Brown AND Caldwell

FINAL REPORT | Prepared for

City of Upland, Upland, California

City of Upland: Water and Recycled Water Master Plan

December 2025

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Water and Recycled Water Master Plan

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Brown AND Caldwell

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List of Abbreviations

ADD	average day demand
ADU	accessory dwelling unit
AFY	acre-feet per year
AWWA	American Water Works Association
BC	Brown and Caldwell
CIP	capital improvement plan
city	City of Upland
DMM	demand management measure
DWR	California Department of Water Resources
EDU	equivalent dwelling unit
EPS	extended period simulation
ETo	evapotranspiration
fps	feet per second
FTE	full-time equivalent
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HAE	Harper and Associates Engineering
IEUA	Inland Empire Utilities Agency
NOAA	National Oceanic and Atmospheric Administration
MCL	maximum contaminant level
MDD	maximum day demand
MDD+FF	maximum day demand with fire flow
µg/L	micrograms per liter
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
MTBE	methyl tertiary butyl ether
PCE	tetrachloroethylene
psi	pounds per square inch
PHD	peak hour demand
PVC	polyvinyl chloride
R&R	rehabilitation and replacement
RHNA	Regional Housing Needs Allocation
SAWCo	San Antonio Water Company
SCAG	Southern California Association of Governments
SCE	Southern California Edison
TAZ	traffic analysis zone
TCE	trichloroethylene
UWMP	Urban Water Management Plan
UWUO	urban water use objective
VOC	volatile organic compound
WECWC	West End Consolidated Water Company
W-RWMP	Water and Recycled Water Master Plan

Executive Summary

Introduction

The City of Upland (City) retained Brown and Caldwell (BC) to prepare this Water and Recycled Water Master Plan (W-RWMP). The W-RWMP evaluates the performance, condition, and reliability of the city's wastewater collection system under existing and future conditions through 2045 and provides a phased Capital Improvement Plan (CIP) to address identified needs. This W-RWMP provided a comprehensive review of the city's wastewater collection system, and is an important update from the 2008 and 2010 master plans which will provide a foundation for future system planning.

This Executive Summary presents the methods, key findings, recommended improvements, and implementation considerations for the water and recycled water distribution systems. The key goals of the W-RWMP were as follows:

- Identify existing and long-term (2045) water demands.
- Define the planning and evaluation criteria for the city's water and recycled water systems.
- Identify deficiencies in the city's potable water system under existing and long-term conditions.
- Prepare an integrated CIP with phasing of recommended improvements and an integrated phasing plan.

Study Area

The planning area for the W-RWMP encompasses approximately 18 square miles, including the City limits (about 15 square miles) and an additional 3 square miles of unincorporated area. The potable water service area generally coincides with the City boundary, extending north to the San Gabriel Mountains and south to the I-10 Freeway. The recycled water service area currently provides water to 24 customers, primarily in the central and northern portions of the City, with planned expansion along 11th and 15th Streets.

The city owns and operates approximately 325 miles of potable water pipeline—ranging in size from under 2 inches to 42 inches in diameter—with the majority installed between 1960 and 1990. The city is supplied by 2 treatment plants, 13 groundwater wells, and 3 inter-agency connections, with 30 booster pumps and 12 storage tanks (to be referred to as reservoirs) supporting system operations and reliability. A summary of the existing distribution system is presented in Table ES-1 and a map of the system is included in Figure ES-1 and a schematic is provided in Figure ES-2.

Table ES-1. Existing System Summary

Facility Summary	Notes
2 treatment plants with capacities of 4.5 and 18.6 mgd	WFA/JPA and SACWTP
13 wells managed by the city	Does not include the 10 wells owned by neighboring agencies which the city contracts for supply.
3 inter-agency connections	The city maintains inter-agency connections with GSWC, MVWD, and CVWD
10 booster pump stations	
12 storage reservoirs	
325 miles of distribution pipe	Under 2" to 42" pipe diameter

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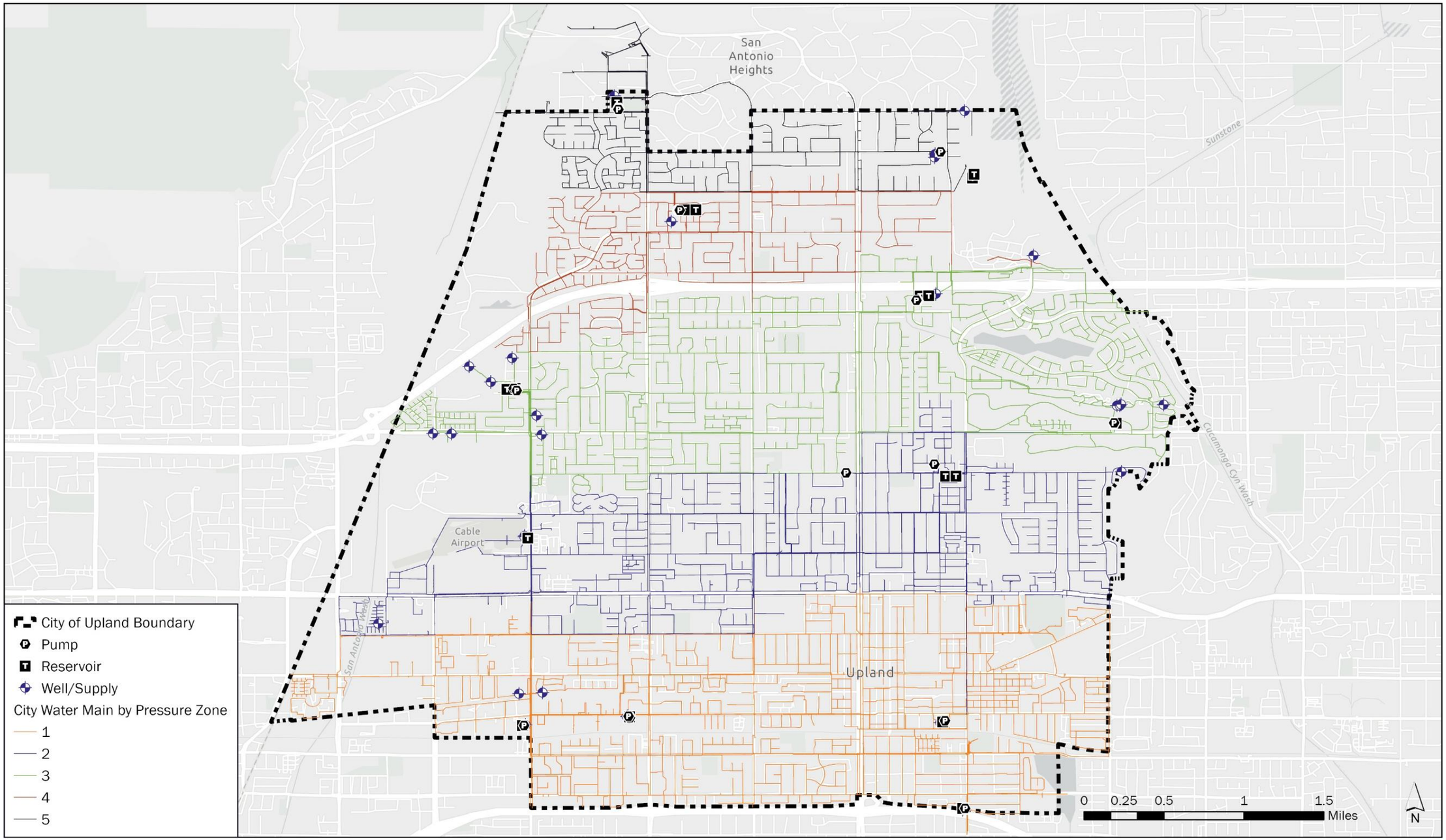


Figure ES-1. System overview

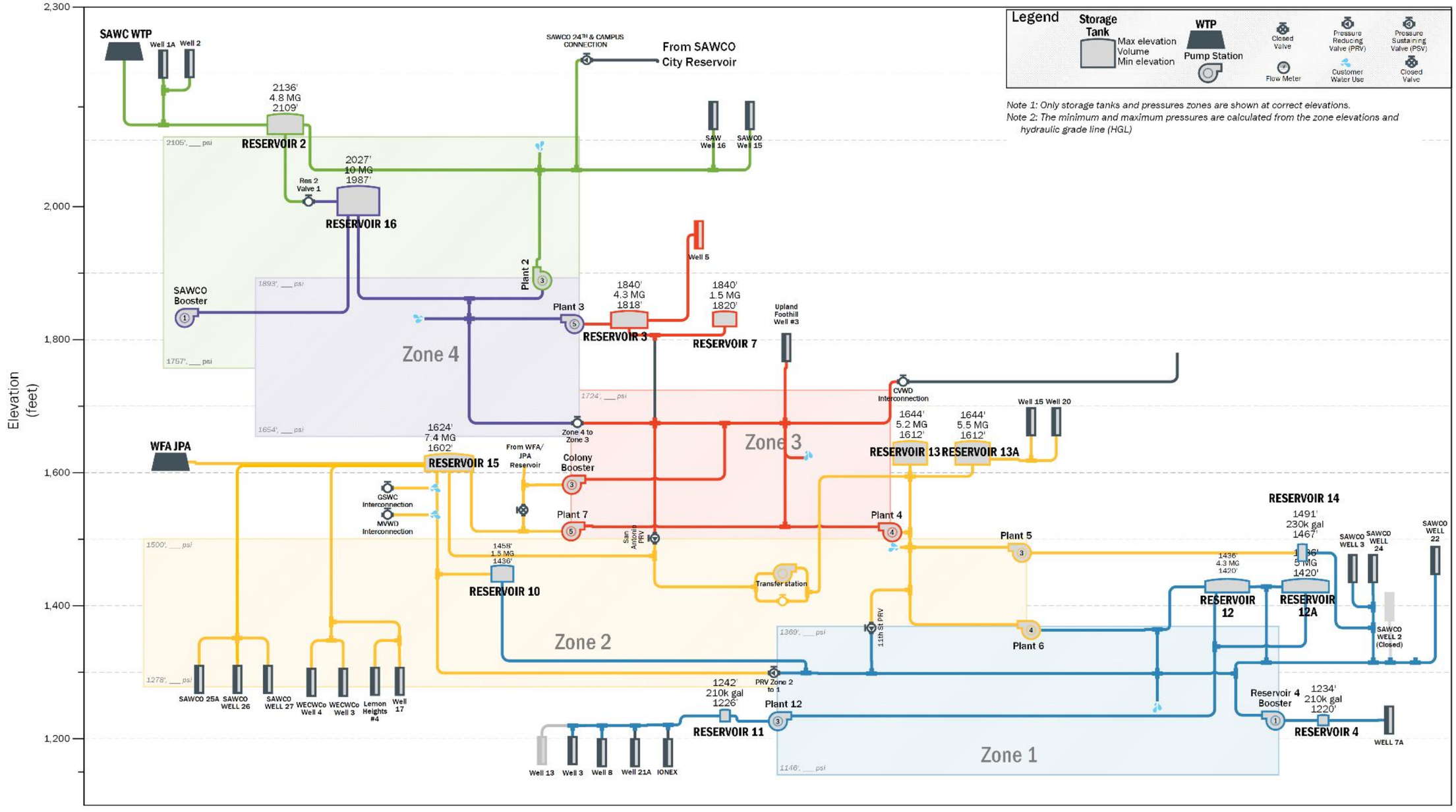


Figure ES-2. City of Upland water system schematic

Land Use and Population

The City of Upland provides wastewater collection service to a population of approximately 79,000 people across nearly 15 square miles. A range of development and growth scenarios were considered as part of this study, with the projected population growing to between 82,000 and 93,000 by 2045, shown in Figure ES-3. The city is mostly (95 percent) built out and primarily residential (roughly 70 percent), with industrial and commercial use making up the majority of the remaining development. Future growth is expected to occur primarily through infill, redevelopment, and accessory dwelling units (ADUs). Future land use considered input from the Regional Housing Needs Allocation (RHNA) and the city's 2021-2029 Housing Element, with the expectation that the city will continue to add residential units, including ADUs, in line with the local and regional housing needs.

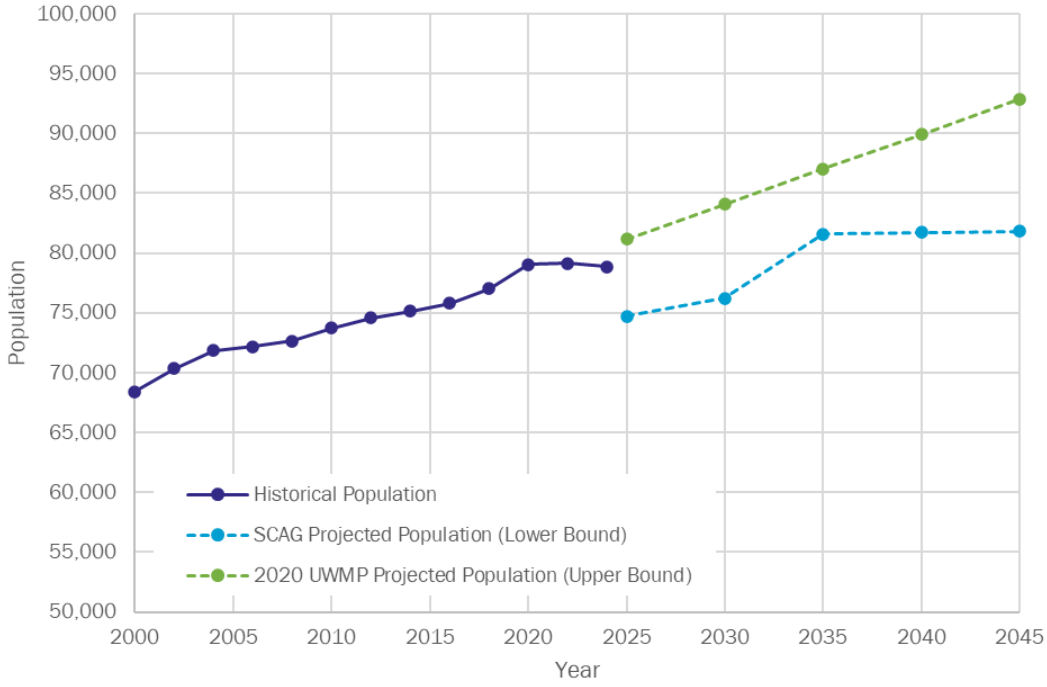


Figure ES-3. Historical and projected population

Water Supply and Demands

The city maintains a diverse supply portfolio. The water supply portfolio includes:

- Imported water from Metropolitan Water District (MWD) purchased through IEUA for treatment at the Water Facilities Authority (WFA)/Joint Powers Authority Agua de Lejos Water Treatment Plant
- Groundwater pumped from City-owned wells and West End Consolidated Water Company (WECWC)
- Groundwater purchased from San Antonio Water Company (SAWCo)
- Surface water purchased from SAWCo and treated by the City
- Recycled water purchased from IEUA

The available potable water supply is approximately 24,600 AFY in average years, with slightly lower supply in dry years. A summary of the city's water supply is presented in Table ES-2.

Table ES-2. Water Supply

Source		Average-year Available Supply (AFY)	Dry-year Available Supply (AFY)	Notes
Groundwater	Chino Basin	5,473	5,473	Groundwater supplies are reliable in drought conditions.
Groundwater	Six Basins	4,122	4,122	
Groundwater	Cucamonga Basin	683	683	
Purchased	SAWCo	6,857	6,857	
Surface Water	SAWCo	1,679	62	Conservatively assumed the lowest surface water availability from the past 10 years for dry-year conditions.
Imported	WFA	5,541	5,541	MWD has indicated that this supply will be fully reliable in dry-year conditions.
Total		24,625	23,008	

Source: 2020 UWMP

Water demand consists of water that leaves the distribution system through metered and unmetered connections, such as fire hydrants. Additional unmetered flows contributing to water demand include maintenance flushing, reservoir cleaning, leaks to pipe joints, or breaks. The city meters all of its customer accounts, including temporary construction meters.

Existing and future water demands were developed based on water use data, model calibration and growth projections. Since 2016, water demands have varied based on hydrologic conditions, with dry years (such as 2016 and 2019) spurring commitment to lowering water demand through reduced or eliminated irrigation and other conservation measures. Tracking with the city's land use, a majority of the water use is associated with residential customers, with more than 50 percent of water use associated with single-family homes and more than 15 percent associated with multi-family homes. Water use by customer class is illustrated in Figure ES-4.

Future water demands were developed using the process outlined in California Department of Water Resources' (DWR) *Making Conservation a California Way of Life*. This approach accounts for the latest state mandated water use regulations and targets. Ultimately, three demand scenarios were developed: the existing demands and a low and high future demand scenario. The low and high demand scenarios—through 2045—provide a range of future demands that account for potential variability in future conditions related to population growth and development, climate change, and compliance with future water-use regulations. The water use projections are illustrated in Figure ES-5.

The city has received recycled water from IEUA since 2012, with terms of the supply agreement updated as part of the Regional Sewage Service contract, signed by the city in November 2023. Per the latest agreement, IEUA maintains its goal of putting as much recycled water to use as possible within its service area and the Chino Basin. The city has maintained recycled water use of around 700 AFY and is considering expanding its recycled water system and use if: sufficient recycled water supply is available and funding is available to support the cost of new infrastructure.

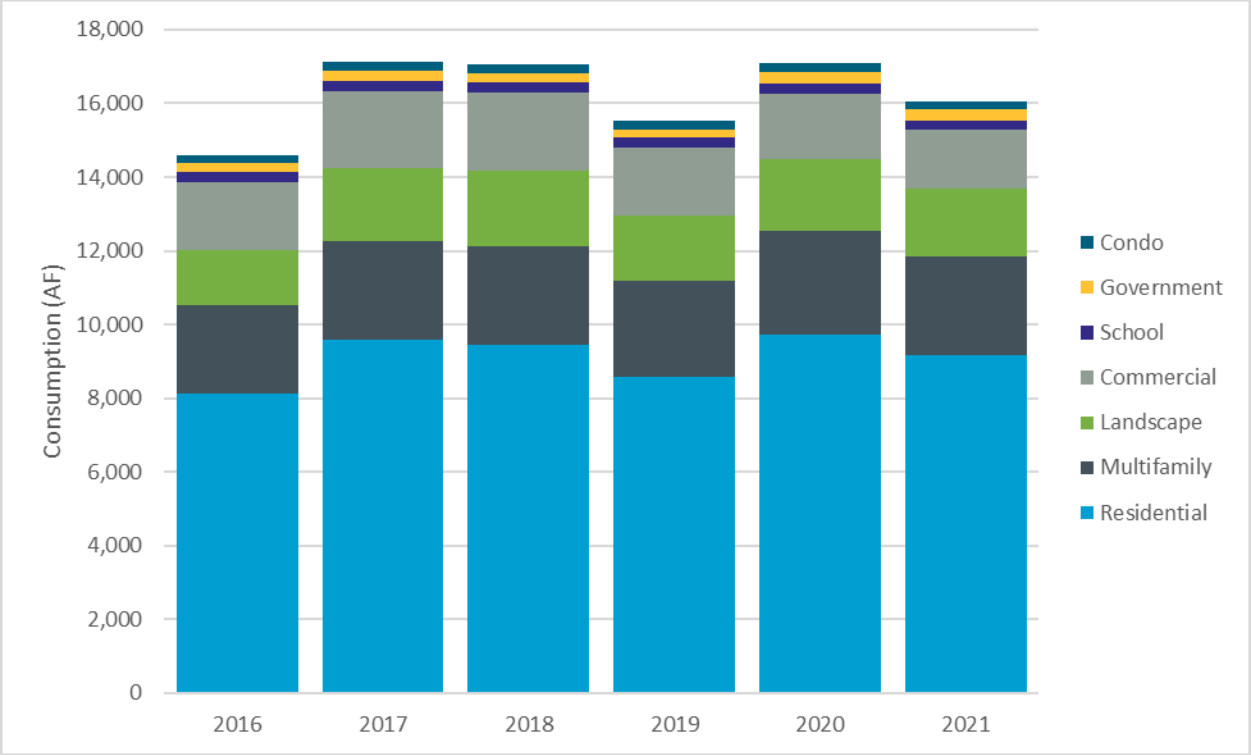


Figure ES-4. Historical water consumption by customer class

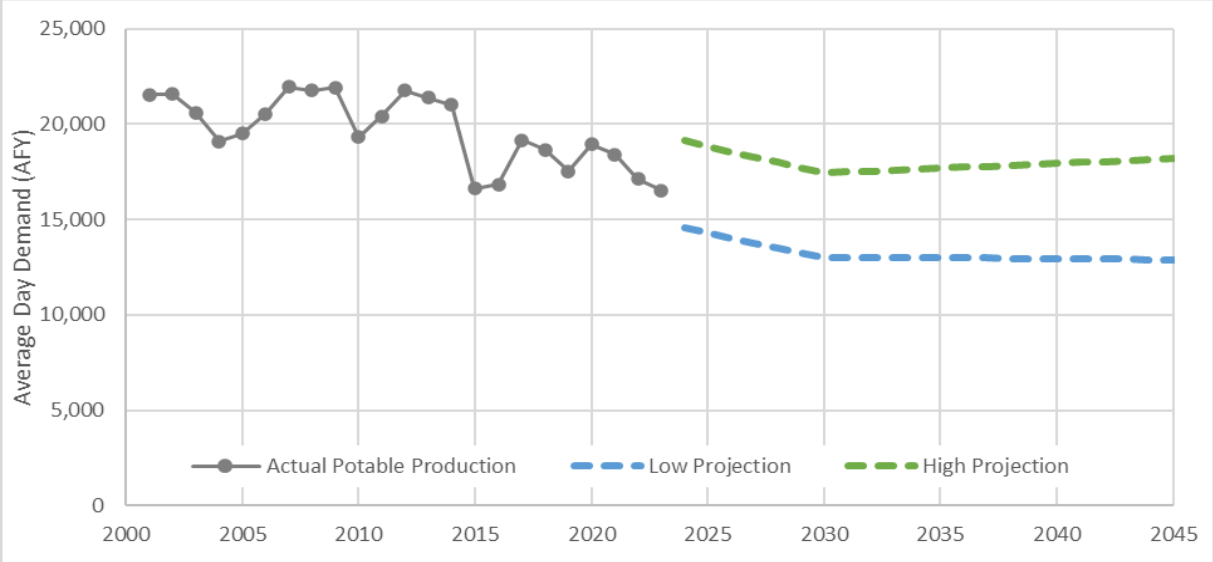


Figure ES-5. Projected potable water demand

Hydraulic Model Development

The facilities from the City's existing model were imported into InfoWater Pro and updated based on the most current GIS data of the system and supplemental information. The model includes all major system components and is structured by pressure zone. Demand allocation was performed using geocoded billing data from 2016–2021, assigned to model junctions based on proximity.

The model was calibrated using SCADA data and hydrant flow tests conducted in September 2023. Calibration included extended period simulation (EPS) and fire flow scenarios. EPS calibration matched modeled pressures and flows to field conditions over a 24-hour period. Fire flow calibration adjusted pipeline roughness coefficients to match field test results. Calibration results showed good agreement between modeled and observed data.

Multiple scenarios were simulated for existing and future (2045) conditions, including average day, maximum day, peak hour, and fire flow events. The model was used to evaluate system performance and support CIP development.

Evaluation Criteria

Evaluation criteria were established to assess system performance under existing and future conditions. These include pressure, fire flow, storage, pump station capacity, and pipeline velocity requirements. Minimum pressure is 40 psi under peak hour demand and 20 psi during fire flow events. Maximum pressure varies by zone, up to 190 psi.

Fire flow requirements range from 1,500 to 4,500 gpm for 2–3 hours depending on land use. Storage requirements include 30% of MDD for operational use, maximum fire flow x duration for fire storage, and 100% of MDD for emergency storage. Pump stations must meet MDD+FF with the largest unit out of service. Pipeline velocity limits are 5 fps (ADD), 7 fps (PHD), and 10 fps (MDD+FF). These criteria were applied consistently across scenarios to identify needed improvements.

A summary of the modeled demand scenarios used for the evaluation is included in Table ES-3.

Table ES-3. Model Demand Scenarios

Pressure Zone	Existing 2024 MDD (mgd)	Future 2045 MDD (mgd)	
		High	Low
Zone 1	11.46	11.71	8.29
Zone 2	7.74	7.09	5.01
Zone 3	8.42	10.17	7.20
Zone 4	4.19	3.90	2.76
Zone 5	2.80	2.58	1.82
Total	34.61	35.45	25.08

Existing System Condition Assessment

A high-level condition assessment was performed for pipelines, wells, booster pumps, and storage reservoirs. The majority of pipes are 6-8 inches in diameter, constructed primarily from cement mortar lined and coated steel. Many are at or beyond their 60-year useful life. Leak history and age were used to prioritize replacements. Small diameter galvanized steel pipelines in alleyways were identified for replacement or abandonment due to deteriorating condition and restricted service pressures.

Southern California Edison testing in 2023 identified three wells and three booster pumps operating below expected efficiency, with recommendations for rehabilitation or replacement. City staff identified additional electrical panel upgrades and mechanical repairs at several facilities. Harper and Associates conducted field evaluations of all twelve storage reservoirs, identifying fifteen projects across four prioritization categories, with several reservoirs in poor or critical condition requiring immediate attention.

Existing System Capacity Assessment

The hydraulic model was used to assess system capacity under ADD, MDD, and MDD+FF scenarios. No pressure or velocity concerns were identified under ADD or MDD conditions. Under fire flow conditions, 428 hydrants failed to meet pressure and flow criteria, primarily in older areas of the City with undersized pipes and hydrant laterals. Model results for the existing fire flow conditions are shown in Figure ES-6. Pump station firm capacities were compared to required capacities, with no deficiencies identified. All zones except Zone 3 have sufficient storage capacity; Zone 3's deficiency is mitigated by supply from adjacent zones and overall system surplus.

Future System Capacity Assessment

The future assessment evaluated system performance under 2045 high-demand projections. No additional pipeline velocity or pressure criteria triggers were identified under future demand conditions. Pump station capacity remains sufficient, provided ongoing maintenance is sustained. Required storage is expected to decrease slightly, with all zones except Zone 3 maintaining sufficient capacity. Zone 3's deficiency is mitigated by supply from adjacent zones and systemwide surplus.

Summary of Recommendations

A significant portion of the water distribution system is at or nearing the end of its useful life, including over 100 miles of pipe and half of the storage reservoirs. The city will need to ramp up its pipeline replacement program to avoid major pipe failures and loss of service. Fire flow deficiencies affecting 428 hydrants require approximately 15 miles of pipeline improvements, with priority given to projects that address both capacity and condition concerns. Reservoir and pump deficiencies identified by recent assessments should be addressed in order of significance, with Well 20 and critical reservoir roof and coating repairs as the highest priorities. The city should develop a replacement optimization plan to prioritize future pipeline and reservoir projects. Non-pipe projects, including pump and electrical upgrades, should be addressed as funding allows, with efficiency improvements implemented as needed to maintain system reliability. Expansion of the recycled water system should proceed as funding and supply allow. An overview of the potable water system improvements are presented in Figure ES-7.

