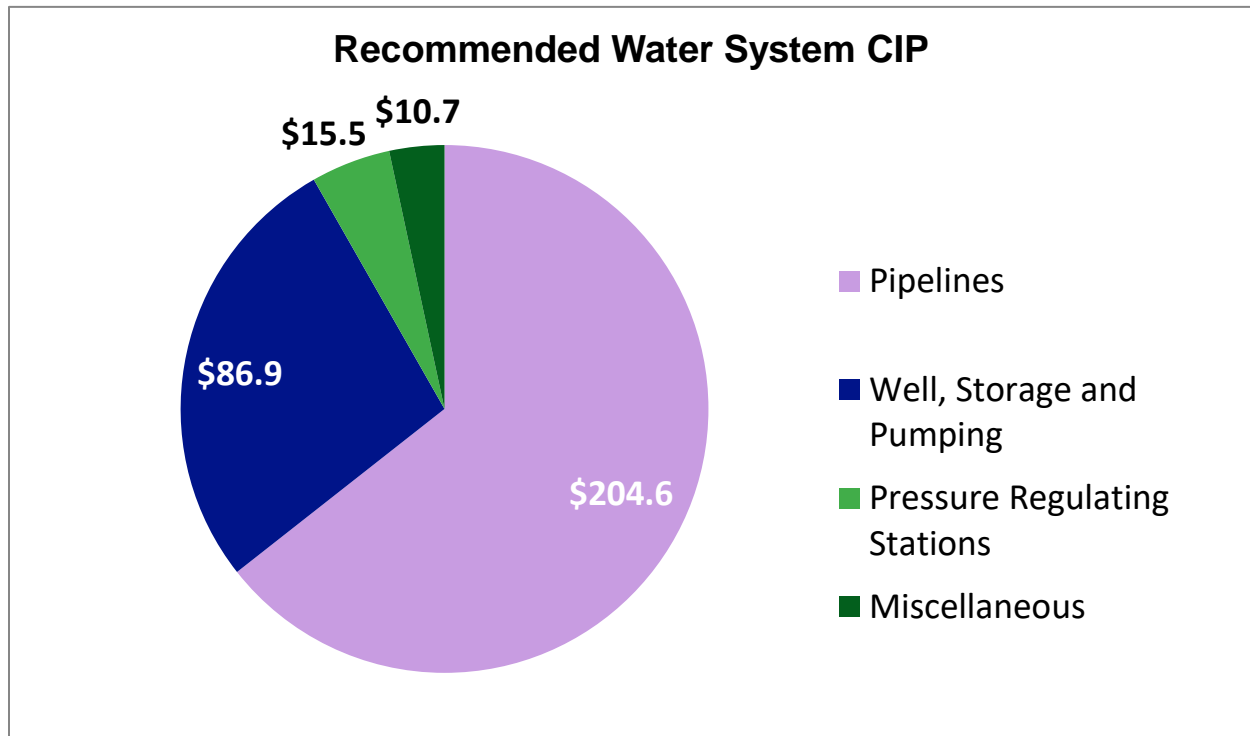


Table ES-2. Recommended Capital Improvement Program Schedule				
Improvement Type	Capital Cost by Fiscal Years, Million Dollars ^(a)			
	FY 2022/23 through 2026/27	FY 2027/28 – FY 2031/32	Long-Term	Total
Pipeline Improvements	25.2	27.6	151.8	204.6
Well, Storage and Pumping Facility Improvements	39.8	8.9	38.2	86.9
Pressure Regulating Station Improvements	2.6	2.5	10.5	15.5
Miscellaneous Improvements	7.4	0.7	2.6	10.7
Total	74.9	39.7	203.1	318

^(a) Costs shown are based on the January 2021 San Francisco ENR CCI of 13,098. Costs include base construction costs plus mark-ups equal to 62.5 percent for construction contingencies and project implementation. Totals may differ from quantities shown due to rounding.