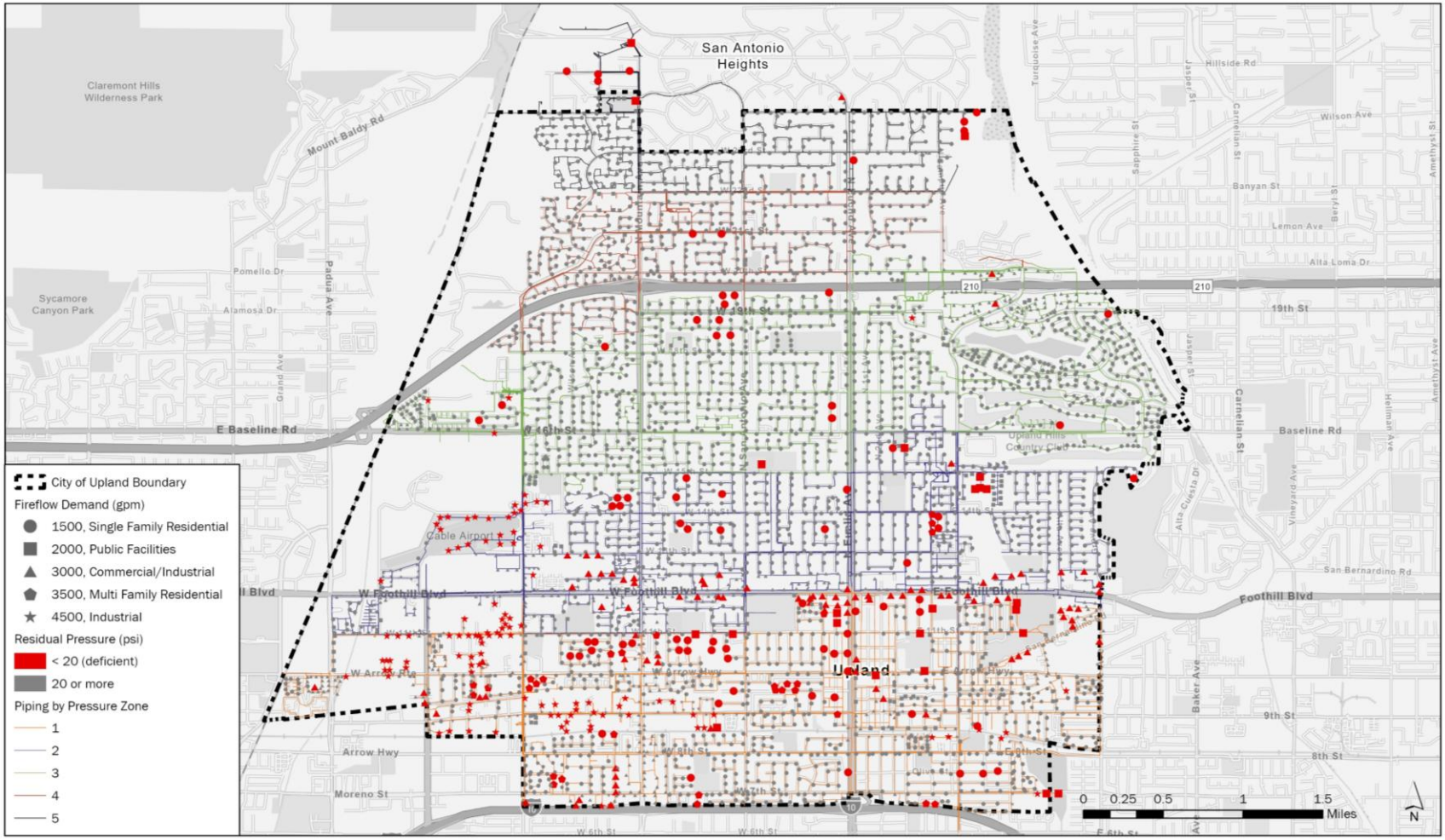


Figure ES-6. Existing system fire flow deficiencies

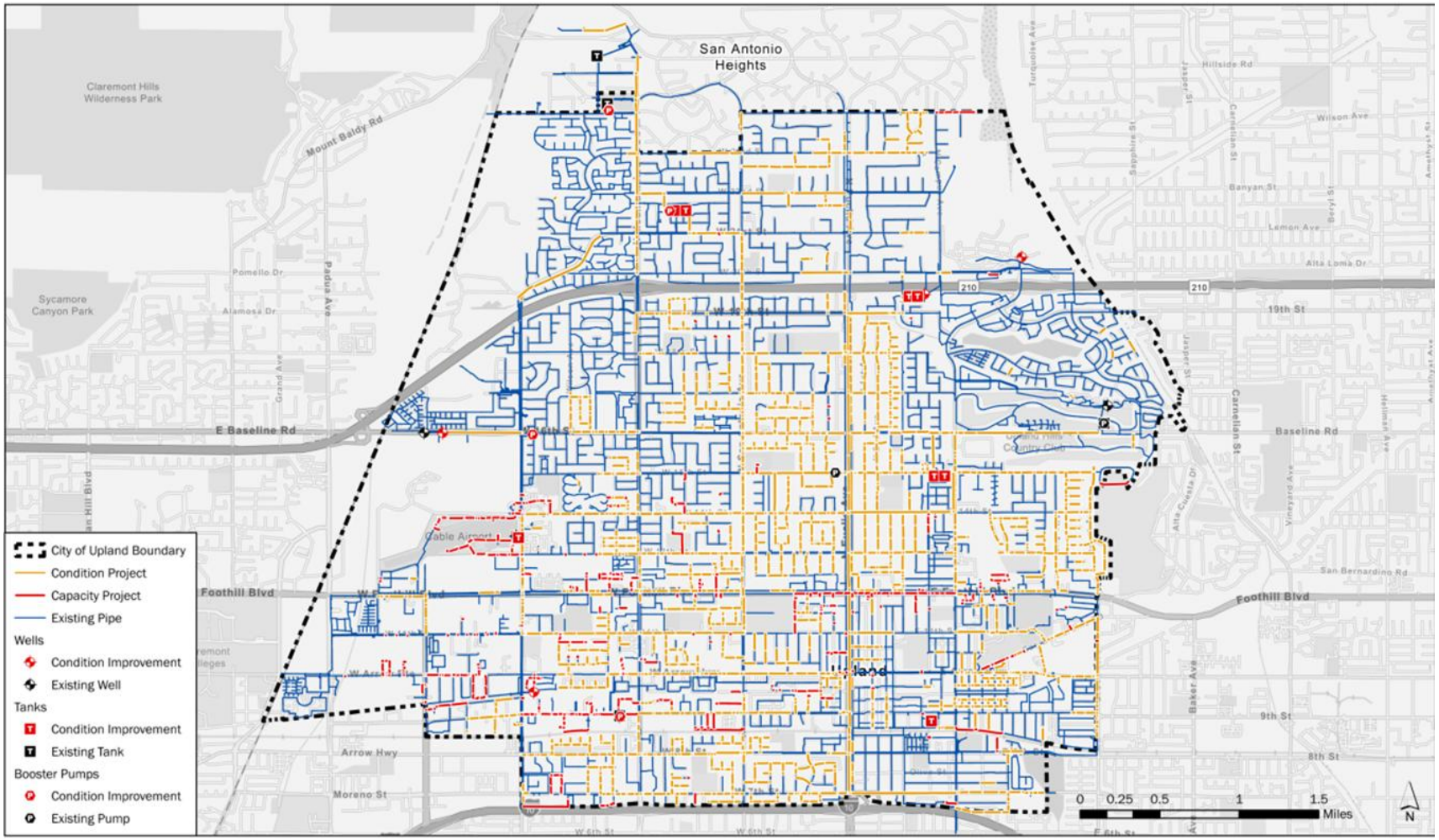


Figure ES-7. Recommended system improvements

Capital Improvement Plan

The CIP provides a long-range framework for prioritizing rehabilitation, replacement, and capacity improvements to maintain reliable service. Cost estimates are based on April 2025 construction cost data and Class 5 estimating standards, with a thirty percent allowance for soft costs. The CIP is phased into near-term (2027–2030, approximately $70 million), mid-term (2031–2040, approximately $80 million), and long-term (post-2040, approximately $1.4 billion) projects. The majority of CIP costs are associated with pipeline rehabilitation and replacement, which account for about two thirds of expenditure through mid-term and over 95 percent of long-term expenditures. Coordination with the city's road paving program is recommended to optimize resources and minimize disruption. The city's target annual CIP spend is set to start at $16 million and gradually increase as implementation capacity grows. Project phasing may be accelerated if additional funding or staffing becomes available. The city should continue to monitor grant and loan opportunities to support system expansion and improvement. The potable water CIP is illustrated in Figure ES-8, ES-9 and ES-10.

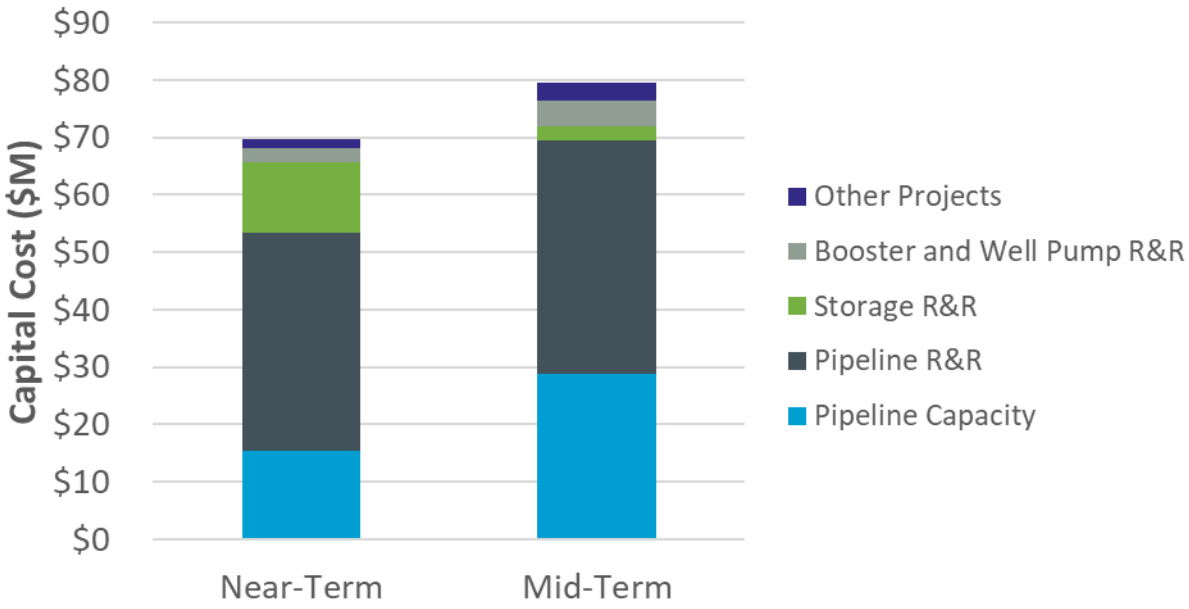


Figure ES-8. Water CIP by improvement category and phase (excludes long-term projects)

Pipeline capacity and R&R projects may address a combination of both capacity- and condition-related deficiencies.

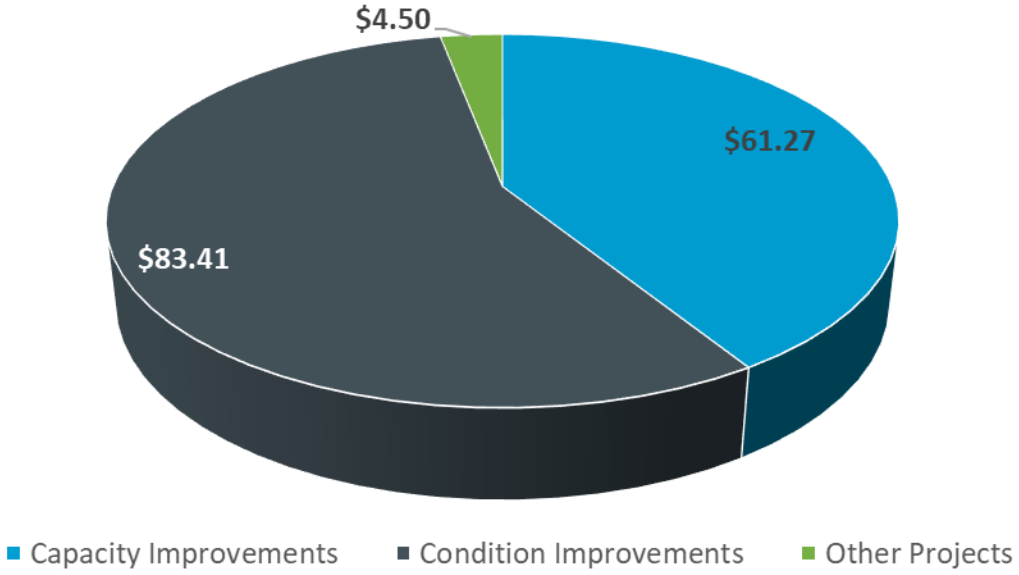


Figure ES-9. Water CIP cost ($M) by facility type (excludes long-term projects)

This budget breakdown allocates the cost of pipeline projects based on the length associated with capacity versus condition improvements

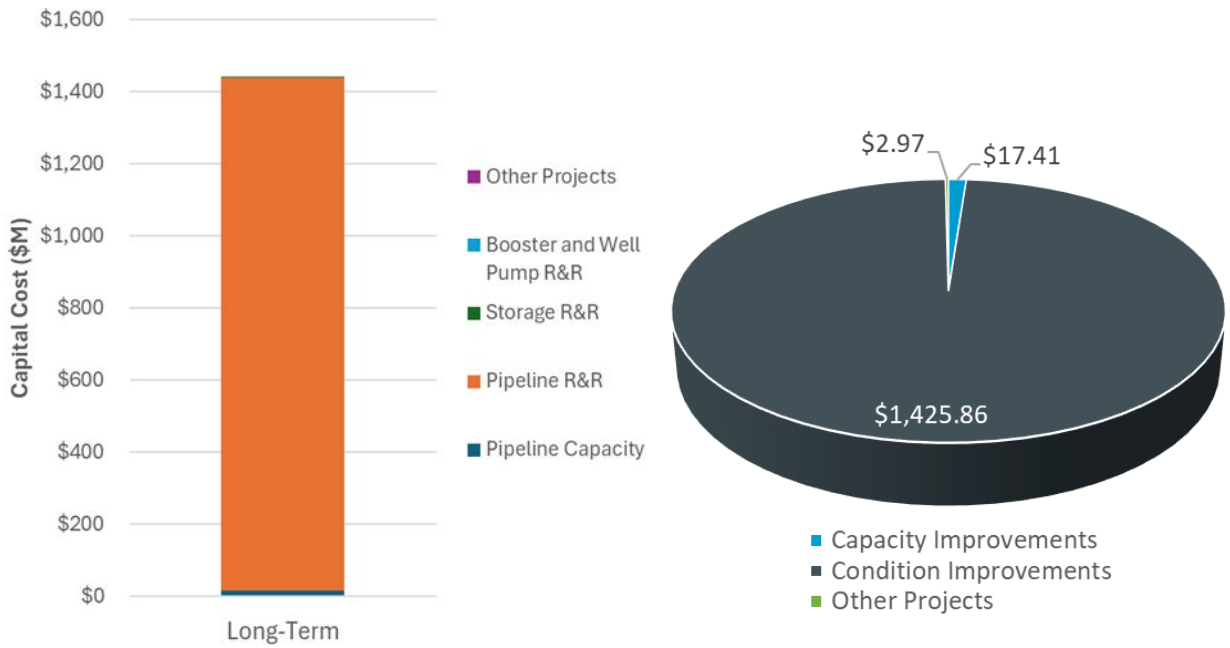


Figure ES-10. Water CIP cost ($M) by category and facility type - long-term projects only

This budget breakdown allocates the cost of pipeline projects based on the length associated with capacity versus condition improvements

Next Steps

While this master plan effort is the most comprehensive system assessment the city has conducted to date, there are additional projects and efforts needed to continue to improve and maintain the potable and recycled water systems. In addition to the system improvements identified as part of this master plan effort, the city has identified three key sets of next steps:

1. **Conduct detailed facility condition assessments** –the city will establish and implement guidelines to assess the condition of key facilities.
1. **Implement additional projects and fill equipment needs** – In parallel to the CIP presented in the master plan, city staff conducted a comprehensive review to identified additional system and equipment needs, including one-time repairs and recurring maintenance as well as staffing gaps (see below).
2. **Expand public works staff to facilitate the implementation of the CIP for the water and wastewater systems and the continued operation and maintenance of its utilities** - To support CIP implementation, the city has identified significant staffing shortfalls—nearly 100 full-time equivalents compared to peer agencies. A Phase 1 Staffing Plan was approved in June 2025 to add positions for CIP delivery and utility operations, with additional organizational improvements under review.

The findings of the water CIP will be incorporated into the city's rate study and used to plan service rate changes. These findings will also be used to support the development of a capital and utility cash reserve policy to support the city's mission to maintain a high level of service.

Section 1
Introduction

The City of Upland (city) contracted with Brown and Caldwell (BC) to develop this Water and Recycled Water Master Plan (W-RWMP) that will evaluate the performance and condition of the city's potable water and recycled water systems under both existing and future conditions through 2045. The city's collection system master plan is being developed in parallel to ensure that master plan planning horizons and assumptions are aligned. This introductory chapter will present the background, purpose, objectives, and report organization of this W-RWMP.

1.1 Background

The city's Water Master Plan and its Recycled Water Master Plan were last updated in 2010 and 2008, respectively. The 2010 Water Master Plan Update incorporated land use changes since the prior 2007 update and considered the recently completed 2008 Recycled Water Master Plan to develop a summary of system recommendations and planning-level project cost estimates for those recommendations. The 2008 Recycled Water Master Plan was developed to identify potential recycled water customers and set guidelines for the construction of a recycled water system within the city service area through a Capital Improvement Program (CIP).

Since the completion of these master plans, the city service area has experienced notable changes related to water demands and potential recycled water customers. Unforeseen multi-year drought conditions have resulted in mandated statewide conservation efforts. These efforts have led to significant water demand reductions and a subsequent reduction in wastewater flows, which has resulted in less available flow for recycled water use. Due to these changes, the city recognizes the importance of updating both plans and developing integrated CIP infrastructure upgrades and construction for the water, recycled water, and wastewater systems. The following W-RWMP will consider the water and recycled water systems—with a parallel effort underway evaluating the wastewater system—to develop a comprehensive and unified plan that extends through 2045. This evaluation represents the most comprehensive master plan undertaken by the city to date.

1.2 Study Area

The city is located in the western region of San Bernardino County, bounded by the San Gabriel mountains to the north, Grove Ave and the I-10 Freeway to the south, Rancho Cucamonga to the east, and Los Angeles County (LA County) to the west. The city boundary encompasses approximately 15 square miles of land and an additional 3 square miles of unincorporated areas within the city's "Sphere of Influence." The total planning area includes about 18 square miles, with the service area for the water and recycled water systems detailed below. A map of the city boundary and service areas is included in Figure 1-1.

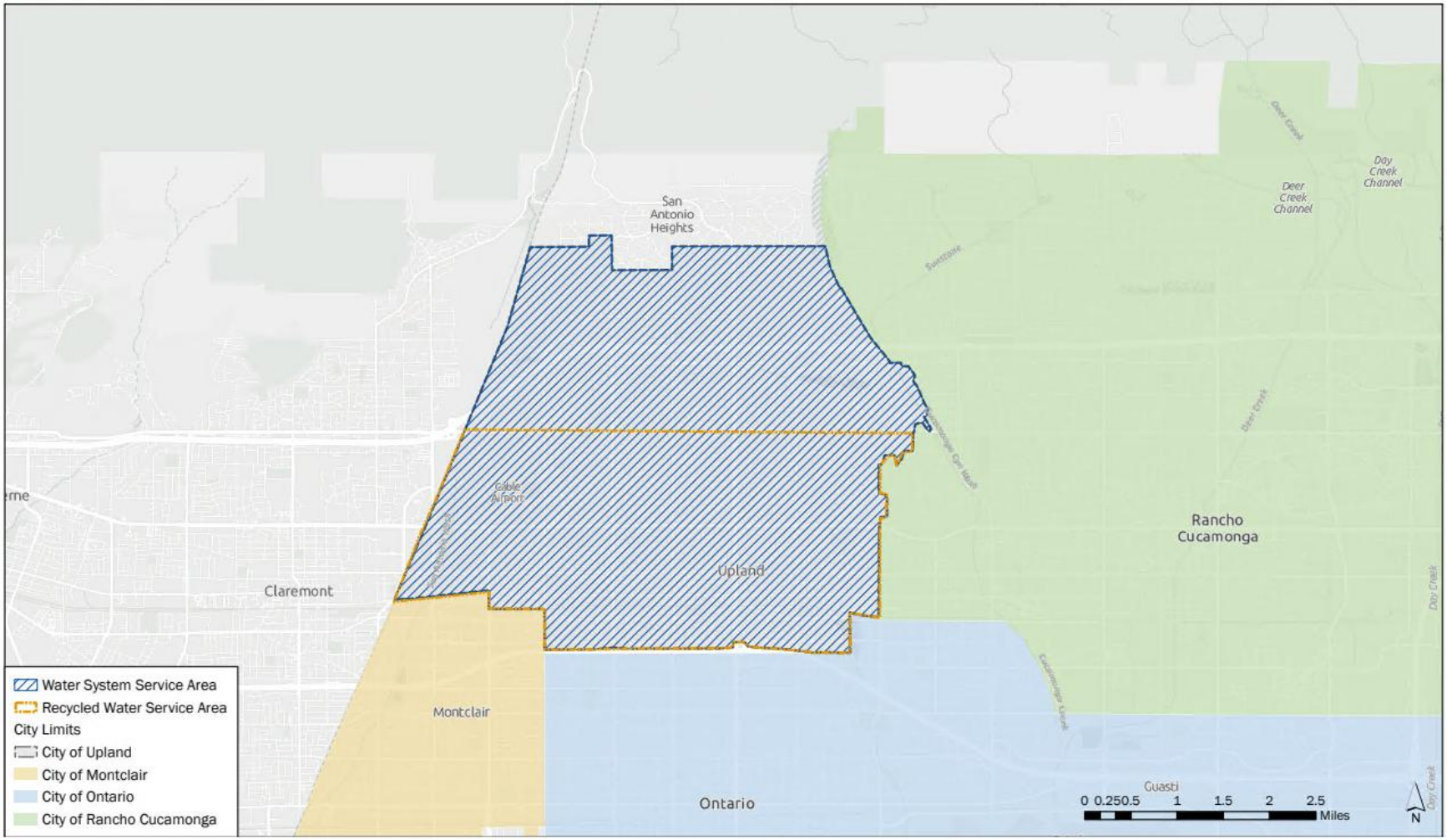


Figure 1-1. Study area

The City of Upland serves potable water to a population of approximately 79,000. The city could be classified as a bedroom community, primarily comprised of single-family homes, with some multi-family homes, commercial uses, and limited industrial uses. Future city growth is constrained by its 95% build-out status, with development opportunities concentrated on existing vacant lots and the redevelopment of older, lower-density areas. The city's weather and climate are typical of the Mediterranean climate, characterized by mild winters with moderate rainfall, warm summers, and year-round sun. Climate change is anticipated to result in overall higher temperatures within the service area, along with more frequent and extreme weather fluctuations such as drought and heatwaves, which will play an important role in the demand for water within the city's service area.

Water Study Area

The city's water service area coincides generally with the city limits as detailed above. The northern boundary of the service area coincides with the southern boundary of the San Antonio Heights residential community and the San Gabriel Mountains.

Recycled Water Study Area

The current recycled water service area provides water to 24 customers in the area bounded by E 16th Street and E 7th Street to the north and south, respectively, and Palm Ave and 11th Ave to the west and east, respectively. Recycled water is provided to the city by the Inland Empire Utilities Agency (IEUA). Recycled water is either directly provided to customers following treatment by IEUA or is used as a supplemental source to recharge the groundwater aquifer for groundwater replenishment. The city has plans to expand the recycled water system along 11th Street and 15th Street, which would extend the study area boundary. System expansion will depend on project funding and water supply availability.

1.3 Goals and Objectives

This W-RWMP consolidates and updates prior master plan data—including supply/demand projections, hydraulic modeling, and CIP updates—to accurately reflect current conditions. This extended 2045 planning horizon guides the City's development of potable and recycled water system facilities. The objectives of this W-RWMP are:

3. Identify existing and build-out (2045) potable water demands and recycled water demands.
4. Define the planning and evaluation criteria for the city's potable and recycled water systems.
5. Identify deficiencies in the city's potable water system under existing and build-out conditions.
6. Identify necessary recycled water system infrastructure and upgrades to serve the city's existing and potential recycled water customers.
7. Prepare an integrated CIP with phasing of recommended improvements and an integrated phasing plan.

1.4 Report Organization

The Master Plan is divided into 9 sections, with the background, analysis, and findings documented in the first 7 sections, as outlined below:

- **Section 1 –** Introduction: Describes the study's objectives.
- **Section 2 –** Study Area: Provides an overview of the master plan study area, climate, land use, and population.
- **Section 3 –** Water Demand, Recycled Water Forecast: Describes the water demand and recycled water demand projections used for the system analysis.

- **Section 4 –** Hydraulic Model Development: Discusses the update to the hydraulic model, model calibration, and model scenarios.
- **Section 5 –** Evaluation Criteria: Describes the evaluation criteria used to assess the performance of the city's water and recycled water systems.
- **Section 6 –** Potable Water System Evaluation: Describes the evaluation of the water supply, storage, and booster station pumping capacities to meet future water demands. It provides recommended improvements necessary to address the identified deficiencies and to ensure reliable system performance.
- **Section 7 –** Capital Improvement Plan: Summarizes cost estimating assumptions and includes capital improvement project costs. Recommended projects are summarized and grouped by project type and phasing.
- **Section 8 –** Limitations
- **Section 9** – References

Section 2

Existing System, Climate, Land Use, and Population

This section presents a summary of the existing system, climate, land use, and population within the study area of this W-RWMP.

2.1 Existing System

The city's water distribution system includes about 325 miles of city-owned pipeline, ranging in size from under 2 inches to 24 inches in diameter. The city is supplied by 2 treatment plants, 13 groundwater wells, and 3 inter-agency connections, with 30 booster pumps and 12 storage tanks (referred to as reservoirs) supporting system operations and reliability.

Much of the city's distribution system was constructed between 1960 and 1990. The city manages a pipe replacement and maintenance program, with many of the pipelines over 50 years old now showing signs of condition degradation and replacement need. A summary of the existing distribution system is presented in Table 2-1 and a map of the system is included in Figure 2-1 and a schematic is provided in Figure 2-2.

Table 2-1. Existing System Summary

Facility Summary	Notes
2 treatment plants with capacities of 4.5 and 18.6 mgd	WFA/JPA and SACWTP
13 wells managed by the city	Does not include the 10 wells owned by neighboring agencies which the city contracts for supply.
3 inter-agency connections	The city maintains inter-agency connections with GSWC, MVWD, and CVWD
10 booster pump stations	
12 storage reservoirs	
325 miles of distribution pipe	Under 2" to 24" pipe diameter. The city also utilizes around 3 miles of WFA pipelines up to 42" diameter.

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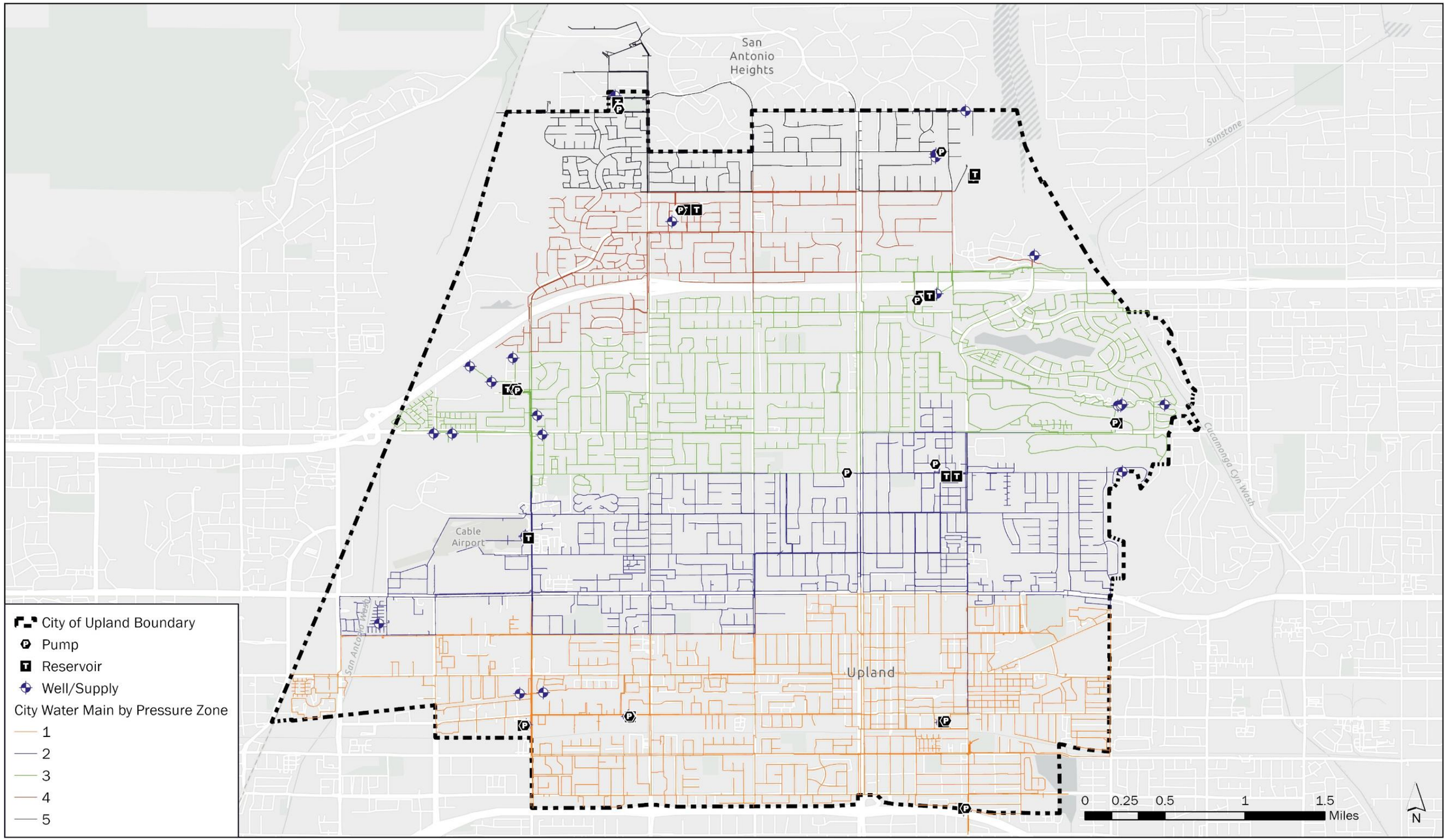


Figure 2-1. System overview

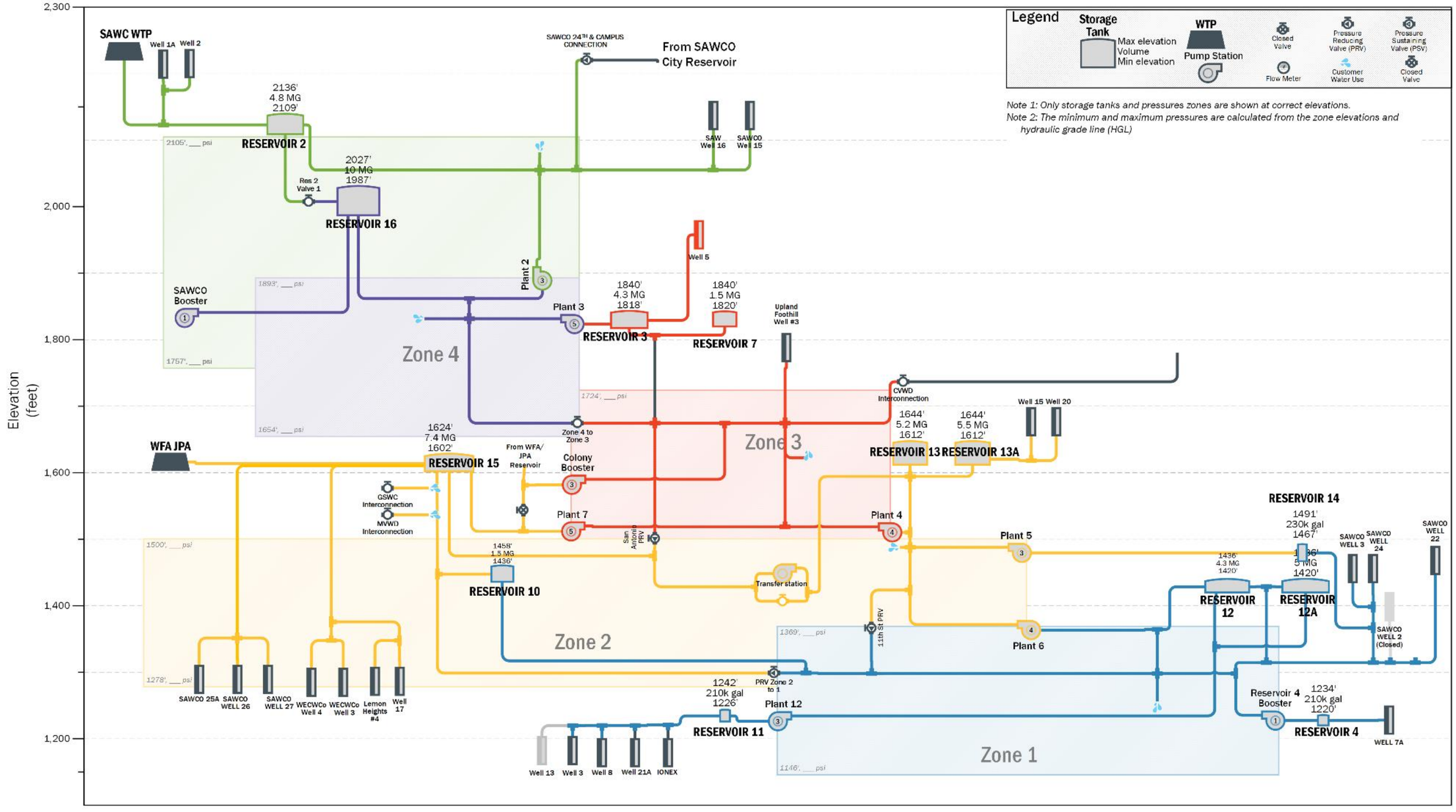


Figure 2-2. City of Upland water system schematic

2.2 Climate

The city is in San Bernardino County, with weather and climate typical of a Mediterranean climate, characterized by mild winters with moderate rainfall, warm summers, and year-round sun. The city currently receives an average of 16.7 inches of precipitation with average winter temperatures of about 52 degrees and average summer temperatures of about 79 degrees. Average evapotranspiration (ETo) totals 49.9 inches and ranges from about 2.0 to 6.7 inches monthly throughout the year (based on average climate data from 1991 to 2021). Monthly and average precipitation, temperature, and ETo are summarized in Table 2-2.

Table 2-2. Climate

Month	Average Rainfall (inches)[a]	Average ETo (inches)[b]	Average Minimum Temperature (◦F) [a]	Average Maximum Temperature (◦F)[a]
January	3.8	1.98	41.4	63.6
February	4.2	2.48	41.9	63.7
March	2.4	3.78	45.1	68.1
April	1.0	4.75	48.1	72.0
May	0.6	5.26	53.1	77.1
June	0.1	6.03	58.9	84.1
July	0.1	6.70	65.1	89.9
August	0.0	6.47	65.3	90.7
September	0.2	4.94	62.2	88.0
October	0.8	3.49	55.0	79.5
November	1.1	2.34	47.4	70.5
December	2.5	1.72	41.2	62.4
Annual	**16.7**	**49.94**	**52.1**	**75.8**

a. Source: Climate Data.org. Data Period of Record: 1991-2021
b. Source: California Irrigation Management Information System (CIMIS), Pomona Station (78).

Climate change is anticipated to result in overall higher temperatures within the service area, along with more frequent and extreme weather fluctuations such as drought and heatwaves. In the past 20 years, the city has seen annual precipitation fluctuate from a low of 7.2 inches during the 2013 drought to a high of 43.9 inches in 2019. Variation in precipitation and temperatures impact the city's water supplies and demands, with drought conditions spurring additional conservation efforts. Climate change impacts have been incorporated into the demand projections and supply considerations, discussed further in Section 3.

2.3 Land Use

The city's General Plan guides development within the city's planning boundary and establishes long-range development policies. The General Plan also provides land use projections. Land use information is an integral component in determining the amount of water use within the city. The type of land use in an area will affect the volume of water use, as well as the volume and character

of wastewater generation. Adequately estimating water use and wastewater generation from various land use types is important in sizing and maintaining effective water and sewer system facilities.

Data for the city's existing land use was extracted from San Bernadino County GIS data (presented in Table 2-3). The city is mostly (95 percent) built out and primarily residential (roughly 70 percent), with industrial and commercial use making up the majority of the remaining development. Future land use data was gathered from the city's General Plan and Planning Department. The city's most recent General Plan was adopted in 2015 and is currently being updated to account for changes in State and local policy regarding housing needs and additional dwelling units and covers growth outside of the city's existing service area. Additional details regarding future land use within the city is discussed in the following section.

Table 2-3. Land Use

General Plan Land Use Category	County Land Use	Existing Area (acres)	Ultimate Area per General Plan (acres)
n/a	Agricultural	40	-
Commercial	Administrative/Professional	36	-
	Commercial	864	329
	Multiple Zonings	5	856
Industrial	Industrial	1,941	1,022
Special/Institutional	Public Facilities	116	1,568
	Restricted	383	
Specific Plan	Specific Plan	-	64
Single-family Residential	Single-family Residential	4,976	4,970
Multiple-family Residential	Multiple-family Residential	122	541
	Total	**8,483**	**9,350**

The General Plan classifies 21 specific land use types into six categories, whereas the County specifies 10 land use categories. For comparative purposes, the 10 County categories could be grouped and aligned with the six General Plan categories. A summary of the existing and future land use is included in Table 2-3 and shown in Figure 2-3 (existing land use) and Figure 2-4 (future land use).

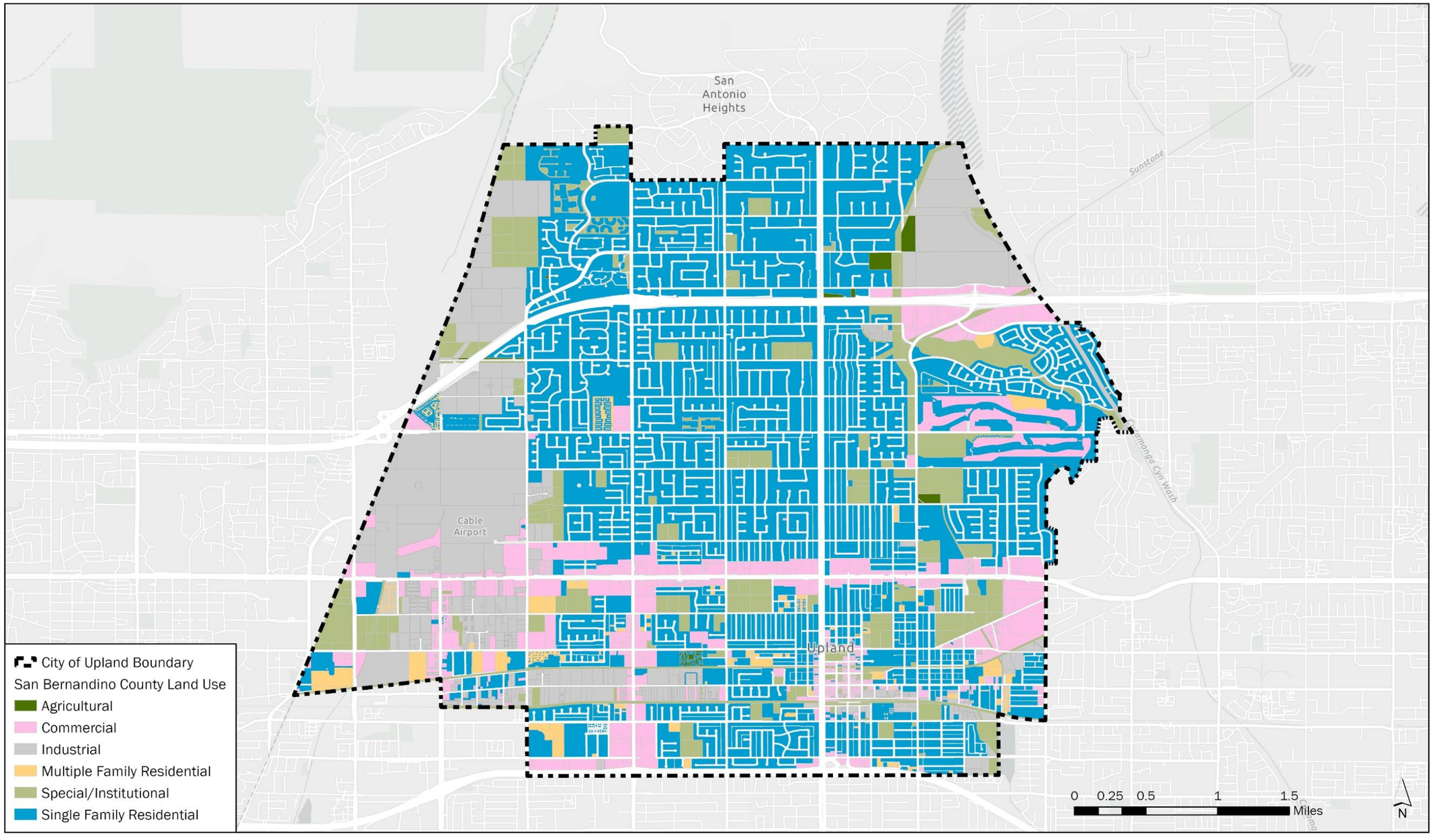


Figure 2-3. San Bernardino County land use (existing)

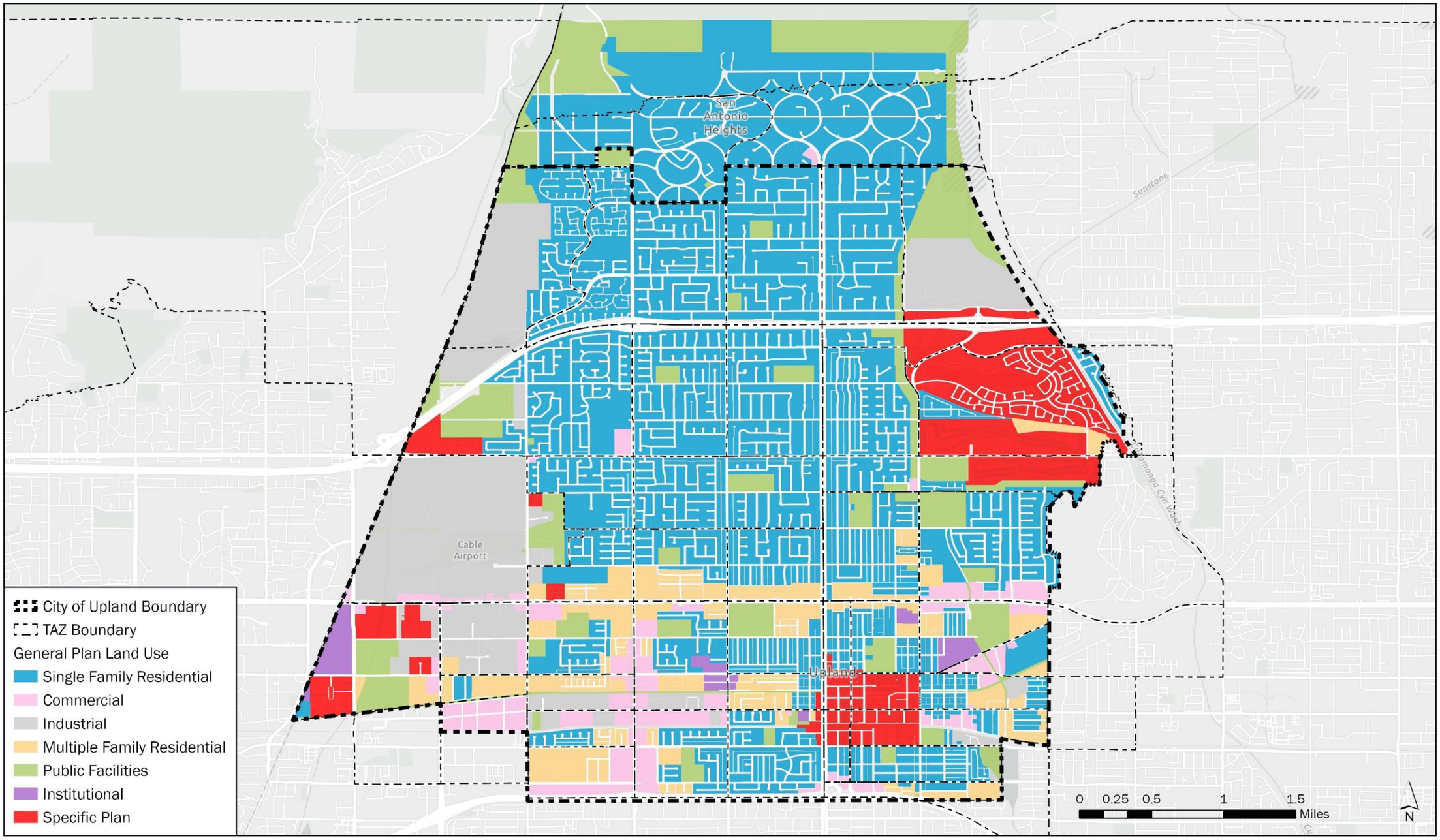


Figure 2-4. General Plan (future) land use map

2.3.1 Projected Land Use

Future land use includes the development of vacant or underdeveloped areas not defined by known developments, which are referred to as infill. It is assumed that development, redevelopment, and infill will be according to the land use designations as depicted previously in Figure 2-4.

Buildout is defined as development of all land included in the planning area of the city and, as the city is already mostly developed, is anticipated by approximately 2045. At buildout, the city will encompass approximately 14.6 square miles. Development through buildout was projected based on the findings of the Regional Housing Needs Allocation (RHNA) and the city's 2021-2029 Housing Element, consolidated by the Southern California Association of Governments (SCAG), as detailed below.

The city is a member of SCAG, a Joint Powers Authority that coordinates to address regional issues and develop growth forecasts. SCAG uses a local input process to incorporate information on current land uses and anticipated growth. The city participated in this process and provided expected growth within its sphere of influence between 2019 and 2050, broken down spatially by traffic analysis zone (TAZ). The city's local input to SCAG included expected non-residential infill and redevelopment within the TAZs, as well as residential growth information from the RHNA and the city's 2021-2029 Housing Element.

The RHNA process is conducted by the California Department of Housing and Community Development to ensure adequate planning to meet the housing needs of everyone in communities across the state. The RHNA process starts with the determination of the housing needs at different affordability levels, broken down into 21 regions across the state, at which point each region allocates the housing needs to the local governments based on expected population changes and existing housing inventories. The city's 2021–2029 Housing Element accounts for the findings of the latest RHNA report (providing housing needs for 2021–2029), broken down for local governments by SCAG.[1] Expected growth by TAZ was broken down by changes in single and multi-family homes and retail and non-retail employment. A summary of known developments is provided in Table 2-4 and the city's local input worksheet is provided in Appendix A.

[1] A copy of the City's Housing Element and the relevant RHNA report are available at the following links:

2021-2029 Housing Element:
https://www.uplandca.gov/uploads/files/DevelopmentServices/Housing%20Element%20Update%202021-2029/Upland_HEU_05-09-2024_REV.pdf

2021-2029 RHNA Report to SCAG: https://scag.ca.gov/sites/main/files/file-attachments/hcd-scag-rhna-final-determination-101519.pdf?1602190258

Table 2-4. Known Future Developments

Development Name[a]	Land Use	Residential Units	Size
Dutch Bros. Coffee[b]	Commercial	--	950 sf
Project: Bridge Point Upland Project	Industrial	--	201,096 sf
Colonies Condos	Multi Family Residential	60	--
Villa Serena	Single Family Residential	65	--
Colonies Campus Center[b]	Mixed Use/Commercial	--	TBD
The Colonies Self Storage building	Commercial	--	164,570 sf
Mountain Green Center – Chick-fil-A Restaurant[b]	Commercial	--	TBD
Yellow Iron[b]	Industrial	--	77,000 sf
Upland Packing House	Multi Family Residential	111	--
Upland Apartments	Multi Family Residential	4	--
Mesa Court Apartments	Multi Family Residential	60	--
Kiva Apartments	Multi Family Residential	66	--
Medical Office Building	Commercial	--	3,475 sf
Commercial/Office Shell Building	Commercial	--	4,000 sf
Foothill Self Storage	Mixed Use/Commercial	--	TBD
Rose Glen Specific Plan[b]	Single Family Residential	64	--
Cable Airport Event Center	Commercial/Industrial Mixed-use	--	15,462 & 11,135 sf
Upland Oncology Center	Commercial	--	3,361 sf
Nisbit Property Subdivision	Residential	8	9.373-14,925 sf
Euclid/Foothill Adaptive Reuse	Commercial/Residential Mixed-use	--	8,685 sf
SAWCO Office Headquarters	Public/Institutional	--	3,698 & 4,066 sf
Roberts Campus Sports Bowl	--	--	--
West Foothill Development	Industrial/Commercial	6	3,750 /45,476 / & 55,616 sf
Quick Quack Car Wash	--	--	2,596 sf
Huntington Drive Townhomes	Residential	39	--
Mountain Green Pads/McDonalds	Commercial	--	--
9th Street Apartments	Multi-Family Residential	20	--
The Courtyard at Upland	--	--	--
Upland Event Center	--	--	1,462 / 3,040 / & 12,232 sf
Starbucks at College Park	Commercial	--	2,434 sf
Buffalo Grove	Multi-Family Residential	72	1,695-1,958 sf
Arrow Townhomes	Multi-Family Residential	132	--
Downtown Parking Structure	--	--	--
IVRS Juvenile Residential Care Facility	Commercial	16	12,000 sf
Washington Street Condominiums	Residential	7	--
City Ventures Townhomes	Residential	32	--

Table 2-4. Known Future Developments			
Development Name[a]	Land Use	Residential Units	Size
Magnolia Villas	Multi-Family Residential	93	--
Euclid Villas	Multi-Family Residential	81	1,500 sf
Memorial Park Water Tower	--	--	--
Vernon Drive Apartments	Multi-Family Residential	24	--
Firefly Cottage	Commercial	--	2,642 sf
Commercial/Office Shell Building	Commercial	--	3,190 sf
RAD Coffee	Commercial	--	--
Hair Secrets	Commercial	--	--
The Independent Order of Odd Fellows	--	--	--
Tom Thomas Magnolia Plaza along the Pacific Electric Trail	--	--	--
Bodenhamer Park	--	--	12,616 sf

a. *Development list provided by city Planning Department.*
b. *Development was in planning phase at the initiation of this master plan effort but was completed prior to the report being finalizing. The development is not reflected in the existing water demands or model loading.*

It should be noted that the city has identified the need to increase the development of accessory dwelling units (ADUs) to provide additional affordable housing options. The Upland Municipal Code allows ADUs in all residential zones, and the city averages 45 new ADUs per year as of the publishing of the Housing Element. While ADUs offer benefits to housing inventory, they have the potential to increase population density above the capacity of the existing utilities. Since ADU development relies on existing homeowners for implementation, it will be important to review system capacity as part of the ADU approval process.

2.4 Population

This section describes the city's current population as well as projected populations throughout the planning period. Historical population estimates from SCAG from 2000 through 2018 are presented in Table 2-5 and depicted on Figure 2-4. As of the 2020 U.S. Census, the total existing population within the city's boundaries was estimated at 79,040.

Table 2-5. Historical Population		
Year	Historical Population[a]	Average Annual Growth (%)
2000	68,393	--
2002	70,357	1.4%
2004	71,831	1.0%
2006	72,198	0.3%
2008	72,654	0.3%
2010	73,732	0.7%
2012	74,568	0.6%
2014	75,147	0.4%
2016	75,774	0.4%
2018	77,017	0.8%
2020	79,040	1.3%

a. *From SCAG and U.S. Census*

The city's 2020 Urban Water Management Plan (UWMP) includes the city's service area population projection using data from SCAG and IEUA. As detailed further in Section 3.2, this study used a low and high population projection as the basis for the demand scenarios. The population projection used for these scenarios are shown in Figure 2-3. The low scenario population projections were estimated from SCAG data (with the latest RHNA information)—indicating some near-term growth with minimal growth after 2035—while the high scenario population projections were estimated from the 2020 UWMP which projected steady growth through the planning period. A summary of the historical and projected populations are included in Table 2-6 and shown in Figure 2-4.