Executive Summary

As part of the WSMP, Bartle Wells Associates (BWA) prepared a high-level rate analysis to evaluate the impacts of implementing the capital program based on the recommendations in the WSMP, and alternative levels of funding. Ten-Year cash flow projections were developed for two alternatives:

- **Alternative A** – Funding based on the recommended capital improvement program implementation schedule
- **Alternative B** – Funding based on 75 percent of the recommended capital improvement program level

Figure ES-6 compares the result from the two alternatives. The top portion of the figure shows Alternative A and the bottom portion of the figure shows Alternative B. Each graphic shows the City operating costs, SFPUC water purchases, debt service, funding of capital projects from rates and funding of capital projects from reserves. Alternative A shows a projected rate increase of 3 percent in FY 2022/23, increasing to 7 percent by FY 2024/25 and continuing at 7 percent through FY 2029/30 and a 6 percent increase in FY 2030/31. This scenario uses approximately \$23M in fund reserves, with the remaining projects funded through rates. Alternative B shows a projected rate increase of 3 percent in FY 2022/23, increasing to 5 percent by FY 2024/25 and continuing at 5 percent through the remainder of the 10-year period. This alternative uses approximately \$32M in fund reserves, with the remaining projects funded through rates, and a final reserve balance of \$14.6M, \$1.1M above the reserve target.

Alternative A supports \$13M/year of CIP funding after an initial phase in through FY2024/45, in line with the 10-year annual average funding requirements of the WSMP, escalated to account for 3 percent annual construction cost inflation. Alternative B supports the same level of CIP funding through FY 2028/29, but ultimately supports roughly \$9M/year of future annual capital funding by the end of the decade due to reduced rate increases. The projections indicate that the City can address its future funding needs by drawing down a portion of its fund reserves while phasing in a series of gradual annual water rate increases over the next decade. Under Alternative A, the City would be able to support the full funding level recommended in the WSMP. Under Alternative B, the City would still be able to support a substantial level of capital funding over the next decade. However, the reduced rate increases would ultimately support a lower level of future annual CIP funding.

The rate projections presented in the WSMP are for planning purposes only. Going forward, the City should conduct a more-detailed water rate study to evaluate options for future rate increases.