Table 2-6. Projected Population				
	Low		High	
Year	Projected Population[a]	Average Annual Growth (%)	Projected Population[b]	Average Annual Growth (%)
2025	74,700	--	81,177	--
2030	76,200	0.4%	84,071	0.7%
2035	81,600	1.4%	87,036	0.7%
2040	81,700	0.0%	89,902	0.7%
2045	81,800	0.0%	92,862	0.7%

a. *From SCAG, accounting for the 2022-29 RHNA findings.*
b. *From 2020 UWMP Table 3-1, provided by IEUA from SCAG data*

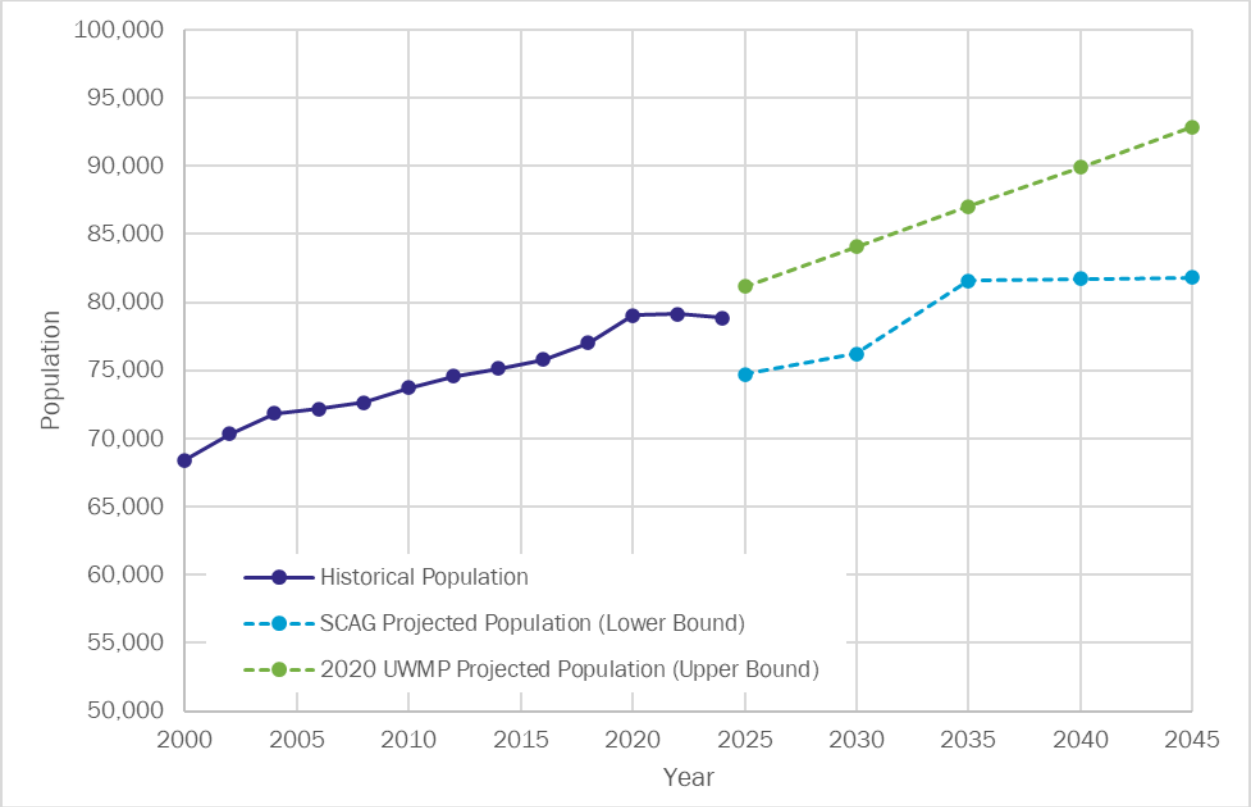


Figure 2-5. Historical and projected population

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Section 3

Supply and Demand

This section summarizes the existing and projected supply and demands for the potable and recycled water systems.

3.1 Potable Water Supply

This section describes the city's existing and projected potable water supply, including a review of the supply water quality and potential constituents of concern.

3.1.1 Historical Potable Water Supply

The city's potable water supply consists of multiple sources:

- Imported water from Metropolitan Water District (MWD) purchased through IEUA for treatment at the Water Facilities Authority (WFA)/Joint Powers Authority Agua de Lejos Water Treatment Plant
- Groundwater pumped from city-owned wells and West End Consolidated Water Company (WECWC)
- Groundwater purchased from San Antonio Water Company (SAWCo)
- Surface water purchased from SAWCo and treated by the city
- Recycled water purchased from IEUA

The groundwater sources are located in three basins: Chino, Six (specifically the Upper Claremont Heights and San Antonio Canyon subbasins), and Cucamonga.

Per the 2020 UWMP, the city has an available potable water supply of around 24,600 acre-feet per year (AFY) in average year conditions. While the city's groundwater and imported water supplies are highly reliable in dry year conditions, its surface water supplies are variable depending on hydrological conditions. For planning purposes, it was assumed that the available surface water in a dry year condition is equal to the lowest available supply recorded in the previous 10 years. This leaves an available dry-year supply of around 23,000 AFY. The city's available water supply is summarized in Table 3-1; additional details are provided in the 2020 UWMP.

The city provided historical production records for 2001 through October 2023. The historical water production by source is summarized in Table 3-2, with Figure 3-1 and Figure 3-2 illustrating the city's specific groundwater basin or agency supplier and general water source, respectively. The largest supply source varies by year, with surface water typically providing the most supply in wet years and groundwater contributing to the largest supply in non-wet years. In the past 6 years, surface and groundwater were the two largest supply sources (around 37 percent each), with imported water providing the remaining supply (about 26 percent). The majority of the city's water supply is provided through SAWCo, followed by WFA and then the city's own water supply and WECWC. Of the groundwater supply, the water is fairly evenly sourced from the Chino, Cucamonga, and Six Basins.

Table 3-1. Water Supply				
Source		Average-year Available Supply (AFY)	Dry-year Available Supply (AFY)	Notes
Groundwater	Chino Basin	5,473	5,473	Groundwater supplies are reliable in drought conditions.
Groundwater	Six Basins	4,122	4,122	
Groundwater	Cucamonga Basin	683	683	
Purchased	SAWCo	6,857	6,857	
Surface Water	SAWCo	1,679	62	Conservatively assumed the lowest surface water availability from the past 10 years for dry-year conditions.
Imported	WFA	5,541	5,541	MWD has indicated that this supply will be fully reliable in dry-year conditions.
Total		24,625	23,008	

Source: 2020 UWMP

Table 3-2. Historical Potable Water Production							
	Total Production (AFY)						
Year	Chino Basin	Six Basin	WFA	SAWCo	WECWC	Water Wheeling and Transfers	Total Potable Production
2001	2,105	2,397	6,150	8,640	2,243	-	21,536
2002	2,192	1,314	8,163	7,515	2,394	-	21,577
2003	1,917	2,159	7,434	7,489	1,619	-	20,618
2004	1,633	1,624	7,326	7,005	1,506	-	19,094
2005	1,499	2,496	5,739	6,579	3,190	-	19,502
2006	1,225	1,452	3,767	9,679	4,420	-	20,543
2007	1,520	1,526	5,830	9,312	3,751	-	21,940
2008	3,613	1,882	4,183	8,945	3,155	-	21,779
2009	3,921	1,860	2,263	10,429	3,443	-	21,915
2010	1,822	1,961	2,167	9,671	3,707	-	19,329
2011	489	1,391	5,209	10,361	3,772	816	21,223
2012	1,807	1,208	5,895	9,771	4,043	948	22,725
2013	2,457	1,138	7,038	9,067	3,032	1,350	22,732
2014	3,065	889	7,918	7,467	2,275	590	21,613
2015	3,022	1,093	5,380	5,084	2,034	-	16,612
2016	1,479	1,002	5,445	7,456	1,882	412	17,263
2017	1,785	1,296	5,634	8,748	1,717	12	19,181
2018	2,394	767	6,160	7,544	1,820	17	18,686
2019	2,090	1,010	3,840	8,460	2,135	-	17,534
2020	2,225	1,066	3,357	9,424	2,859	-	18,931
2021	1,916	554	5,981	7,482	2,472	0	18,405
2022	1,112	764	4,321	8,810	2,133	0	17,139
2023	1,235	693	3,287	9,232	1,881	0	16,328

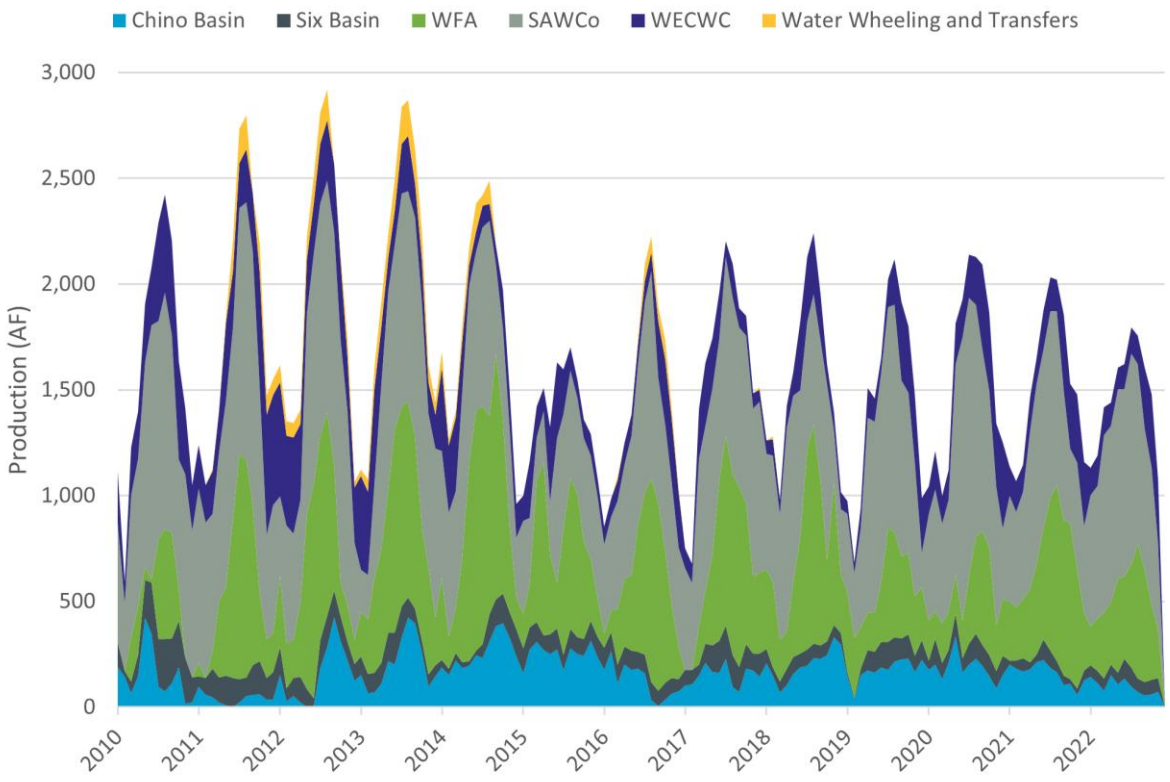


Figure 3-1. Historical monthly potable production, 2010–2022



Figure 3-2. Annual potable water supply by source (2010-2022)

3.1.2 Potable Water Quality

Historical water quality data for the groundwater and surface water resources were reviewed for the period from January 2020 through May 2022. The historical data included general physical and chemical characteristics, inorganic and organic contaminants, radionuclides, contaminants with primary and secondary maximum contaminant levels (MCL), and microbial contaminants. Parameters with results above the respective method detection limits were only considered for statistical analysis.

Based on historical data, nitrate, perchlorate, and volatile organic compounds (VOC) were the most frequently monitored water quality parameters. A summary of the monitored water quality parameters is included in Table 3-3 and discussed in more detail below.[2] A statistical summary of the water quality data for the groundwater sources (i.e., Chino Basin, Cucamonga Basin, and Six Basin) and surface water source (i.e., raw water source for San Antonio Canyon Water Treatment Plant) is presented in Appendix B. Statistical summaries for each individual well are also included in Appendix B.

Table 3-3. Water Quality Summary

Water Quality Parameter	MCL	Findings
Nitrate	10 mg/L N	Wells 3 and 8 recorded nitrate concentrations above the MCL.
Tetrachloroethylene (PCE)	5 µg/L	Well 7A observed PCE concentrations above the MCL.
Trichloroethylene (TCE)	5 µg/L	Sampling did not observe concentrations above the MCL.
Methyl tertiary butyl ether (MTBE)	13 µg/L	Sampling did not observe concentrations above the MCL.

Based on the recent historical data (Jan 2020 through May 2022), the source waters available for the City of Upland appear to be of very good quality with the exception of Chino Basin. While most of the water quality parameters in Chino Basin were within the typical range observed in groundwater sources, nitrate, regulated with an MCL of 10 milligrams per liter nitrogen (mg/L N), ranged from 6.2 to 20 mg/L N (8.9 ± 2.4 mg/L N [average ± standard deviation]). Specifically, City Wells 3 and 8 had nitrate concentrations ranging from 11 to 15 mg/L N and 10 to 20 mg/L N, respectively. While nitrate data is not available for City Well 3 after May 2020, the available data indicated an increasing trend, as shown in Figure 3-3, that suggests the need to carefully monitor City Well 3 if this water source will continue to be used in the future.

VOCs were also detected in City Wells 7A and 20 in Chino Basin and City Well 5 in Six Basin. Figure 3-4 shows the VOCs detected in City Well 7A in Chino Basin. Tetrachloroethylene (PCE) was the major VOC detected in City Well 7A, with concentrations ranging from 8.6 to 30 micrograms per liter (µg/L) (14.7 ± 3.7 µg/L). Chloroform concentrations ranged from 0.5 to 1.3 µg/L in the well water, whereas dichlorodifluoromethane (Freon 12) concentrations ranged from 0.52 to 3 µg/L. Trichloroethylene (TCE) existed at concentrations ranging from 1.2 to 3.2 µg/L. In separate sampling events, methyl tertiary butyl ether (MTBE) was detected in City Well 20 in Chino Basin, and chloroform was detected at 1.2 µg/L in City Well 5 in Six Basin.

PCE and TCE are federally regulated each with an MCL of 5 µg/L, and MTBE is regulated in California with an MCL of 13 µg/L. Chloroform has a maximum contaminant level goal of 70 µg/L and

[2] Since the water quality analysis was completed in 2023, some city sampling has observed per- and polyfluoroalkyl substances (PFAS). The levels are below the respective MCLs but additional monitoring is recommended to maintain safe water quality and treatment may be required depending on sampling trends.

California public health goal of 0.4 µg/L. Freon 12 is not currently regulated. Given the existence of PCE at concentrations higher than its MCL (i.e., 5 µg/L), treatment must be implemented before using the water from City Well 7A in Chino Basin. The city currently wastes water from any wells testing above a regulated MCL, as it did with Well 7A water during the test sampling period shown.

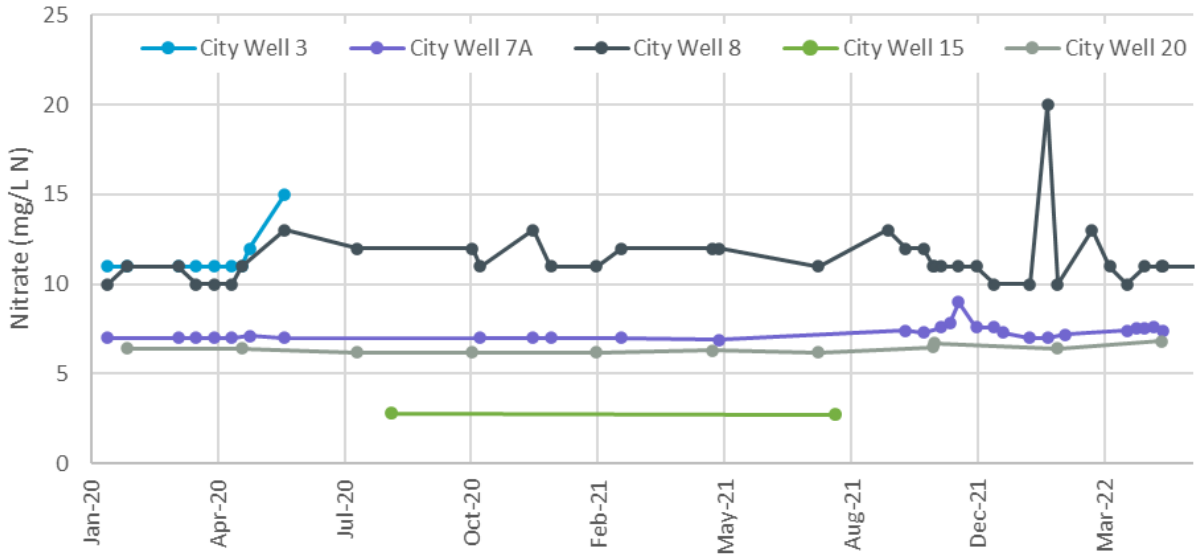


Figure 3-3. Nitrate concentrations in city wells in Chino, Cucamonga, and Six basins

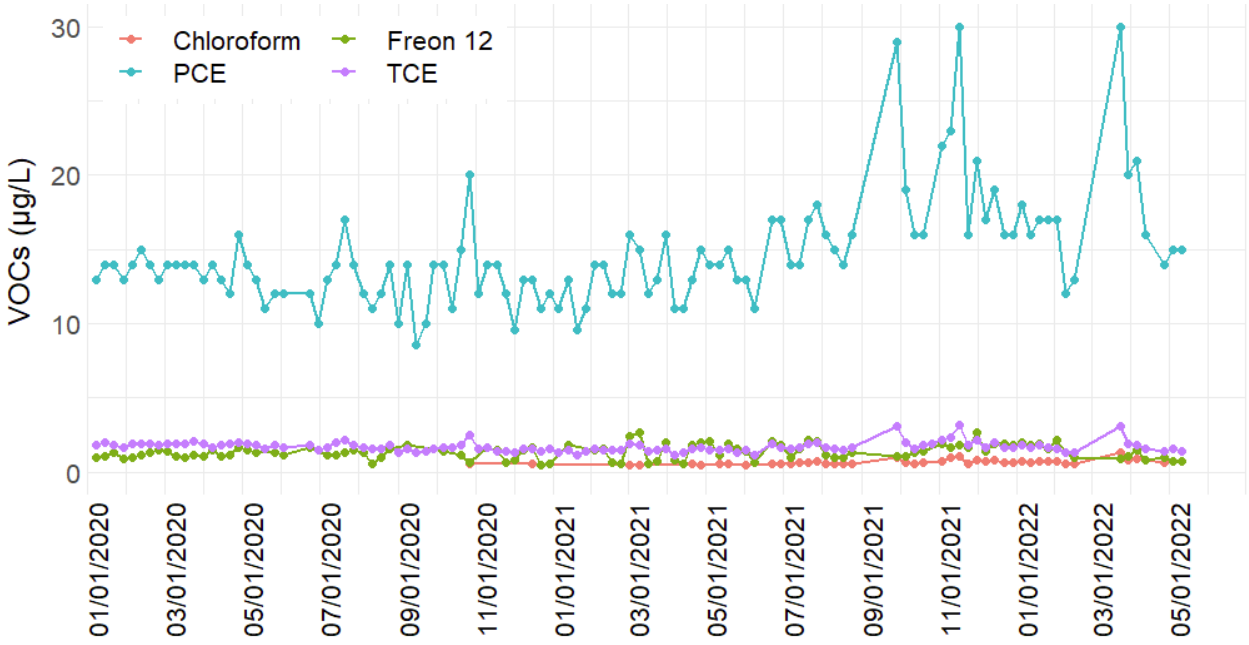


Figure 3-4. Volatile organic compounds detected in the City Well 7A in Chino Basin

3.1.3 Future Potable Water Supply

The city does not have any planned projects to add to its existing water supply portfolio. The city will continue to monitor groundwater quality and will consider additional treatment as needed to meet water quality standards.

3.2 Potable Water Demands

This section describes the city's existing and projected potable water demand. This includes a discussion of the historical water consumption, historical water supply, water loss, and peaking factors as well as a description of the demand projection methodology water demand projections through 2045, and the anticipated phasing of demands.

3.2.1 Historical Potable Water Demands

Water demand consists of water that leaves the distribution system through metered and unmetered connections, such as fire hydrants. Additional unmetered flows contributing to water demand include maintenance flushing, reservoir cleaning, leaks to pipe joints, or breaks. The city meters all of its customer accounts, including temporary construction meters. A description of historical water consumption, water supply, and the estimated amount of water loss or unaccounted for water is presented below.

Potable Water Demand

The city provided historical consumption records for 2016 through 2021. As shown previously in Table 3-2, the total annual potable water production has been decreasing since 2013 due to increased conservation in response to the severe statewide drought and the associated mandatory water use restrictions imposed by the Governor and local entities. Since 2016, water demands have varied based on hydrologic conditions, with dry years (such as 2016 and 2019) spurring commitment to lowering water demand through reduced or eliminated irrigation and other conservation measures. Tracking with the city's land use, a majority of the water use is associated with residential customers, with more than 50 percent of water use associated with single-family homes and more than 15 percent associated with multi-family homes. This is shown by the year in Figure 3-5 and by averaged for the period of record by customer class in Figure 3-6.

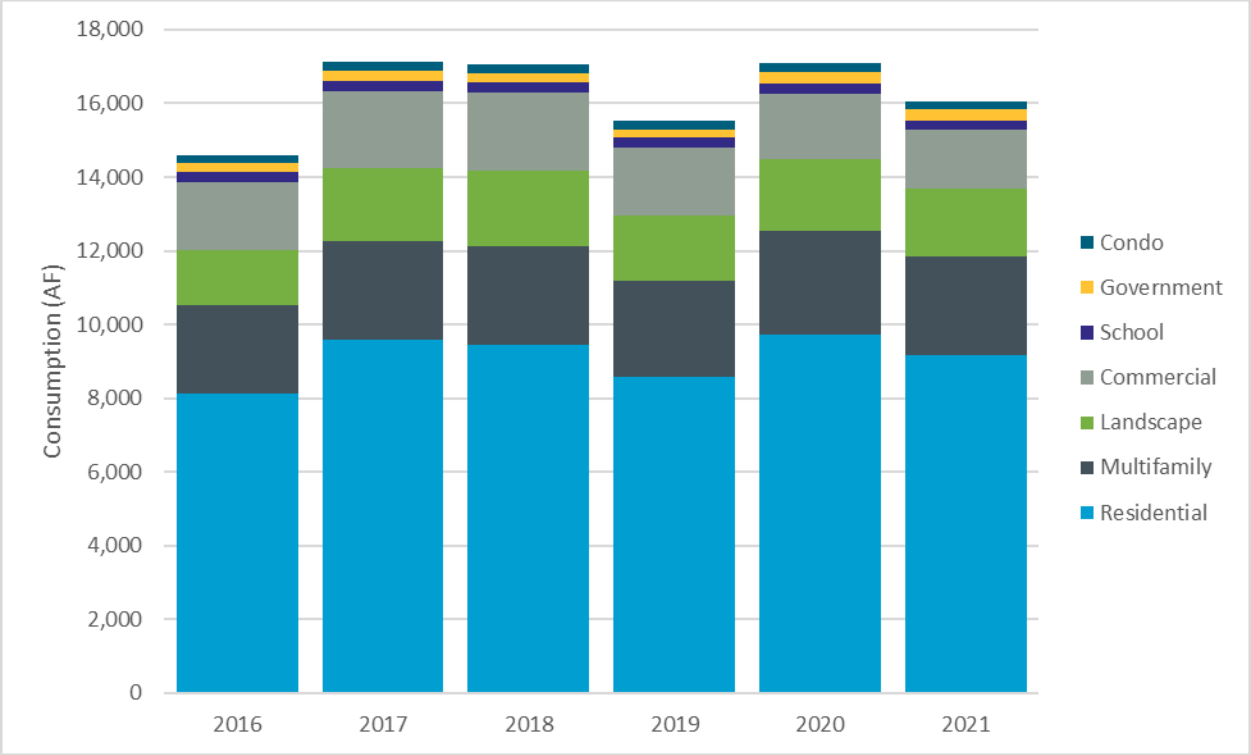


Figure 3-5. Historical water consumption by customer class

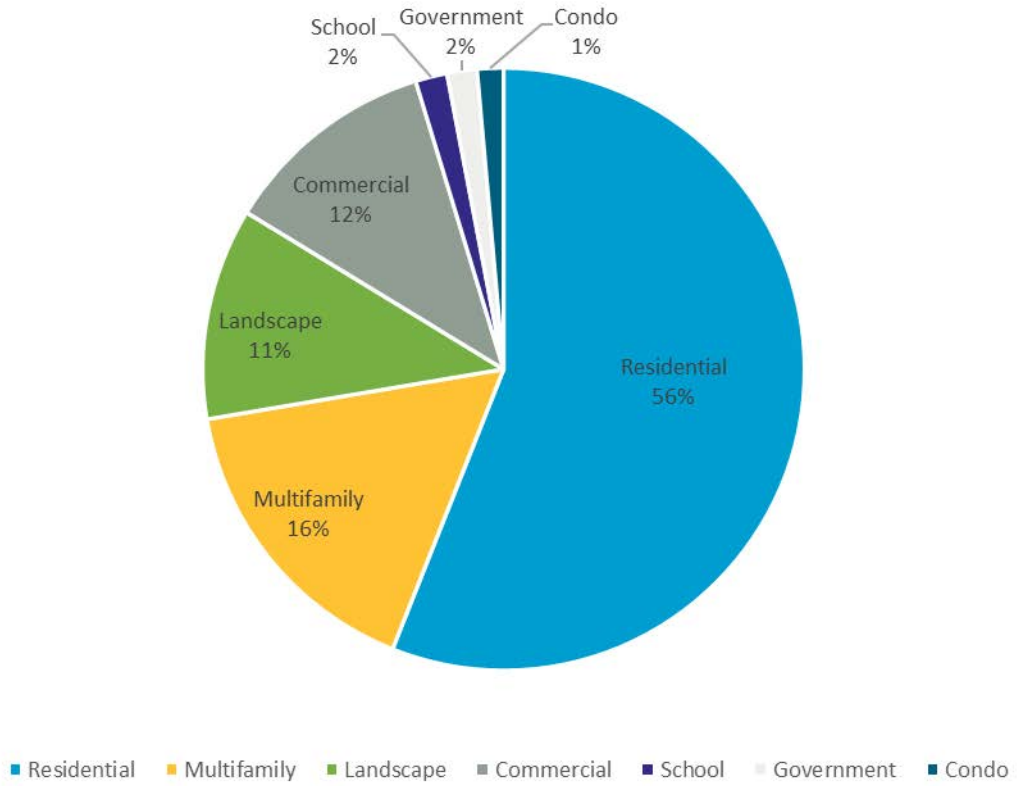


Figure 3-6. Annual potable consumption breakdown by customer class (2016-2021)

Water Loss

The difference between water supply and consumption (billed to customers) is defined as water loss, which is also referred to as non-revenue water. Water loss may be attributed to leaking pipes, unmetered or unauthorized water use, inaccurate meters, reservoir overflows, hydrant testing, system flushing, reservoir cleaning, and firefighting. The city's estimated historical water loss is summarized in Table 3-4.

Table 3-4. Historical Water Loss

Year	Potable Production (AF)	Consumption (AF)	Water Loss (AF)	Water Loss (%)
2016	17,263	14,577	2,686	16%
2017	19,181	17,118	2,063	11%
2018	18,686	17,067	1,619	9%
2019	17,534	15,525	2,010	11%
2020	18,931	17,097	1,834	10%
2021	18,405	16,823	1,582	9%
2022	17,139	15,010	2,130	12%
2023	16,328	12,752	3,576	22%
Average	17,878	15,746	2,132	12%

The water loss for well-operated systems is typically less than 15 percent. As shown in Table 3-4, the city's average water loss for 2016 through 2023 is 12 percent, which is typical of many potable water providers. The recent spike in water loss of 22 percent in 2023 was due to a severe main break, which the city promptly addressed. Higher water loss affects water utilities financially due to increased production costs and lost revenue. The city's 2017 American Water Works Association (AWWA) water audit provides recommendations to reduce the city's water loss percentage, including identifying data gaps, sampling, and equipment replacement. A summary of the water audit and recommendations are presented in Appendix C.

3.2.1.1 Potable Water Peaking Factors

Maximum day demand (MDD) is the day on which the highest demands of the year occur. The average day demand (ADD), MMD, MDD, and the MDD/ADD factor are shown in Table 3-5. The largest peaking factor in the most recent 10 years is 2.18, which was used for demand projections.

Table 3-5. MDD Factors				
Year	ADD (mgd)	MMD (mgd)	Estimated MDD (mgd)	MDD/ADD Factor
2001	19.2	28.4	42.6	2.21
2002	19.3	27.2	40.8	2.12
2003	18.4	26.1	39.1	2.12
2004	17.0	24.7	37.1	2.17
2005	17.4	26.5	39.7	2.28
2006	18.3	28.6	42.9	2.34
2007	19.6	28.2	42.2	2.16
2008	19.4	25.7	38.5	1.98
2009	19.6	29.6	44.3	2.27
2010	17.3	25.5	38.2	2.21
2011	18.2	26.4	39.6	2.17
2012	19.4	27.9	41.8	2.15
2013	19.9	28.7	43.1	2.17
2014	19.6	25.3	38.0	1.94
2015	15.6	18.9	28.3	1.82
2016	15.7	22.8	34.3	2.18
2017	17.9	24.0	36.0	2.02
2018	17.5	24.7	37.1	2.12
2019	16.4	23.1	34.6	2.12
2020	17.7	23.9	35.8	2.02
2021	17.2	22.4	33.6	1.95
2022	16.0	20.0	29.9	1.87
2023	15.1	22.0	33.1	2.18
Average	17.9	25.2	37.9	2.11

mgd = million gallons per day

Daily Peaking Factors

A diurnal pattern, or diurnal curve, can be used in a hydraulic model to represent the hourly demand of variation throughout the day. Diurnal curves typically vary depending on the usage type. Based on the city's available SCADA records, a diurnal pattern was developed for the system's upper pressure zones (zones 4 and 5) and lower pressure zones (zones 1, 2, and 3).

SCADA data included time series data of the reservoir levels, pump station run times, and select groundwater well flows, which were used to calculate the total demand for each hour of the day. The demand at each time step was then normalized by the daily average demand, which resulted in a peaking factor for each hour. September 12, 2023, was selected as a representative 24-hour pattern. Figure 3-7 shows the upper area and lower area diurnal patterns calculated from the September 12, 2023 data.

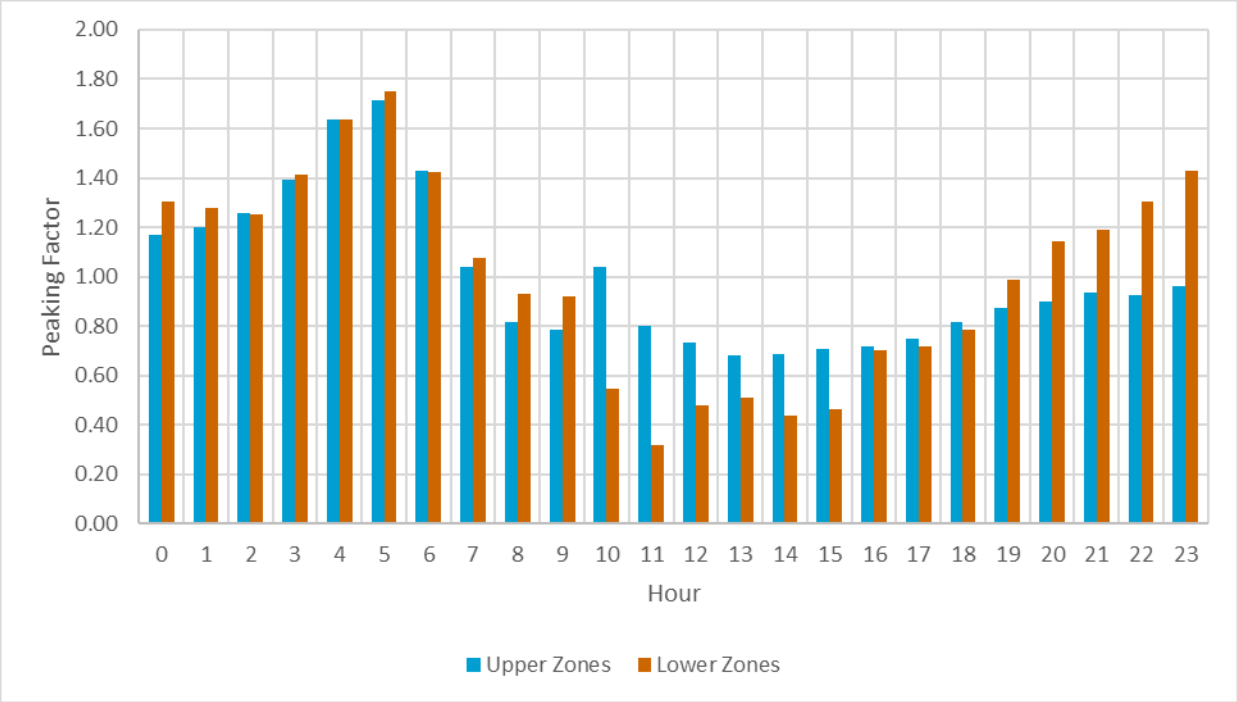


Figure 3-7. Upper and lower zones diurnal patterns

3.2.1.2 Per Capita Water Use

Average per capita water use expressed in gallons per capita per day (gpcd) was developed using the historical city populations and water demands. The city's gpcd has generally trended down over the last 20 years, with some significant dips and rebounds around extended drought periods. Table 3-6 summarizes the historical per capita water use, and Figure 3-8 shows historical water use compared to previous demand projections and available supplies.

Table 3-6. Historical per capita water use				
Year	Demand (AFY)	Demand (mgd)	Population	Per Capita Demand (gpcd)
2001	21,530	19.23	69,375	277
2002	21,570	19.26	70,357	274
2003	20,610	18.41	71,094	259
2004	19,090	17.05	71,831	237
2005	19,500	17.41	72,015	242
2006	20,540	18.34	72,198	254
2007	21,940	19.59	72,426	270
2008	21,780	19.44	72,654	268
2009	21,910	19.56	73,193	267
2010	19,330	17.26	73,732	234
2011	20,400	18.22	74,150	246
2012	21,770	19.44	74,568	261
2013	22,270	19.88	74,858	266
2014	21,910	19.57	75,147	260
2015	17,460	15.59	75,461	207
2016	17,640	15.75	75,774	208
2017	20,000	17.86	76,396	234
2018	19,560	17.47	77,017	227
2019	18,320	16.36	78,029	210
2020	19,810	17.69	79,040	224
2021	19,300	17.23	79,079	218
2022	17,970	16.04	79,118	203
2023	16,960	15.14	79,157	191

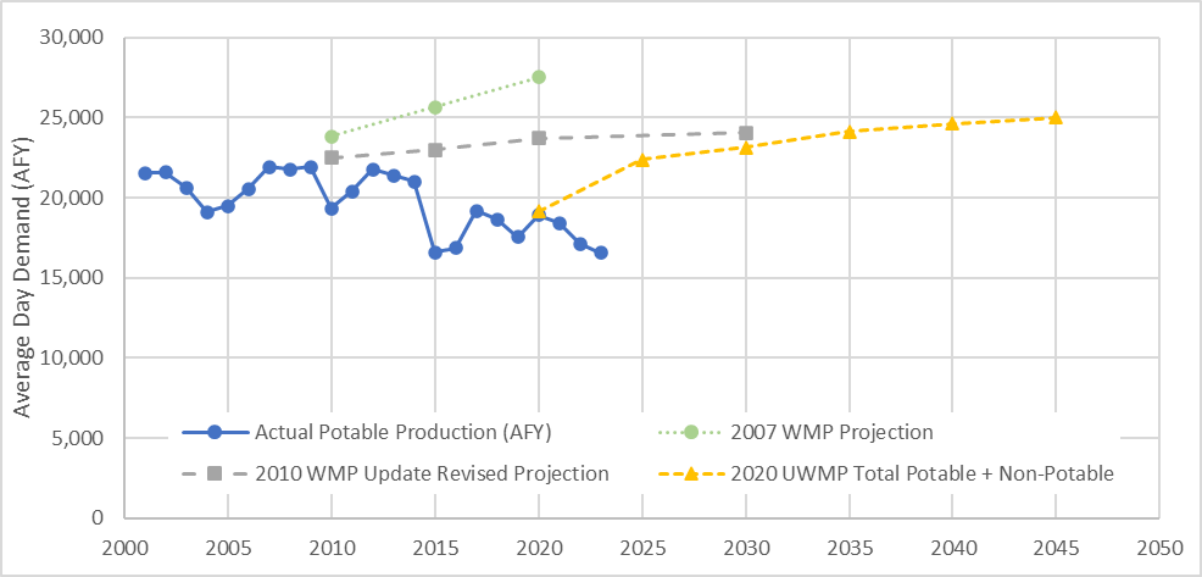


Figure 3-8. City of Upland historical and projected demands

3.2.2 Demand Forecasting Methodology

The demand forecasting methodology used primarily follows the process used in the California Department of Water Resources (DWR) *Making Conservation a California Way of Life.* The methodology breaks the demand projections into several components and relies on various data inputs for each piece. A summary of the demand projection components is outlined below; the process is illustrated on Figure 3-9.

- **Indoor residential water use** – is based on DWR's recommended residential indoor water use standards and the city's project population. The residential indoor water use standard prescribes up to 55 gpcd for indoor water use to 2025, at which point it decreases to 47 gpcd, and then drops to 42 gpcd for 2030 and beyond. These gpcd factors are multiplied by the projected population, detailed in Section 2.4.
- **Outdoor residential water use** – is based on DWR's recommended outdoor water use standards, precipitation estimates, evapotranspiration estimates, and irrigable acreage estimates. DWR has provided preliminary estimates of the residential landscape acreage and does not expect an increase in water use efficiency (reduction in outdoor water use) until 2030. This component also relies on precipitation estimates from the Environmental Protection Agency's (EPA) CREAT tool and evapotranspiration estimates from the University of California–Merced's Climate Toolbox. Using a range of data from these sources, detailed in Section 3.2.3, the potential impacts of climate change are captured in the outdoor water use estimates.
- **Commercial/Industrial/Institutional (CII) indoor water use** – is based on the city's consumption records for these users. Per the *Making Conservation a California Way of Life* process, it is anticipated that water use in this sector will remain relatively consistent, outside of any major development.
- **Commercial/Industrial/Institutional (CII) outdoor water use** – is based on the city's consumption records for landscape meters. Per the *Making Conservation a California Way of Life* process, it is anticipated that water use in this sector will remain relatively consistent, outside of any major landscaping development.
- **Other demands** – includes authorized unbilled water, apparent water loss, and "other demands." Authorized unbilled water use, such as fire hydrant use, is expected to remain consistent and is based on an average of the values provided in the provisional data released as part of the *Making Conservation a California Way of Life* proposed regulation package. Apparent water loss, discussed in Section 3.2.1, is also not expected to change and is based on an average of the values provided in the provisional data. Finally, "other demands" are also based on an average of the values provided in the provisional data.

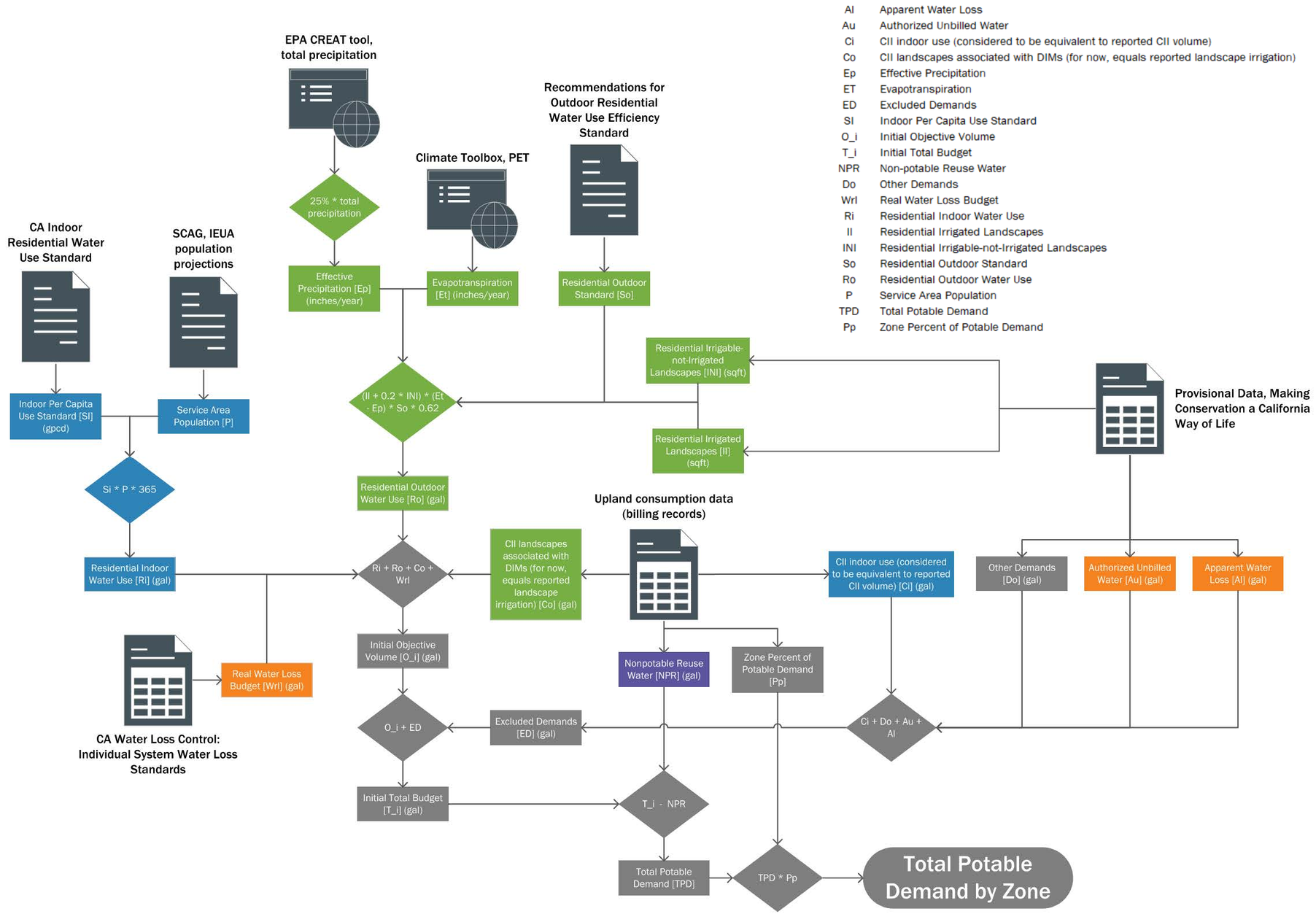


Figure 3-9. Demand projection development process

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3.2.3 Future Water Demand Projection

Using the methodology outlined in Section 3.2.2, two future demand scenarios were developed. The low and high demand scenarios provide a range of future demands that account for potential variability in future conditions related to population growth and development, climate change, and compliance with regulations. An overview of the differences between the low and high demand projections is included in Table 3-7, and the projections themselves are included in Table 3-8 and illustrated in Figure 3-10.

Table 3-7. Comparison of Low versus High Demands

Demand Component	Low Demand Assumption	High Demand Assumption	Data Source
Population	• Estimated from SCAG data (with latest RHNA information)	• Estimated from 2020 UWMP data	Based on SCAG/RHNA data
Indoor Residential Per Capita Use	• Meets regulatory standard at target year	• gpcd remains +5 above target for a given year	Based on State regulation
Water Loss Budget	• Set to 5% below recent water loss	• Set to 5% above recent water loss	Based on city data
Commercial, Industrial, and Institutional Landscape	• Set to lowest recorded demand for Landscape account types from 2016-2022	• Set to highest recorded demand for Landscape account types from 2016-2022	Based on city data
Residential Irrigated Landscape	• Set by provisional data from SWRCB – *Making Conservation a California Way of Life*		
Precipitation/Evapotranspiration	• Projected high range rainfall totals • Projected low range potential evapotranspiration (PET)	• Projected low range rainfall totals • Projected high range PET	Precipitation projections from EPA CREAT tool, evapotranspiration from Climate Toolbox
Residential Outdoor Irrigation Standard	• Meeting recommended outdoor efficiency standard	• 5% above the recommended outdoor efficiency standard	Standard based on DWR recommendations (Sept 2022)
Commercial, Industrial, & Institutional Indoor Use	• Set to lowest recorded demand for these account types from 2016-2022	• Set to highest recorded demand for these account types from 2016-2022	Based on city data
Water Loss	• 1% reduction per year from existing water loss	• 1% increase per year from existing water loss	Based on city data

Table 3-8. Projected Potable Water Demand

	Projected Annual Demand (AFY)		Projected Annual Demand (MG)	
Year	Low	High	Low	High
2025	14,289	18,805	4,656	6,127
2030	13,032	17,444	4,247	5,684
2035	13,006	17,685	4,238	5,763
2040	12,944	17,943	4,218	5,847
2045	12,888	18,213	4,199	5,935

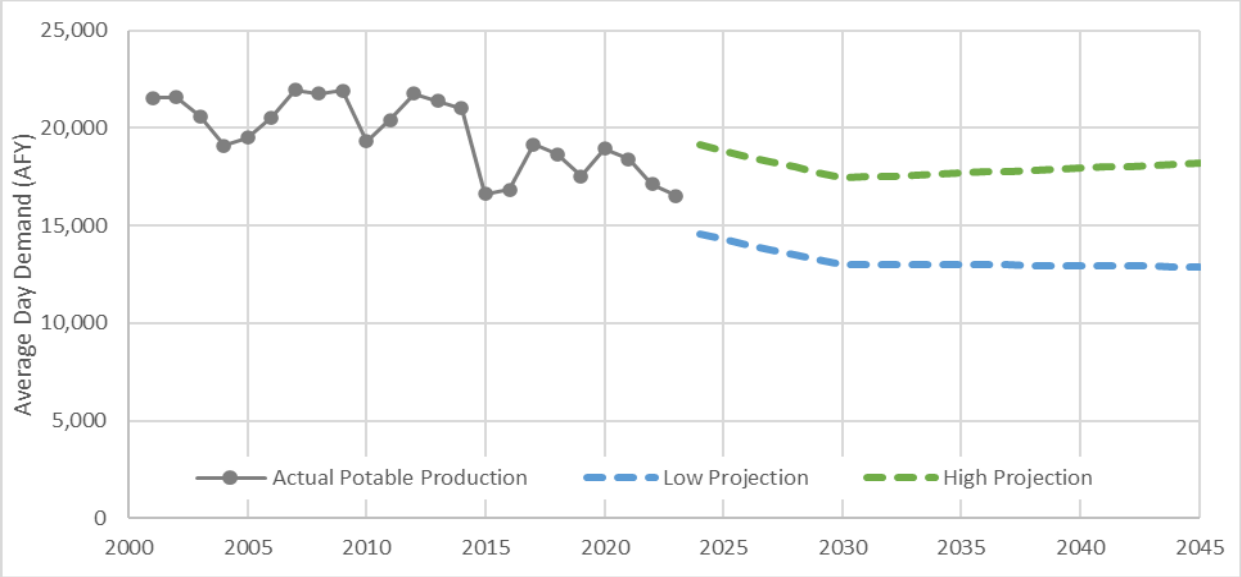


Figure 3-10. Projected potable water demand

Both demand projections show a downward demand trend through 2030, in alignment with decreasing indoor water use standards. From 2030 onward, both projections grow in proportion to the anticipated population growth, and by 2045 the low and high demand projections differ by almost 5,500 acre-feet per year (AFY) annually (equivalent to about 5 mgd).

After discussion with city staff, it was determined that the high demand projection would be used for the capacity assessment as it provides an additional level of conservatism when determining future facility sizing needs. However, the low demand projection would also be reviewed to check for high-pressure and water age concerns. The system capacity assessment is discussed further in Section 6.

3.2.4 Conservation Programs

The city has implemented a wide range of demand management measures (DMM), resulting in the gradual decrease in water use over the last 20 years even as the population has gradually increased. The city's recent DMM activities, and programs administered by IEUA promoting regional water use efficiency, include:

- Water waste prevention ordinances
- Water service metering
- Conservation pricing
- Public education and outreach
- Programs to assess and manage distribution system real loss
- Water conservation program coordination and staffing support

Water use efficiency has been an important part of the city's efforts to reduce demands to meet statewide targets and mandates and will continue to play an important role as the city strives to meet the new water use targets established by *Making Conservation a California Way of Life* framework. Under the adopted regulations—stemming from Senate Bill 606 and Assembly Bill 1668 passed in 2018—all retail water suppliers must keep their actual water use at or below a State-mandated Urban Water Use Objective (UWUO) beginning in 2027. This objective represents the total efficient use across several categories: residential indoor water use, residential outdoor/irrigation water use, commercial irrigation with dedicated meters, and distribution system water loss. Based on

preliminary analyses conducted by city staff and their water conservation consultant, the city is currently projected to exceed its UWUO without the implementation of additional conservation programs.

At the time of this master plan effort, the city is offering water savings rebates covering high-efficient toilets and clothes washers, rain barrels, high efficiency sprinklers, and special irrigation controllers. The city is also participating in a regional turf removal program and provides local landscaping retrofit support. It is expected that the city will continue to ramp up its conservation efforts and may consider the following:

- Identifying customers with inefficient use through data analysis tools
- Expanding residential water efficiency programs, with a focus on irrigation tune-ups
- Measuring commercial landscape areas and identifying special landscape areas
- Providing targeted services to large irrigation accounts, including scheduling and system optimization
- Increasing incentives as well as support and education for turf removal and landscape transformation
- Categorizing and analyzing CII account use
- Documenting all planning, implementation, and outcomes in detailed annual reports to the State

Additional water conservation information and planning will be provided in the city's 2025 UWMP, to be finalized in June 2026. It should be noted that the additional efforts related to water use efficiency planning may result in adjusted demand projections, depending on the level and timing of investment the city chooses to pursue to meet the new water use standards.

3.3 Recycled Water Supply and Demand

This section describes the city's recycled water supply and demand. This includes a summary of the city's agreement with IEUA as well as the projected changes to supply and demand.

3.3.1 Existing Recycled Water Supply and Demand

The city has received recycled water from IEUA since 2012, with terms of the supply agreement updated as part of the Regional Sewage Service contract, signed by the city in November 2023. Per the latest agreement, IEUA maintains its goal of putting as much recycled water to use as possible within its service area and the Chino Basin. As a Contracting Agency, the city has right of first purchase of recycled water from IEUA, with its base entitlement based on its proportion of wastewater contributed to the Regional Sewerage System, after accounting for losses in the treatment process and allocation for regional groundwater recharge and the Santa Ana River Base Flow[3] requirement.

In recent years, the city base entitlement allocation has been approximately 9 percent of available flow, which equates to around 5,200 AFY. After accounting for the regional groundwater recharge and Santa Ana Rive Base Flow, the city's annual entitlement is around 3,600 AFY. Using this water right, the city has been able to provide sufficient supply for all of its existing recycled water customers.

Additionally, since the city pumps groundwater from Chino Basin, which is replenished partially with recycled water, and the city is a contributor to these regional recycled water supplies, IEUA allocates

[3] The Santa Ana River Base Flow requirement was defined as part of the 1968 Prado Settlement, which establishes minimum flow requirements at the Prado Dam along the Santa Ana River.

a replenishment credit to individual agencies proportionately based on their annual respective wastewater flow contributions. This credit, the amount of recycled water for indirect potable reuse, can be used to offset a portion of the city's pumping from the Chino Basin. In recent years, the city's replenishment credit has been about 1,500 AFY, though there are plans to expand the program to allow greater quantities of recycled water for direct use and for groundwater recharge benefitting agencies in the IEUA service area.

The annual recycled water supply—direct usage, not groundwater replenishment—for the last 7 reported years (2017 to 2023) is summarized in Table 3-9. This purchased supply from IEUA has been relatively consistent from 2017 through 2023 at an average of 687 AFY, which leaves nearly 3,000 AFY of unused allocation.

Table 3-9. Historical Recycled Water Supplies

Year	Recycled Water (AF)
2017	699
2018	748
2019	658
2020	735
2021	747
2022	694
2023	528
Average	687

3.3.2 Future Recycled Water Demand Projection

Expansion of the city's recycled water system is dependent on two factors: the availability of recycled water supply, and funding and cost effectiveness for the necessary capital investment to construct new pipelines and connections. Per the latest agreement with IEUA, the recycled water supply available to the city is not likely to increase significantly. Based on the city's current recycled water usage, this leaves almost 3,000 AFY of the city's allotment for purchase and use.