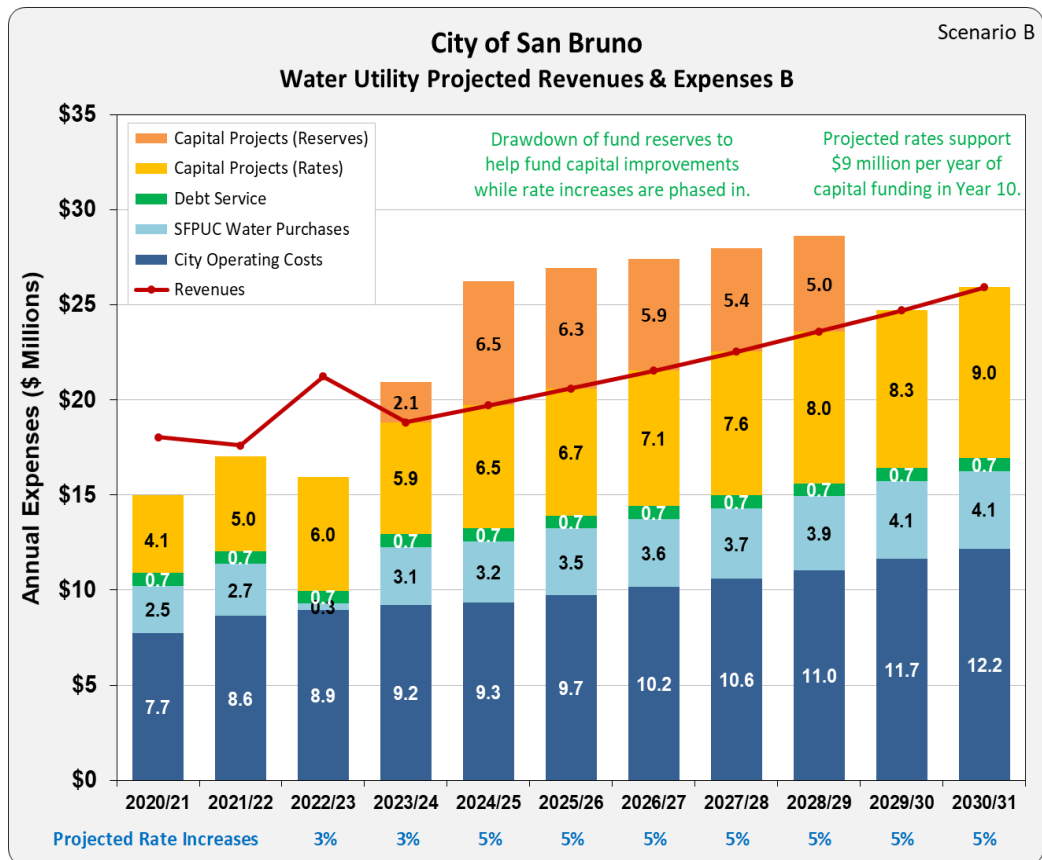
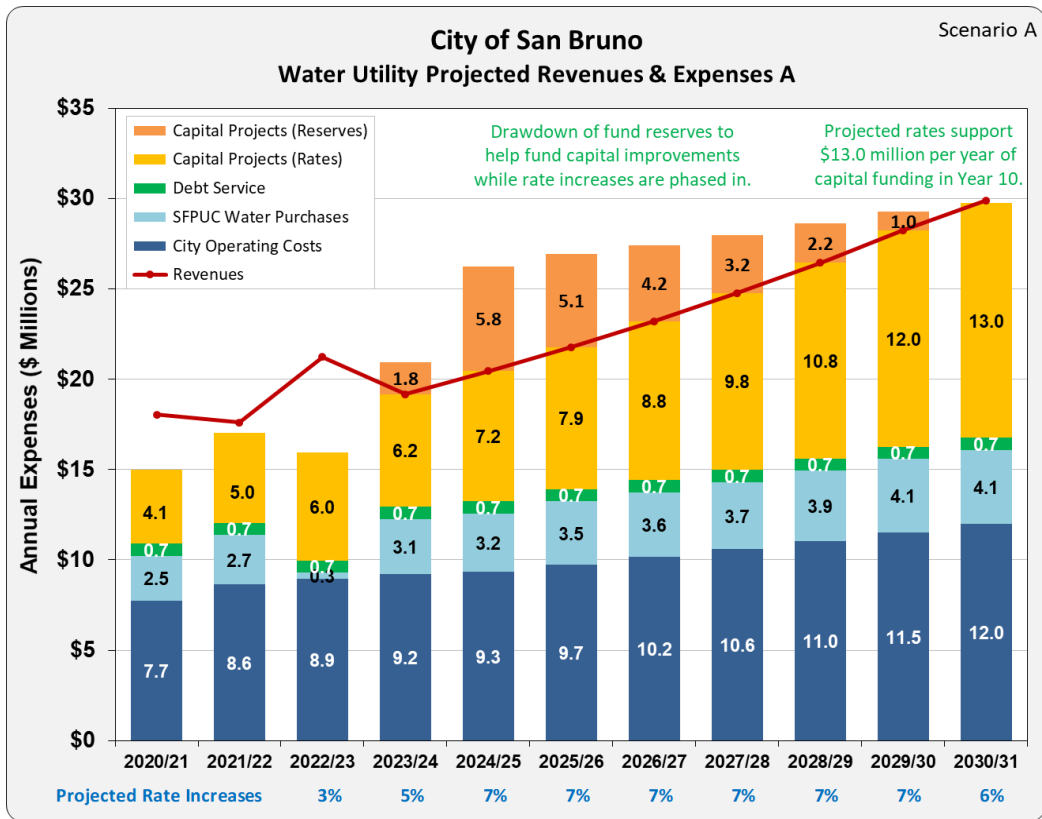


Figure ES-6. Ten-Year Cash Flow Projections for Alternatives