As for infrastructure funding, the city has been monitoring grants and loan programs for potential funding sources for system expansion. The city has identified two potential recycled water system expansion projects that would add up to 10 new customers. First, the 11th Street project would extend a pipeline 2.7 miles from the existing IEUA trunk line in Euclid Ave west along 11st Street to Monte Vista Ave. This project would connect three schools, one park, and the Upland Basin for enhanced storage and groundwater recharge. The second project is a 1.8-mile pipeline from the IEUA trunk at Second Ave west along 15th Street to Benson Ave. This project would connect two schools, two parks, and a city recreation facility. These system expansion projects and potential new customers are identified in Figure 3-11. Should both projects be implemented, the city anticipates utilizing its full remaining recycled water allotment, bringing the total system demand to around 3,600 AFY.

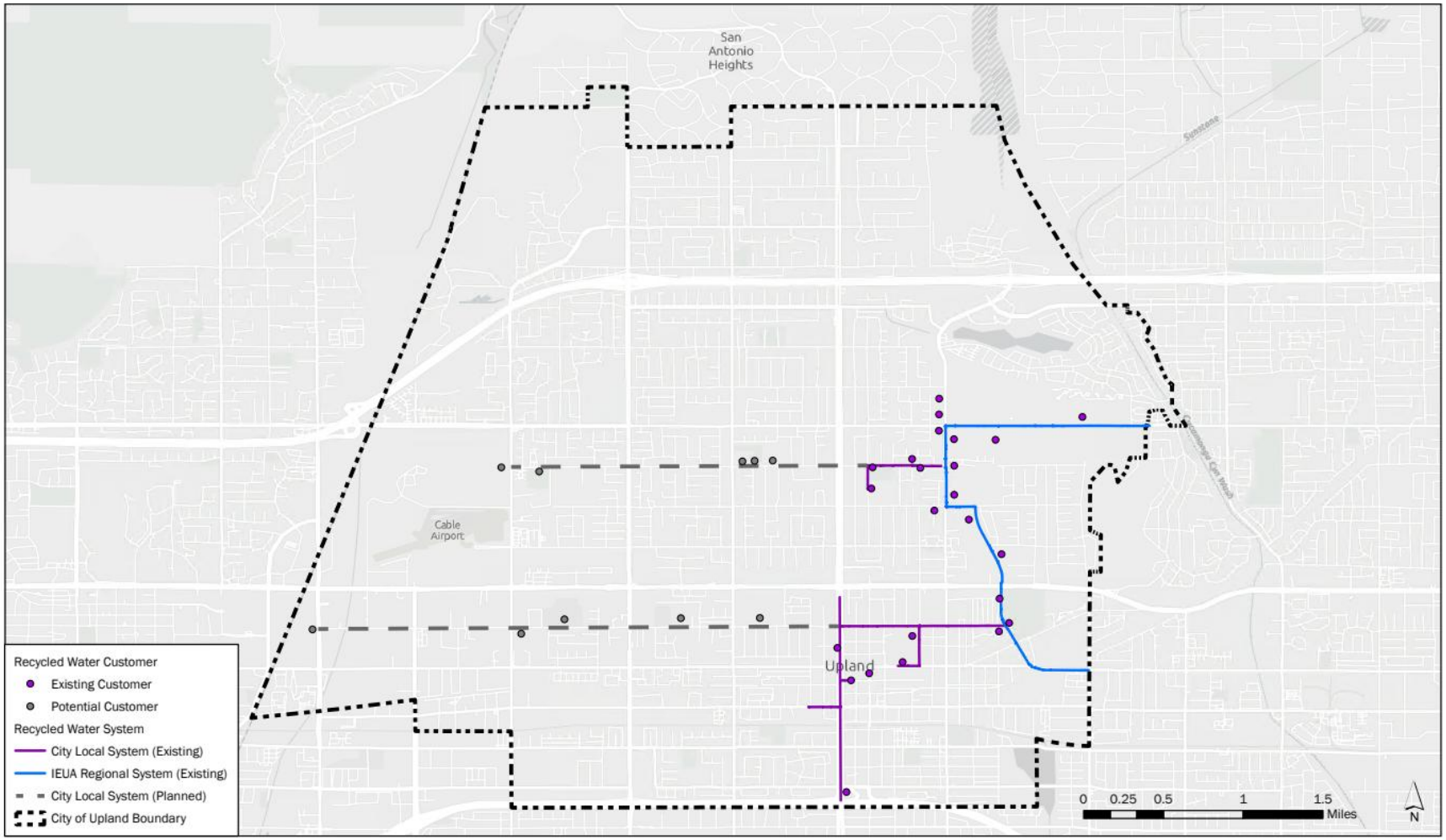


Figure 3-11. Potential recycled water customers

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Section 4

Hydraulic Model Development

This section summarizes the development of the hydraulic model, including network development, demand allocation, and calibration.

4.1 Potable Water System Hydraulic Model Network Development

A hydraulic model is a simplified representation of a real potable water distribution system. Hydraulic models can be used to assess the capacity of a distribution system and perform various analyses. In conjunction with a water system master plan update, BC created an updated computer model for the city using the latest data from the city's GIS database.

A summary of the model development process is provided in this section. Details on the methods and data that were used to create the model, including the modeling software and workflow, model element information, demand allocation, and quality assurance protocols, are provided in the Water Model Development Technical Memorandum, provided in Appendix D.

The facilities from the city's existing model were imported into InfoWater Pro® and updated based on the most current GIS data of the system and supplemental information provided by the city. A schematic of the water system is provided in Figure 2-2, and an overview of the water system model and associated facilities is provided in Figure 4-1.

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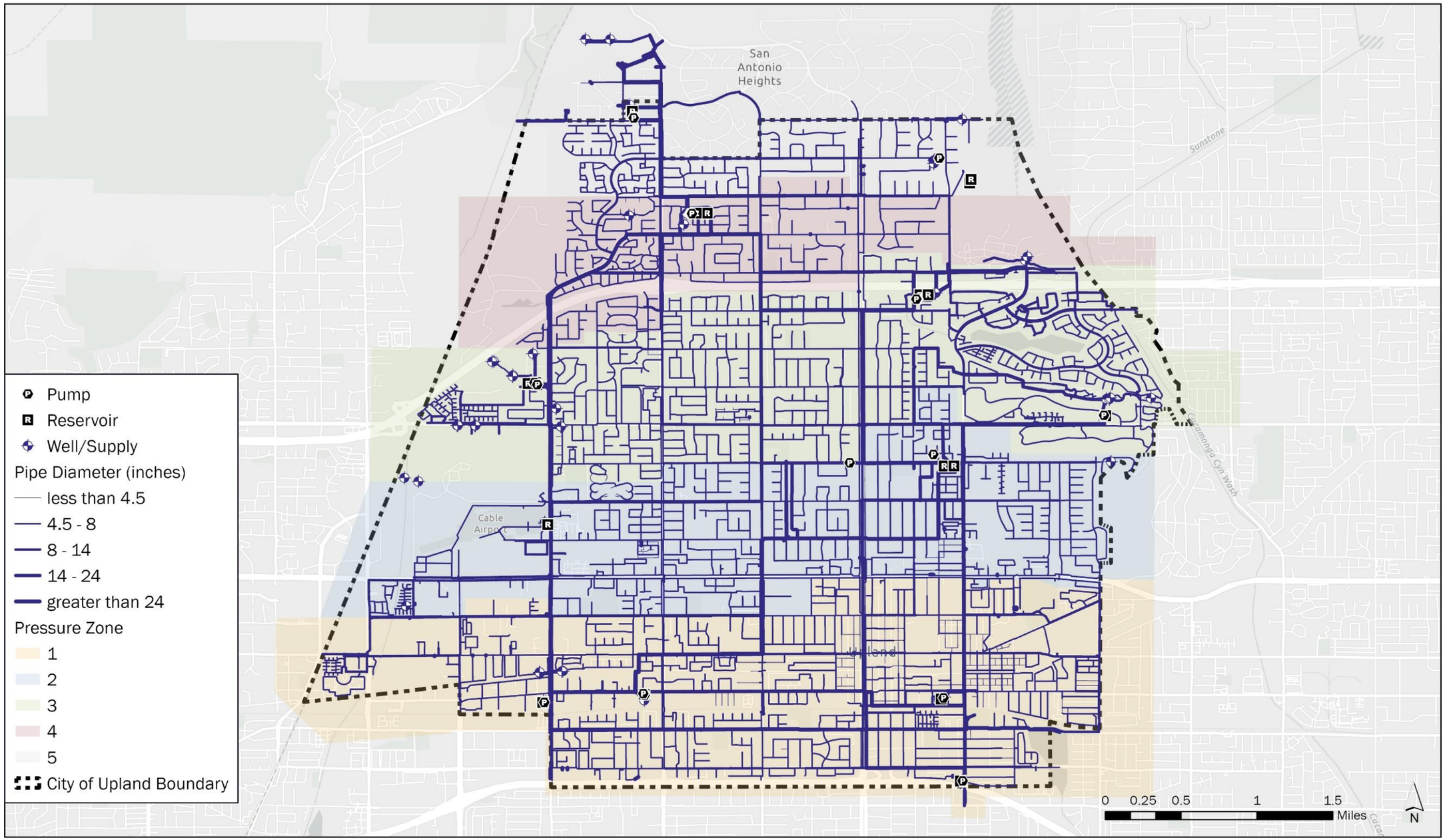


Figure 4-1. City of Upland water system model facilities

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4.2 Potable Water Demand Allocation

Once the physical facilities of the model were constructed, the system demands were reviewed and allocated. The city provided customer-billed water use data for January 2016 to December 2021. This data was used to calculate a base demand for each customer served by the water system.

Demand allocation consists of assigning the calculated customer demands and non-revenue water to the appropriate location in the model. The city provided location data for each customer, which was geocoded in GIS and added to the model. The geocoded location was used to assign the calculated demands to the closest pipe in the model and then to the closest demand junction on that pipe. Figure 4-2 illustrates the demand allocation process for an example system.

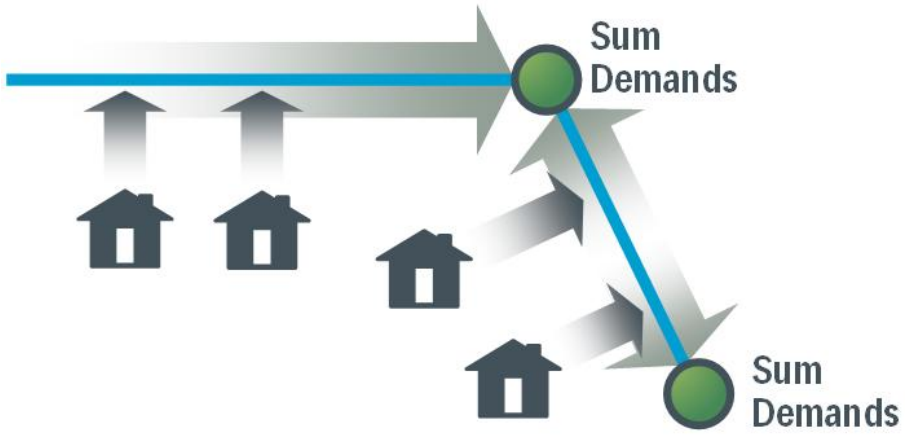


Figure 4-2. Demand allocation from billing data

Future system demand allocation involves distributing the projected future system demands to the appropriate nodes in the model. The same demand allocation method detailed previously was used to allocate future demands to customers. More information on demand development is provided in Section 3. Table 4-1 summarizes the high and low demand totals used for each pressure zone for the existing and future model scenarios.

Table 4-1. Model Demand Totals

Pressure Zone	Existing 2024 MDD (mgd)	Future 2045 MDD (mgd)	
		High	Low
Zone 1	11.46	11.71	8.29
Zone 2	7.74	7.09	5.01
Zone 3	8.42	10.17	7.20
Zone 4	4.19	3.90	2.76
Zone 5	2.80	2.58	1.82
Total	34.61	35.45	25.08

4.3 Hydraulic Model Calibration

The model was calibrated to ensure that model results are representative of actual system operations. The calibration process includes recording system performance, and then making appropriate adjustments to the computer model until the results match the data gathered during testing. Two types of calibration were performed: fire flow calibration and extended period simulation (EPS) calibration.

EPS calibration is intended to closely match the model pressures and flows to field conditions over a 24-hour period of similar demand and system boundary conditions. The primary adjusted parameters for this calibration were operational controls and set points. Using SCADA data, the model was calibrated for September 13, 2023. The EPS calibration compared modeled pump station flows, discharge pressures, and reservoir and storage reservoir levels.

Fire flow calibration is intended to match model pressures to field pressures under similar demand and system boundary conditions. The primary parameter adjusted during fire flow calibration is the pipeline roughness coefficients, although other parameters may also be adjusted as calibration progresses. Fire flow tests stress the distribution system and are used to refine roughness coefficients to better match the distribution system's actual conditions. Hydrant field testing was performed in the city's system on September 12, 2023, and consisted of 15 hydrant tests. Calibration scenarios in the model were set up to represent the system on the day of testing.

Generally, the model was well calibrated for both the EPS and fire flow simulations. Additional details regarding the model calibration are provided in Appendix D.

4.4 Model Scenarios

Following model calibration, multiple scenarios were created in the model to evaluate the system with the variety of operating characteristics that are experienced, for both existing and future conditions. A summary of the model scenarios is provided in Table 4-2.

Table 4-2. Model Scenarios

Scenario	Operating Condition	Demand Condition	System Demand (mgd)	Notes
Existing ADD Wet Year	Wet Year	Existing/ADD	17.08	
Existing ADD Dry Year	Dry Year	Existing/ADD	17.08	
Existing MDD Wet Year	Wet Year	Existing/MDD	37.23	
Existing MDD Dry Year	Dry Year	Existing/MDD	37.23	Also used for fire flow simulations.
Future ADD Wet Year	Wet Year	Future/ADD	16.26	
Future ADD Dry Year	Dry Year	Future/ADD	16.26	
Future MDD Wet Year	Wet Year	Future/MDD	35.45	
Future MDD Dry Year	Dry Year	Future/MDD	35.45	Also used for fire flow simulations.

Section 5

Evaluation Criteria

This section presents the planning criteria and methodologies for the analysis used to evaluate the existing potable water system to identify existing system deficiencies and size future improvements and expansions. The planning criteria are used in the existing and future system analyses in Table 5-1 and to define capital improvement projects in Section 7.

5.1 Potable Water System Evaluation Criteria

The city's water system was evaluated under a range of normal and emergency operating conditions and demand scenarios. The normal operating conditions are:

- ADD Average day demand
- PHD Peak hour demand
- MDD Maximum day demand
- MDD+FF Maximum day demand with fire flow

Distribution system evaluation criteria are required to determine the performance of the city's water system under the range of operating conditions as discussed above and to identify system deficiencies and improvement projects. Under each operating condition, the capacities and performance of the water system are compared to the evaluation criteria to determine which pipelines or water facilities need to be upgraded or replaced. The evaluation criteria for the potable water system consist of the following categories:

- System pressure
- Pipeline velocity
- Fire flow availability
- Storage volume
- Pump station capacity

The evaluation criteria used to evaluate the city's potable water system are summarized in Table 5-1. These criteria remained largely unchanged from the city's 2010 Master Plan, with updates made to the acceptable maximum pressures based on current operating preferences and increased fire flow requirements for some land use categories based on the latest Fire Code and city land use characteristics. Detailed descriptions for each evaluation criteria are provided following the table.

Table 5-1. Water System Evaluation Criteria		
Description	**Units**	**Value**
Delivery Pressure		
ADD	psi	50 <
PHD	psi	40 <
MMD+FF	psi	Minimum 20 at hydrant
System Pressure		
ADD	psi	up to 190
PHD	psi	40 to 155 (zones 1 and 4) 40 to 190 (zones 2, 3, and 5)
MDD+FF	psi	20 to 155 (zones 1 and 4) 20 to 190 (zones 2, 3, and 5)
Pipeline Velocity Criteria[a]		
ADD[b]	fps	5 >
PHD[b]	fps	7 >
MDD+FF	fps	10 >
Fire-flow Requirements[c]		
Low-density Residential	gpm for 2 hours	1,500
High-density (Multi-family) Residential	gpm for 3 hours	3,500
Urban Mixed Use	gpm for 2 hours	1,500
Commercial	gpm for 3 hours	3,000
Institutional	gpm for 3 hours	3,000
Industrial	gpm for 3 hours	4,500
Parks/Vacant	gpm for 2 hours	1,000
Storage Requirement		
Operational	MG	0.3 x MDD
Fire Storage	MG	Max FF Requirement x Flow Duration (4,500 gpm x 3 hours = 0.81 MG)
Emergency Storage	MG	1.0 x MDD
Pump Station Requirement		
Pump Station Firm Capacity	gpm	Firm Capacity (with largest pump out of service) > MDD+FF

a. If pipeline triggers velocity criteria, the minimum pipeline replacement size is 8 inches.
b. Up to 10 fps for pipelines just downstream of pump stations
c. Fire-flow requirements are based on 2022 California Fire Code, and City of Upland Zoning Map and Code. The code standards were applied to the approximate average building size for each land use category to develop planning-level factors.
fps = feet per second
gpm = gallons per minute
psi = pounds per square inch

5.1.1 Potable Water System Pressures

Minimum system pressures are evaluated under both PHD and MDD+FF conditions. Maximum system pressures are evaluated under ADD. The minimum pressure criterion for PHD demand conditions is 40 psi, while the minimum pressure criterion under MDD+FF conditions is 20 psi. The pressure analysis is limited to demand nodes because only locations with service conditions need to meet such pressure requirements. Lower pressures are only acceptable for junctions at water system facilities and on transmission mains; however, no pressure shall be less than 5 psi to avoid potential water quality issues.

Maximum system pressures are evaluated under the ADD conditions. The city's distribution system operates at relatively high pressure compared to other utilities. Additionally, the maximum pressure criterion for normal ADD conditions has been differentiated for each zone based on their operations and facilities. The maximum pressure for zones 1 and 4 is 155 psi, with the maximum pressure for zones 2, 3, and 5 being 190 psi.

5.1.2 Potable Water Pipeline Velocities

Pipeline velocities are evaluated using three maximum velocity criteria for selected flow conditions under both existing and future demand scenarios. A maximum velocity of 5 fps and 7 fps were used for ADD demand conditions and PHD conditions, respectively. Fire hydrant laterals are excluded from these criteria, as higher velocities are acceptable. Under fire conditions, velocities up to 10 fps were allowed. Ideally, all transmission and distribution pipelines should have maximum velocities less than 8 fps to minimize head loss; however, higher velocities in existing pipelines are not, by themselves, sufficient justification for pipeline replacement.

5.1.3 Potable Water Storage Capacity

The total storage required for a water system is evaluated in three components:

- Storage for operational use
- Storage for firefighting
- Storage for emergencies

These three components are determined for each pressure zone to evaluate the ability of the water system to meet the storage criteria on both a zone-by-zone basis and a systemwide basis. These three storage requirements are discussed in more detail below.

- **Operational Storage.** Operational storage is defined as the quantity of water supplied to meet daily fluctuations in demand beyond the quantity of water produced on a daily basis. It is necessary to coordinate the production rates of water sources and the available storage capacity in a water system to help ensure a continuous flow of treated water supply to the system. Water systems are often designed to supply the average flow on the day of maximum demand. Water storage is then used to supply water for peak hour flows that may occur throughout the day. This operational storage is continuously replenished throughout the day to maintain water quality.

  AWWA recommends an operational supply volume that ranges from one-quarter to one-third of the demand experienced during one maximum day. Based on discussions with city staff, an operational storage requirement of 30 percent of the MDD per zone has been selected.
- **Fire Flow Storage.** The governing fire department provides the city with the fire flow rate and duration to determine if fire storage is required for a pressure zone. Fire flow storage is determined based on the single greatest fire flow requirement (flow and duration) within each pressure zone (up to 0.81 MG if the zone includes an industrial water user).

- **Emergency Storage.** Storage is also required to meet system demands during emergencies. Emergencies cover a wide range of rare but probable events, such as water contamination, failure at a water treatment plant, power outages, transmission pipeline ruptures, several simultaneous fires, and earthquakes. The volume of water needed during an emergency is usually based on the estimated amount of time expected to elapse before the disruptions caused by the emergency are corrected. The occurrence and magnitude of emergencies is difficult to predict. The city's recommended emergency storage is set to 100 percent of the MDD.

5.1.4 Potable Water Pump Station Capacity

Typically, a pump station consists of multiple pump units, including one spare pump to provide reliability in case of a breakdown or repair. For the purpose of this Master Plan, pump station capacity was compared to MDD+FF demands for each pressure zone. Pump stations within each zone shall have sufficient capacity to meet the required MDD and the maximum zone FF with the largest unit out of service.

5.2 Recycled Water System Evaluation Criteria

The city's recycled water system was not hydraulically evaluated as part of this Master Plan. For documentation purposes, the city's recycled water system evaluation criteria are presented in Table 5-2.

Table 5-2. Recycled Water System Evaluation Criteria

Description	Value	Units
Delivery Pressure[a]		
Peak Hour: General	50 to 150	psi
Peak Hour: Groundwater Storage	5 to 150	psi
System Pressure[a]		
Peak Hour	0 to 150	psi
Pipeline Velocity Criteria		
Peak Hour – Diameter ≤12 inches	4 >	fps
Peak Hour – Diameter >12 inches	6 >	fps
Storage Requirement		
Operational	0.67 x MDD	MG
Surplus Storage	0.30 x MDD	MG
Pump Station Capacity		
Pumping to zone without gravity storage	Pump stations shall meet PHD of the zone with the largest unit out of service	
Pumping to zone with gravity storage	Pump stations shall meet MDD of the zone with the largest unit out of service	

a. Hydraulic grade line differential between potable and recycled water systems should be minimized.

Section 6

System Evaluation

This section summarizes the existing and future system evaluation, including condition and capacity assessments as well as a supply assessment. These assessments identify gaps between current conditions and needed improvements to achieve the city's level of service goals.

6.1 Potable Water Supply Assessment

As discussed in Section 3.1, the city is currently served by a mix of groundwater, surface water, and imported water. A water supply assessment was conducted to evaluate the city's ability to meet existing and future demands under various supply scenarios, including typical average and dry year conditions as well as various emergency conditions where supply sources are not available. The supply scenarios included:

1. Existing, average year supplies and dry year supplies – average and dry year baseline conditions
2. Loss of large well (e.g., Well 7A) supply – represents emergency scenario no. 1
3. Loss of SAWCo Connection supply – represents emergency scenario no. 2
4. Loss of imported water supply – represents emergency scenario no. 3

Existing and projected demands, both the high and low projected demand, were compared to the available supplies in the supply scenarios listed above. As summarized in Table 6-1, the city's available supply is greater than the expected demands in all scenarios except under when the SAWCo supply connection is unavailable—under existing or projected high demands—or when SWP imported water is unavailable and demands reach the projected high level.

Table 6-1. Water Supply Reliability Assessment

Supply Scenario		Available Supply (AFY)	Sufficient Supply to Meet Demand Condition[a]		
			Existing Demand (16,959 AFY)	2045, Low Demand (12,888 AFY)	2045, High Demand (18,213 AFY)
Baseline[b]	Average-year	24,625	Yes	Yes	Yes
	Dry-year	23,008	Yes	Yes	Yes
Emergency Scenario No. 1: Large Well (Well 7A) Out of Service[c]	Average-year	22,958	Yes	Yes	Yes
	Dry-year	21,341	Yes	Yes	Yes
Emergency Scenario No. 2: SAWCo Connection Out of Service[d]	Average-year	18,533	Yes	Yes	Yes
	Dry-year	16,916	No	Yes	No
Emergency Scenario No. 3: No Imported Water[e]	Average-year	19,084	Yes	Yes	Yes
	Dry-year	17,467	Yes	Yes	No

a. *Demands from section 3.2.3*
b. *All sources available.*
c. *City Well 7A (city's largest well) is out of service.*
d. *SAWCo 15th Street connection (typically the largest supply point) is out of service. Note that the city can ramp up groundwater production to offset the loss of this supply.*
e. *No Water Facilities Authority (WFA) purchased water is available (SWP imported water is not available). Note that the city can ramp up groundwater production to offset the loss of this supply.*

It should be noted that if SAWCo or imported supply was not available, the city would likely be able to ramp up production at its groundwater wells to offset the loss. Alternatively, the city could enact tier one water use restrictions per its UWMP to reduce demands by the estimated 10 percent shortfall.

Thanks to the city's diverse supply portfolio, there is sufficient capacity to meet existing and projected annual demands under a range of demand and supply conditions. Further, the city has adequate system storage, discussed further in Section 6.3.1.3, to meet its max day demands.

6.2 Potable Water System Condition Assessment

Condition assessments were performed for the city's pipelines, well and booster pumps, and storage reservoirs.

6.2.1 Pipelines

The city's distribution system includes about 325 miles of pipeline, ranging in size from under 2 inches to 42 inches in diameter. The majority of pipes are 6- and 8-inch diameter and were constructed from 1960 to 1990. The most common pipe material used is cement mortar lined and coated steel (CMLCS) followed by steel. A summary of the distribution system pipelines is included in Table 6-2 and Table 6-3 and illustrated by installation year in Figure 6-1. The city maintains records of known pipe leaks and the associated maintenance activities. Pipes with leaks in the last five years are identified in Figure 6-2.

Table 6-2. Summary of Existing Distribution System Pipelines

Diameter (inches)	Length (feet)
≤2	22,300
3-4	11,500
4-5	35,300
6	655,900
8	529,800
10	120,700
12	107,700
14	48,600
16	88,900
18	31,800
20	34,900
24	9,900
30	9,600
42	9,100
Total	**1,716,000**

Installation Year	Length (feet)
Unknown	312,900
1941 - 1950	1,900
1951 - 1960	105,700
1961 - 1970	322,700
1971 - 1980	367,600
1981 - 1990	324,200
1991 - 2000	66,800
2001 - 2010	124,700
2011 ≤	89,500
Total	**1,716,000**

Material	Length (feet)
Cast Iron	85,400
Cement Mortar Lined & Coated Steel	643,500
Cement Mortar Lined and Wrapped Steel	26,600
Copper and Lined-Copper	136,600
Polyvinyl Chloride (PVC)	9,300
Steel	295,400
Other	21,200
Unknown	498,000
Total	**1,716,000**

Table 6-3. Existing Pipe Characteristics

Install Year/Material	Cast Iron	Cement Mortar Lined and Coated Steel	Cement Mortar Lined and Wrapped Steel	Copper and Lined-Copper	PVC	Steel	Other	Unknown	Total Length (ft)
1941 - 1950	0	0	0	0	0	0	0	1,900	**1,900**
1951 - 1960	41,000	1,400	0	3,000	0	47,700	0	12,700	**105,800**
1961 - 1970	27,200	23,800	11,100	24,000	0	133,500	8,300	94,800	**322,700**
1971 - 1980	700	128,100	4,300	91,700	1,700	76,700	3,000	61,400	**367,600**
1981 - 1990	0	249,300	7,700	4,500	3,100	12,000	1,300	46,300	**324,200**
1991 - 2000	1,100	38,800	2,400	900	200	1,300	4,600	17,400	**66,700**
2001 - 2010	600	106,700	1,200	0	2,400	6,700	3,900	3,000	**124,500**
2011 ≤	0	86,900	0	0	1,800	200	100	500	**89,500**
Unknown	14,900	8,500	0	12,400	0	17,300	200	259,800	**313,100**
Total Length (ft)	**85,500**	**643,500**	**26,700**	**136,500**	**9,200**	**295,400**	**21,400**	**497,800**	**1,716,000**

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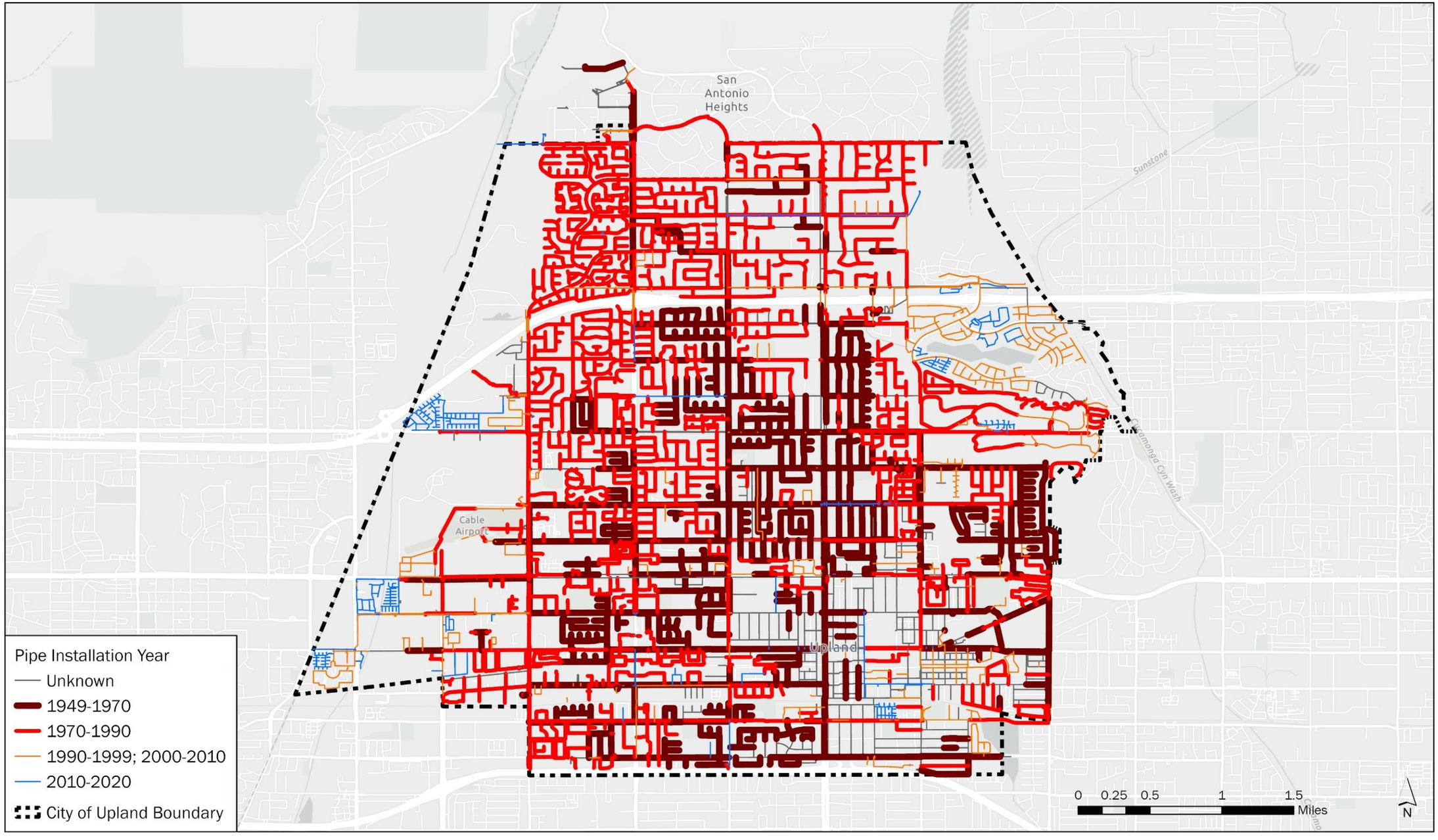


Figure 6-1. Pipe installation year

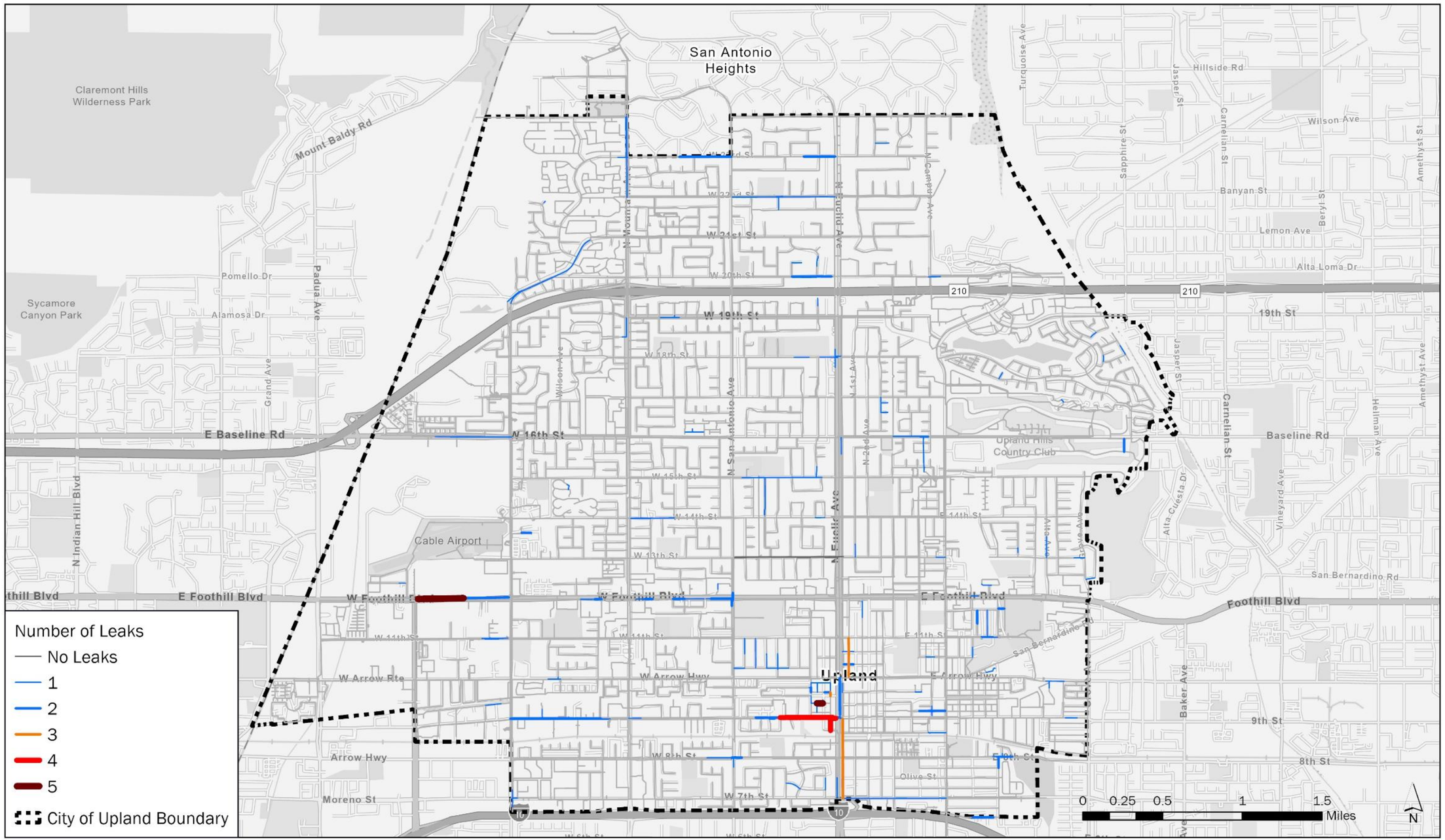


Figure 6-2. Pipe leak history (2021 – 2024)

A high-level pipe condition assessment was conducted using pipe age and leak history to prioritize condition-based replacement projects. Pipes were prioritized for replacement based on recent leak history—with input from city staff regarding the pipe leaks and repairs—and remaining useful life. Based on observations by city staff, the average useful life of the city's water distribution system pipe is 50 to 60 years. For the purposes of the condition assessment, the useful life of the pipe was assumed to be 60 years.

Based on the condition assessment, the recommended replacement year for each pipe in the city's system was determined. Pipes with recent leak history were elevated to near-term priority (2025-2030), with non-leaking pipe replacement timing based on the remaining useful life. For those pipes that are already past the assumed 60-year useful life, the replacement year was assumed to be in the near-term. A summary of the length of pipe by replacement year is included in Figure 6-3.

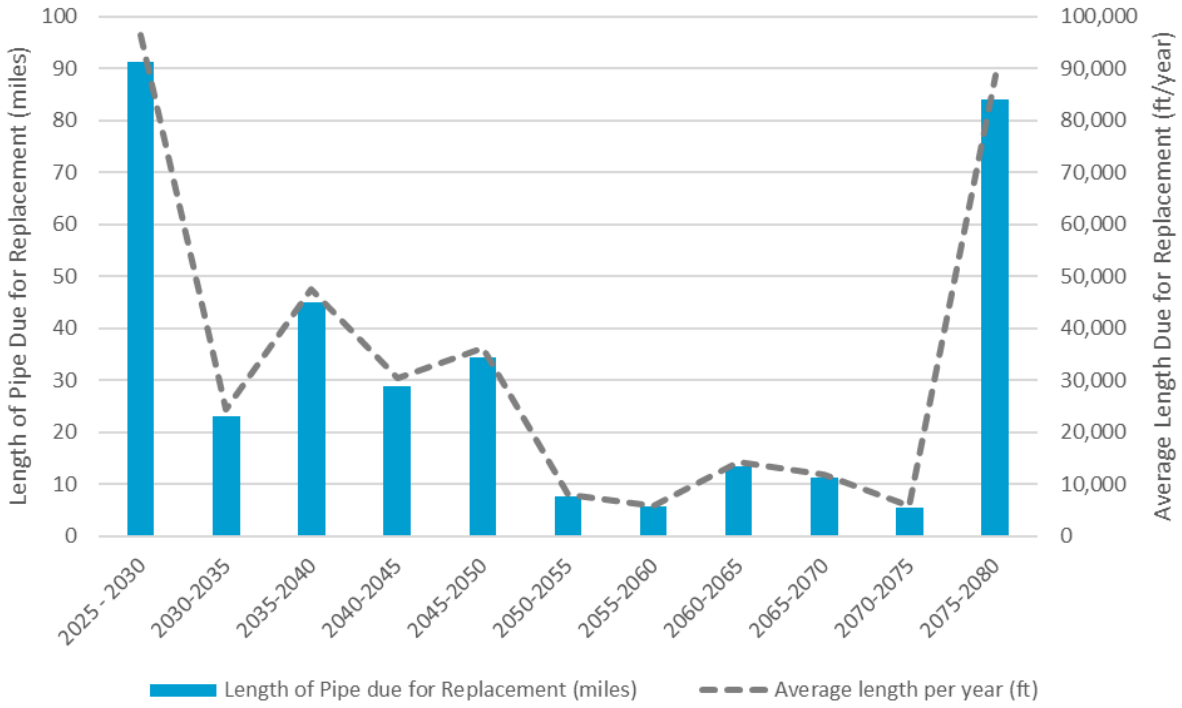


Figure 6-3. Pipe replacement by year

Assumes 60-year pipe useful life

The pipe replacement year was used to develop projects for the capital improvement plan, detailed further in Section 7. A more detailed pipeline condition assessment is also recommended to refine the pipeline replacement prioritization. This could include more extensive CCTV and other visual inspections.

In addition to the age-based assessment, the city also identified a number of small diameter pipelines located in the alleyways between Campus and 11th and Arrow and 9th. These pipelines, primarily 1.5" to 3" galvanized steel, are of deteriorating condition and restrict service pressures to customers on these lines. City staff have identified the need to either abandon the small diameter pipelines in the alleyways (and relocate service laterals to the larger pipelines in the main street), or replace the small diameter pipelines with larger mains (should there be sufficient space). This project is discussed further in Section 7.

6.2.2 Wells and Booster Pumps

The city contracted Southern California Edison (SCE) to conduct pump efficiency testing on all of its well and booster pumps. SCE conducted testing in October 2023 and identified 3 well and 3 booster pumps performing below their expected efficiency ratings. These pumps were recommended for rehabilitation and/or replacement. Detailed efficiency testing reports are included in Appendix E.[4]

In addition to the SCE testing, city staff conducted physical reviews of the well and pump station facilities to identify other condition-related deficiencies. In all, city staff identified 3 pumps to be replaced, 2 electrical panel upgrades, and a well sounding line to be replaced.

A summary of the SCE and city-identified condition-related deficiencies is included in Table 6-4,

Table 6-4. Well and Pump Station Condition Assessment

Facility	Equipment Type	Observation
Lemon Heights 4	Well Pump (vertical turbine)	Pump is operating inefficiently. Likely cause is pump wear and tear and/or failure of pump design to meet existing conditions. (SCE 2023)
Mountain View 4	Well Pump (submersible)	
Upland Foothills – Well 3	Well Pump (submersible)	
Plant 2 – Booster Pump 3	Vertical turbine pump	
Plant 3 – Booster Pump 1	Vertical turbine pump	
Plant 3 – Booster Pump 2	Vertical turbine pump	
City Well 20	Well Pump (submersible)	City staff observed signs of potential pump failure, pump needs to be replaced.
Plant 10, Well 3	Well Pump (submersible)	City staff observed that the existing pump does not work, needs to be replaced.
Upland Foothills – Booster 2	Vertical turbine pump	City staff observed signs of pump wear, needs replacement.
15th Street Transfer	Vertical turbine pump, electrical panel, cooling system	City staff observed that the electrical panel, service pump, and cooling system in need of replacement.
West End 3 and 4	Electrical panel	City staff observed that the electrical panel needs to be upgraded.
City Well 15	Sounding line	City staff observed that the sounding line needs to be replaced.

6.2.3 Reservoirs

The city contracted Harper and Associates Engineering (HAE) to conduct field evaluation of all 12 city reservoirs. The evaluations included an interior evaluation by diving method and an exterior evaluation. Detailed reports, including photographic surveys, findings, recommendations, and cost estimates, were prepared for each reservoir. A prioritization report was also developed to identify near- and long-term recommendations. A summary of the 15 HAE recommendations—which include phased projects for Reservoirs 2, 4, and 10—is included in Table 6-5 and the detailed report is included in Appendix F.

[4] In 2025, the city was working with Henschel Pump to conduct additional efficiency testing. Results of these tests will be used to identify additional improvement needs and update recommended projects, as needed.

Table 6-5. Storage Reservoir Condition Assessment		
Storage Reservoir[a]	Category[b]	Notes
2[c]	1	Reservoirs 2, 4, and 10 have issues on the roof that should not be postponed. Reservoir 16 had been identified due to the poor condition of joint sealants, but since the completion of the HAE report, the city determined that additional improvements would be needed at Reservoir 16. The condition improvement project is detailed in Section 7.
10[c]		
4[c]		
16		
12	2	The four reservoirs in this category are in poor condition and should be rehabilitated as soon as possible. The coating in Reservoir No. 14 and No. 7 is older and in worse overall condition than Reservoir No. 12 and No. 13. However, there is more significant corrosion and metal loss on the structural members and connections in Reservoir No. 12 and No. 13 and if not rehabilitated soon, there is potential for failure occurring at these connections.
13		
14		
7		
3	3	The four reservoirs in this category are all concrete reservoirs. They all have some condition improvement work that needs to be done, but it is not as critical as the work needed for the steel reservoirs in Category 2.
13A		
12A		
4[c]		
11	4	The three reservoirs in this category are in overall good condition at this time, except for the roof repairs recommended for Reservoirs 2 and 10 in Category No. 1. After the roof repairs are completed, these two reservoirs should be inspected again in the next 2-3 years to monitor the corrosion rate on the roof and structural members. The prioritization should be updated based on the findings from the inspections. Reservoir 11
10[c]		
2[c]		

a. Reservoirs listed in order of project priority, as identified by Harper and Associates.
b. Category designated by Harper and Associates.
c. Phased projects have been identified for Reservoirs 2, 4, and 10, thus two projects are listed for each.

6.3 Potable Water System Capacity Assessment

A capacity assessment was conducted using the hydraulic model and a spreadsheet analysis. The findings of the capacity assessment for existing and future conditions are presented in the following sections.

6.3.1 Existing Assessment

This section details the findings of the existing system capacity assessment.

6.3.1.1 Pipelines

The model was used to identify existing deficiencies. The ADD and MDD (which includes PHD conditions) scenarios were simulated to review pipe velocity and system pressures and compare performance against the criteria presented in Section 5. No pressure or velocity concerns were identified under these conditions. Maps of the existing system maximum pressures under ADD conditions and minimum pressures under MDD (PHD) conditions are presented in Figure 6-4 and Figure 6-5.

The MDD with fire flow scenario (MDD+FF) was used to assess the system's ability to deliver adequate pressure and flow during a fire event. Fire flows were simulated in the model at 3,835 hydrants around the city, with 428 hydrants failing to meet the pressure and flow criteria. The failing hydrants are mostly associated with high fire flow requirements such as industrial or commercial land use (summarized in Table 6-6). These hydrants, shown in Figure 6-6, are concentrated in Zones

1 and 2 around the old portion of the city where pipes and hydrant laterals are undersized. The number of deficiencies in this area is consistent with the findings of the previous master plan and not surprising given that the city had not yet implemented many of the previously recommended infrastructure improvements.

Table 6-6. Fire Flow Deficiencies

Land Use Type	Fire Flow Requirement (gpm at 20 psi)	Modeled Hydrants[a]		
		Total	Pass	Fail
Low-density Residential	1,500	2,640	2,560	80
High-density (Multi-family) Residential	3,500	146	102	44
Urban Mixed Use	1,500	71	60	11
Commercial	3,000	585	467	118
Institutional	3,000	173	149	24
Industrial	4,500	206	55	151
Parks/Vacant	1,000	14	14	0
	Total	**3,835**	**3,407**	**428**

a. *The city hydrants were added to the hydraulic model using GIS data provided by the city. Hydrants were spatially linked to the nearby existing land use category to assign the required fire flow at each location. The initial fire flow requirements were reviewed with city staff to make adjustments as needed where hydrants were located near two different land use categories.*

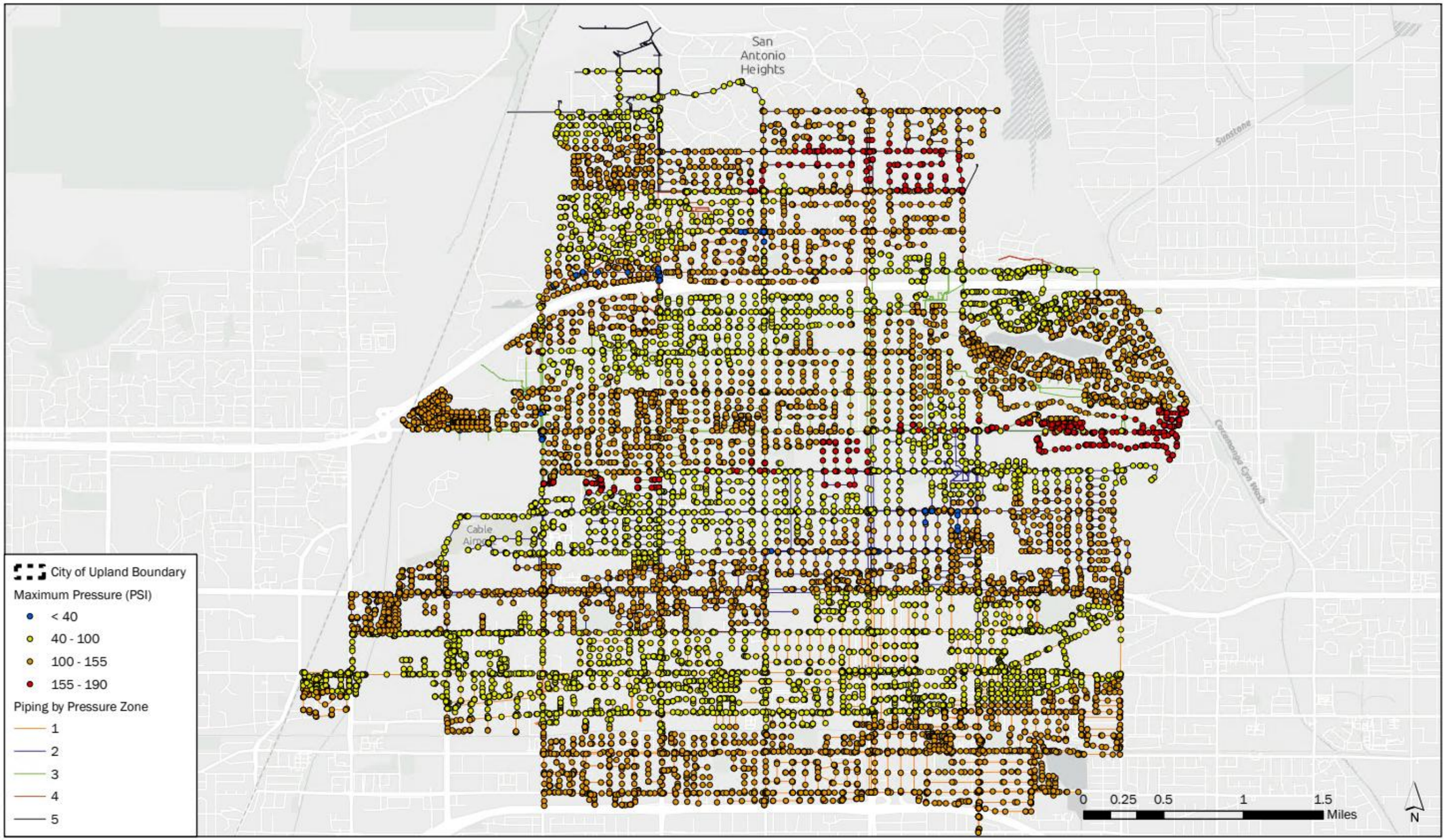


Figure 6-4. Existing system maximum pressures (ADD)

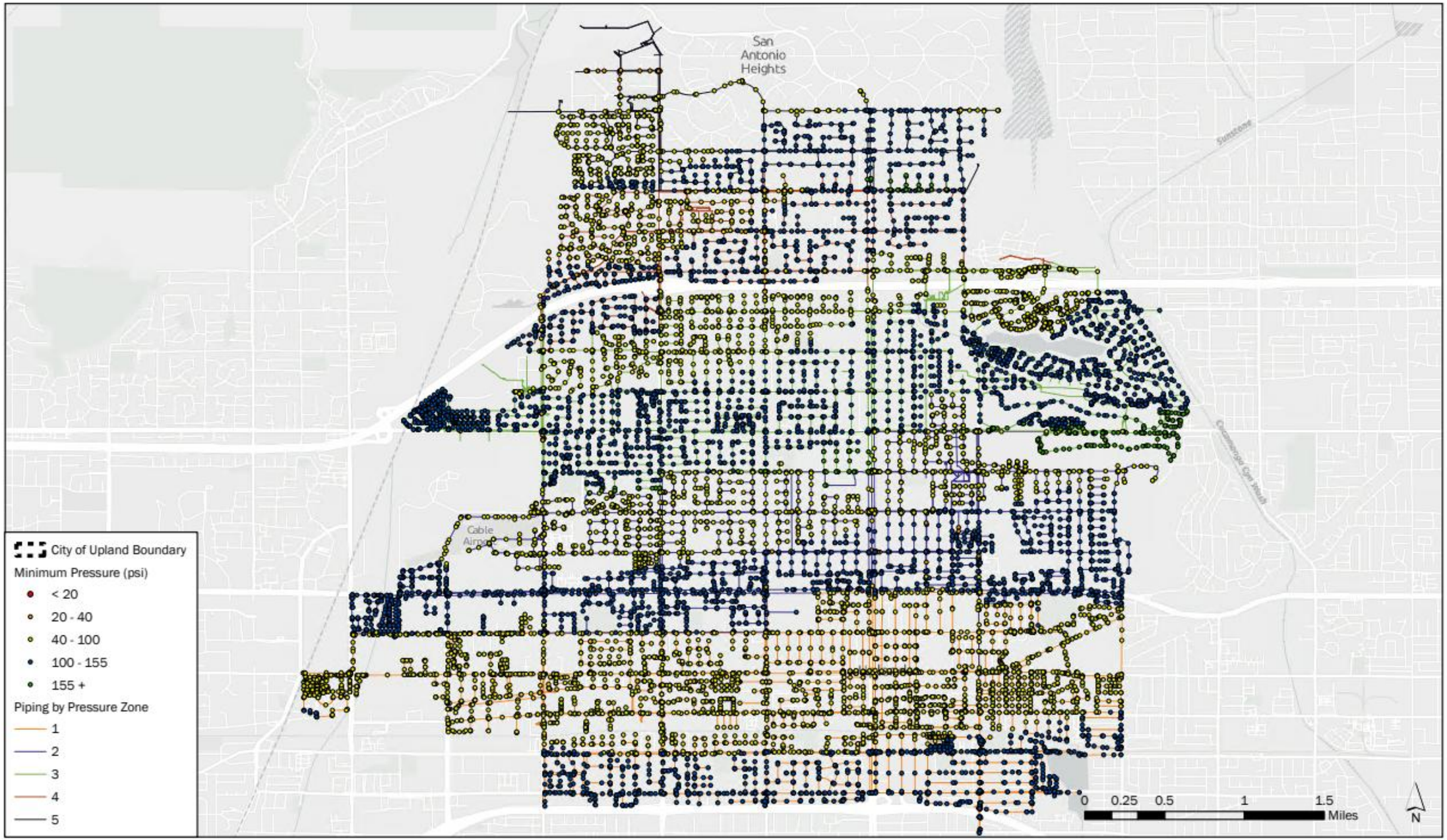


Figure 6-5. Existing system minimum pressures (MDD)

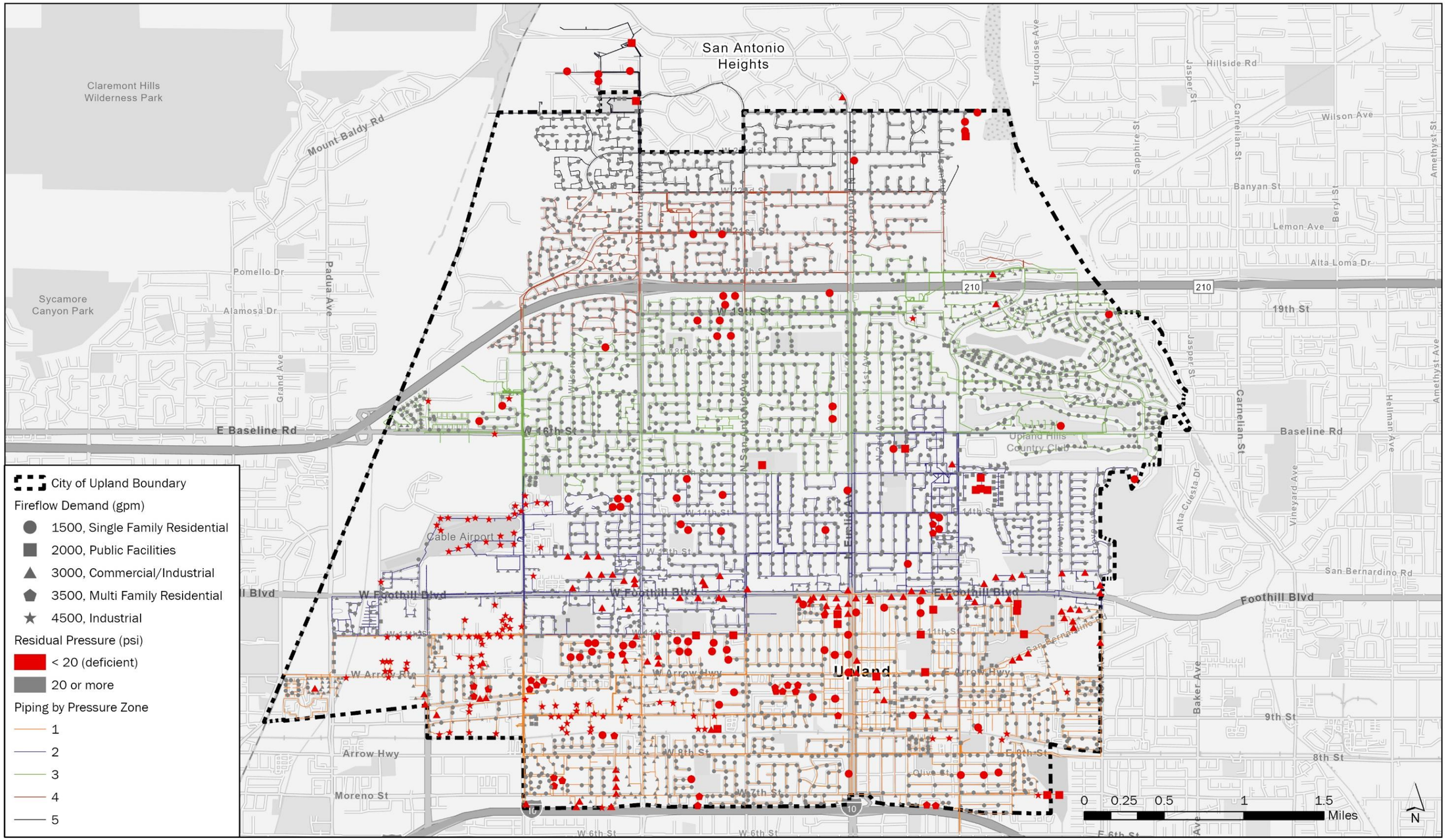


Figure 6-6. Existing system fire flow deficiencies

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6.3.1.2 Pump Stations

The pump station firm capacities were compared with the required capacity to identify deficiencies for existing and future conditions as shown in Table 6-7. No pump capacity deficiencies were identified.

Table 6-7. Existing System Pump Capacity

Zone	Supply (Pumping) Capacity (gpm)	Max Day Demand + FF (gpm)	Zone Pumping Surplus (gpm)
1	12,988	10,573	2,415
2	19,959	8,601	11,358
3	20,598	10,345	10,253
4	7,461	6,720	741
5	8,721	4,986	3,735

6.3.1.3 Storage Reservoirs

The city currently maintains 12 storage tanks across its system, providing a total of 42.7 MG of storage to the system. A summary of the existing storage tanks by zone is included in Table 6-8.

Table 6-8. Existing System Storage

Zone	Reservoir	Reservoir Storage Capacity (MG)	Zone Storage Capacity
1	4	0.2	10.9
	10	1.5	
	11	0.2	
	12	4.0	
	12A	5.0	
2	13	5.4	11.0
	13A	5.6	
3	3	4.3	5.8
	7	1.5	
4	16	10.0	10.0
5	2	5.0	5.0
Total		**42.7**	**42.7**

Using the storage criteria presented in Table 5-1, the required storage capacity for the existing system was calculated and compared to the existing available storage, shown in Table 6-9. Based on that comparison, all zones have sufficient storage capacity except for Zone 3, which has a deficiency of 3.57 MG. However, because Zone 3 can be easily supplied from Zones 2 and Zone 4 and the system overall has sufficient storage capacity, no additional storage is recommended. Further, the city could also claim credit for the groundwater storage provided by the groundwater basins, which would provide additional systemwide storage redundancy.

Table 6-9. Existing System Storage Evaluation							
Zone	Max Day Demand (mgd)	Operational Storage Required (MG)[a]	Emergency Storage Required (MG)[b]	Fire Storage Required (MG)[c]	Total Storage Required (MG)	Existing Storage (MG)	Deficiency (MG)
1	11.46	3.44	5.73	0.54	9.71	10.9	1.19
2	7.74	2.32	3.87	0.54	6.73	11.0	4.27
3	11.03	3.31	5.52	0.54	9.37	5.8	(3.57)
4	4.19	1.26	2.09	0.54	3.89	10.0	6.11
5	2.80	0.84	1.40	0.63	2.87	5.0	2.13
Total	37.23	11.17	18.61	2.79	32.57	42.7	10.13

*a. Operational storage requirement = max day demand * 30%*
*b. Emergency storage requirement = max day demand * 50%*
*c. Fire storage requirement = max fire flow requirement * duration (3 hours)*

6.3.2 Future Assessment

The future assessment provided a review of the system under 2045, high demand projections.

6.3.2.1 Pipelines

No additional pipeline velocity or pressure criteria triggers were identified under future demand conditions for the ADD, MDD, or MDD+FF demand scenarios. This is not surprising given the expected decline in system demands.

6.3.2.2 Pump Stations

As with the existing system assessment, no pumping deficiencies were identified. It will be critical for the city to continue system maintenance to maintain available pumping capacity.

6.3.2.3 Storage Reservoirs

Due to the projected decrease in system demands, the required system storage is also expected to be slightly reduced. Under future conditions, all zones have sufficient storage capacity except for Zone 3, which has a deficiency of 2.88 MG. As with the existing system storage assessment, no additional storage is recommended because Zone 3 can be easily supplied from Zones 2 and Zone 4 and the system overall has sufficient storage capacity. A breakdown of the future system storage evaluation is presented in Table 6-10.

Table 6-10. Future System Storage Evaluation							
Zone	Max Day Demand (mgd)	Operational Storage Required (MG)[a]	Emergency Storage Required (MG)[b]	Fire Storage Required (MG)[c]	Total Storage Required (MG)	Existing Storage (MG)	Deficiency (MG)
1	11.71	3.51	5.86	0.54	9.91	10.9	0.99
2	7.09	2.13	3.54	0.54	6.21	11	4.79
3	10.17	3.05	5.09	0.54	8.68	5.8	(2.88)
4	3.90	1.17	1.95	0.54	3.66	10	6.34
5	2.58	0.77	1.29	0.63	2.69	5	2.31
Total	35.45	10.63	17.72	2.79	31.15	42.7	11.55

*a. Operational storage requirement = max day demand * 30%*
*b. Emergency storage requirement = max day demand * 50%*
*c. Fire storage requirement = max fire flow requirement * duration (3 hours)*

6.4 Recycled Water System Assessment

The city's existing recycled water system was not evaluated as part of this effort. Per discussions with city staff, the recycled water system is providing the desired level of service and there are no capacity- or condition-related concerns. A more detailed review of the recycled water system is recommended as part of the evaluation of any potential system expansion.

6.5 Summary of Recommendations

A significant portion of the water distribution system is at or nearing the end of its useful life; specifically, over 100 miles of pipes and half of the storage reservoirs (those designated as Category 1 and 2 by Harper and Associates). The city will need to ramp up its pipeline replacement program to avoid any major pipe failures and loss of service.

Additionally, there 428 hydrants across the city that are currently predicted to fall short of the fire flow requirement. To address fire flow deficiencies, 8 miles of pipeline improvements are needed. A significant portion of those necessary capacity improvements overlap with the aging infrastructure; therefore, pipeline improvements that can address both aging infrastructure and address fire flow deficiencies should be prioritized.

Due to the number of pipeline deficiencies, specific projects will be developed for the more critical needs—presented in Section 7—with larger groups of pipelines grouped for future improvements. It is recommended that the city develop a replacement optimization plan to prioritize future pipeline replacements.

Non-pipe projects should also be addressed in order of significance. HAE identified 15 reservoir projects, split into 4 prioritization categories. Of the 10 well and booster pumps with condition-related deficiencies identified by SCE and city staff, Well 20 is the highest priority as it has shown signs of pump failure. The other non-efficiency concerns should be addressed next. Efficiency improvements can be implemented as funding becomes available, provided that functionality does not continue to degrade to a point that impacts system operations.

An overview of the recommended system improvements is presented in Figure 6-7, with details of the recommended capacity and condition projects presented in the next section.

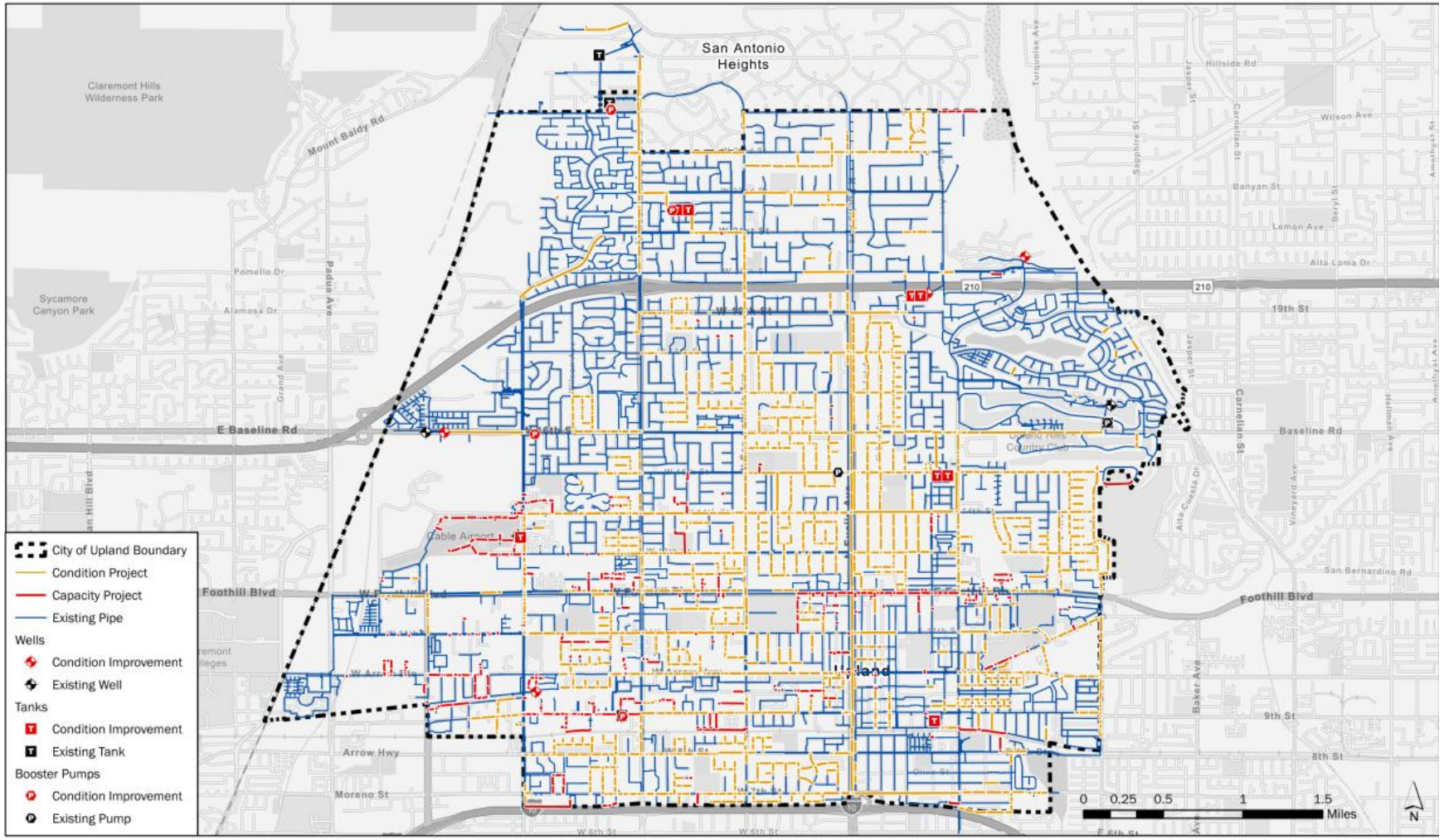


Figure 6-7. Recommended system improvements

Section 7

Capital Improvement Plan

The purpose of this section is to present the CIP for the city's water and recycled water systems. It includes a description of the assumptions used in the cost estimates listed for each project.

7.1 Cost Estimating Assumptions

Cost estimates provided in in Table 7-1 are based on a budgetary, planning level, engineer's opinion of probable project costs. They were developed based on construction cost information provided in April 2025, at which time the Engineering News Record (ENR) construction Cost Index Value (ENR, 2025) was 13,731.5.

Table 7-1. Example Capital Cost Calculation

Cost Component	Markup/Allowance (%)	Cost ($)
	Bare construction cost	1,000,000
Materials sales tax (applied to 50% of bare cost)	7.75	38,750
	Subtotal	*1,038,750*
Contractor Overhead and Profit	15	$155,813
	Subtotal	*$1,194,563*
Contractor General Conditions	15	$179,184
	Subtotal	*$1,373,747*
Undesigned/Undeveloped Detail Contingency	30	$412,124
	Subtotal	*$1,785,871*
Bonds and Insurance	3.5	$62,505
	Total Construction Cost	$1,848,376
Soft Costs	30	$554,513
Total Capital Improvement Cost		$2,402,889

Cost estimates are for the total estimated capital improvement cost, in dollars, of the proposed improvement projects. Baseline construction costs were calculated by multiplying the estimated number of units by the unit cost, such as length of pipeline times the average cost per linear foot of pipeline. Unit Construction costs used for this Master Plan are presented in Section 7.1.3 and are based on cost estimates provided by the city for similar projects and from cost estimating databases. A 30 percent markup was then applied to the construction costs to develop the capital improvement cost to capture the soft costs associated with the implementation of the project.

7.1.1 Cost Estimating Accuracy

Class 5 cost estimates per Association for the Advancement of Cost Engineering International standards, were developed for the projects. The expected accuracy range for Class 5 estimates is -20 to -50 percent on the low end and +30 to +100 percent on the high end.

The estimate reflects BC's professional opinion of accurate costs at this time and is subject to change. BC has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's method of determining prices, competitive bidding or market conditions, practices, or bidding strategies. BC cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented herein. The costs for each recommended improvement are presented in present day (April 2025) value.

7.1.2 Capital Cost Development

Capital costs were developed by first estimating the construction cost and then adding the soft cost markup. The construction cost includes markups for material sales tax (assumed to be applied to 50 percent of the project cost), contractor overhead and profit, contractor general conditions, undesigned/undeveloped detail contingency (to capture the planning-level stage of these projects), and bonds and insurance. The soft cost markup covers costs associated with engineering, construction-phase professional services, and project administration.

As shown in the following sample calculation of the capital improvement cost, the total cost of select project construction contingencies is 240 percent of the bare construction cost (without the construction markups). The calculation of percent is the overall markup on the baseline construction cost to arrive at the capital improvement cost; it is not an additional contingency. An example of the capital cost calculation with the markups and allowances is presented in Table 7-1.

7.1.3 Unit Construction Cost

All unit prices represent installed costs and include excavation, bedding, backfill, compaction, materials, appurtenances, and delivery to the site. Pipeline unit costs also include the cost of street improvements, per City Ordinance No. 1841, which includes 4-inch base course, cold mill, 2" overlay and sealcoating as well as pavement markings.

Unit costs were developed based on recent bids received by the city, construction cost database information, and BC's cost estimating database and recent construction experience. Unit costs are presented along with the detailed project costs in Appendix G.

7.2 Potable Water CIP

The capital projects identified in this section are sized to meet the water system evaluation criteria discussed in Section 5. The improvement projects are divided into the following project categories:

- **Water System Capacity Improvements:** developed based on the system capacity assessment presented in Section 6.3
  - Pipeline improvements
- **Condition (rehabilitation and replacement or R&R) Improvements:** developed based on the system condition assessment presented in Section 6.2
  - Pipeline improvements
  - Storage Reservoirs improvements
  - Pump improvements (booster and well pumps)
- **Other projects**: developed based on discussions with city staff to identify other needs not identified as part of the capacity and condition assessments.
  - Backup generators
  - Valving improvements for reliability

- Electrical panel upgrades
- Well sounding line replacement
- Site security improvements
- Additional system evaluation studies

The city's CIP was developed to assist in budgeting the improvements needed to provide the required level of service to the city's water and recycled water customers. Planning level costs were estimated for each project or referenced from existing reports where available. A summary of the water system CIP is provided in Table 7-2, including the project IDs, category, need, and cost. Overviews of the pipeline, storage reservoirs, pumps, and other projects are shown in Figure 7-1, Figure 7-2, Figure 7-3, and Figure 7-4, respectively.

Due to the significant number of pipes that need to be replaced and/or upsized, pipeline projects were developed to address both capacity- and condition-related needs. Generally, condition-related projects were developed first, so those projects were adjusted to incorporate pipe upsizes from overlapping capacity improvement projects. As such, 28 of the 38 individual pipeline condition improvement projects include pipeline upsizes to address capacity deficiencies, with 9 of the projects entirely overlapping between condition- and capacity-related benefits.

Similarly, 1 of the capacity improvement projects was adjusted to incorporate an adjacent pipeline that warrants replacement due to its current condition. The length of the pipeline project attributed to capacity- or condition-related deficiencies are broken out in Table 7-2, with the length being classified as a capacity improvement in cases where it addresses both capacity and condition concerns. Considering the dual-benefit of the majority of the projects listed as pipeline condition improvements, the pipeline project costs through the mid-term is roughly split between capacity and condition benefits, bringing the portion of capacity improvement projects closer to condition-improvement projects through the mid-term closer, $61 and $83 million, respectively, as broken down in Figure 7-5. An overview of the dual capacity and condition benefits can be seen in Figure 7-6, with project-specific details shown in the maps provided in Appendix G.

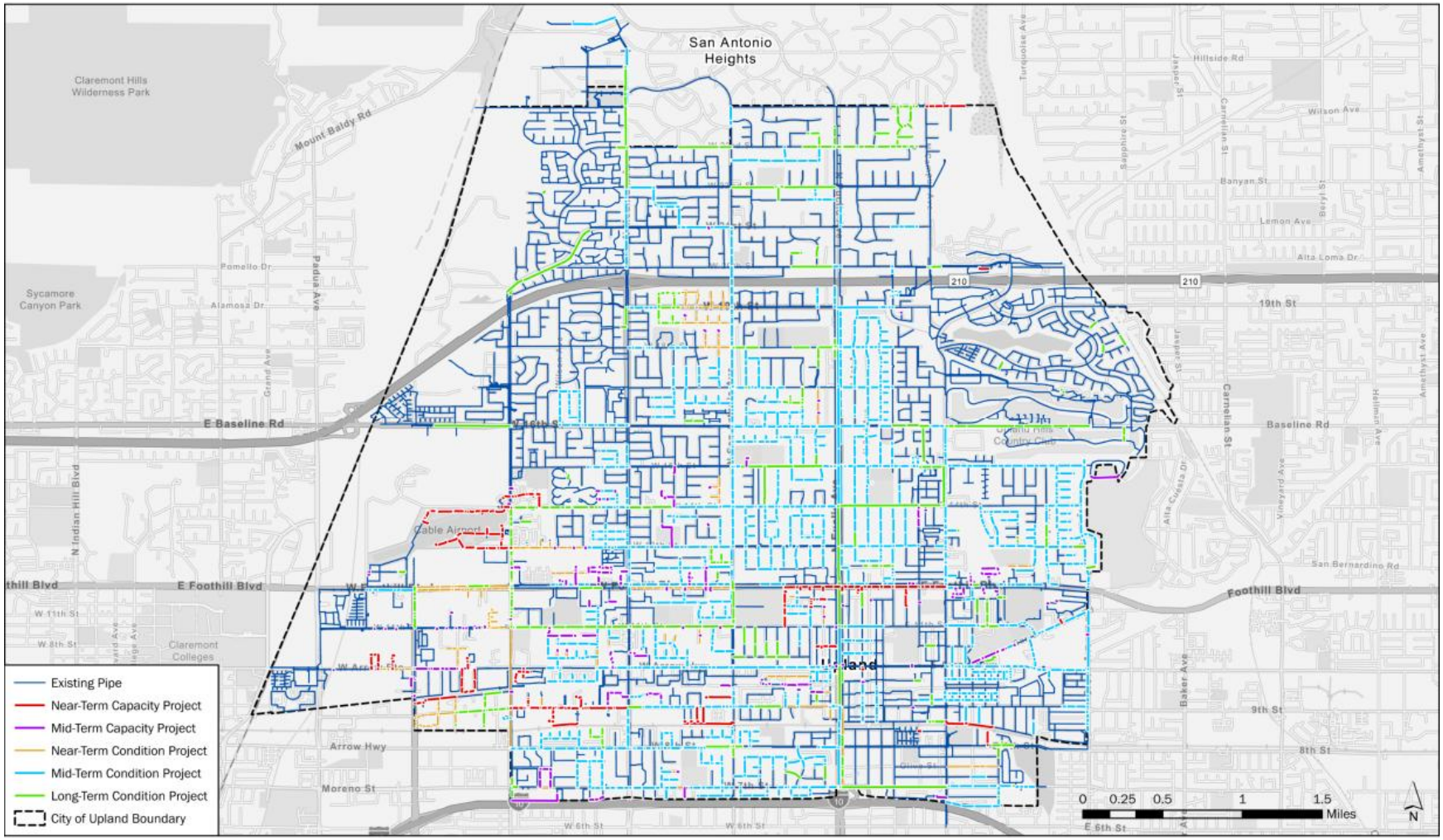


Figure 7-1. CIP pipeline projects

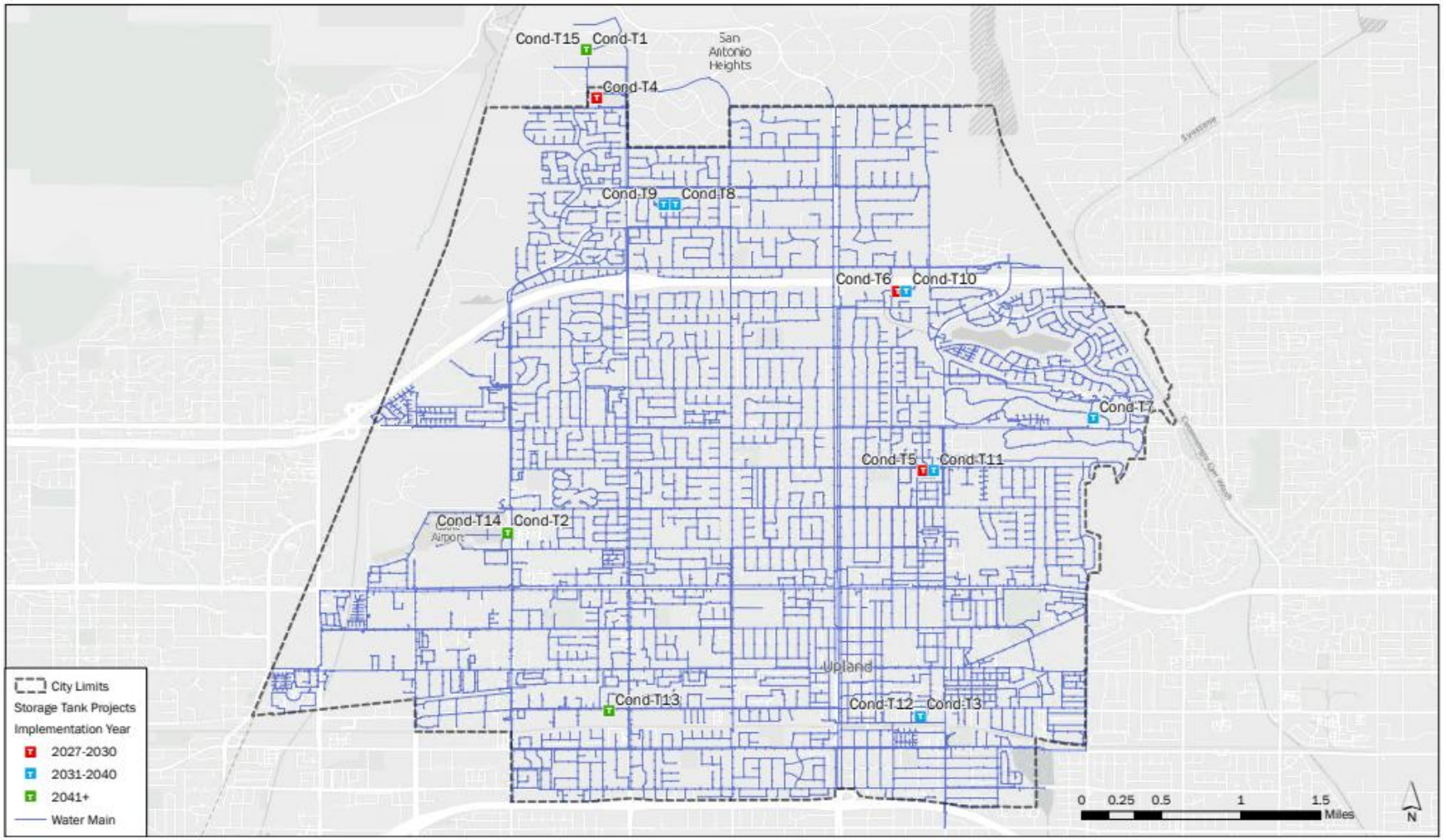


Figure 7-2. CIP storage reservoir projects

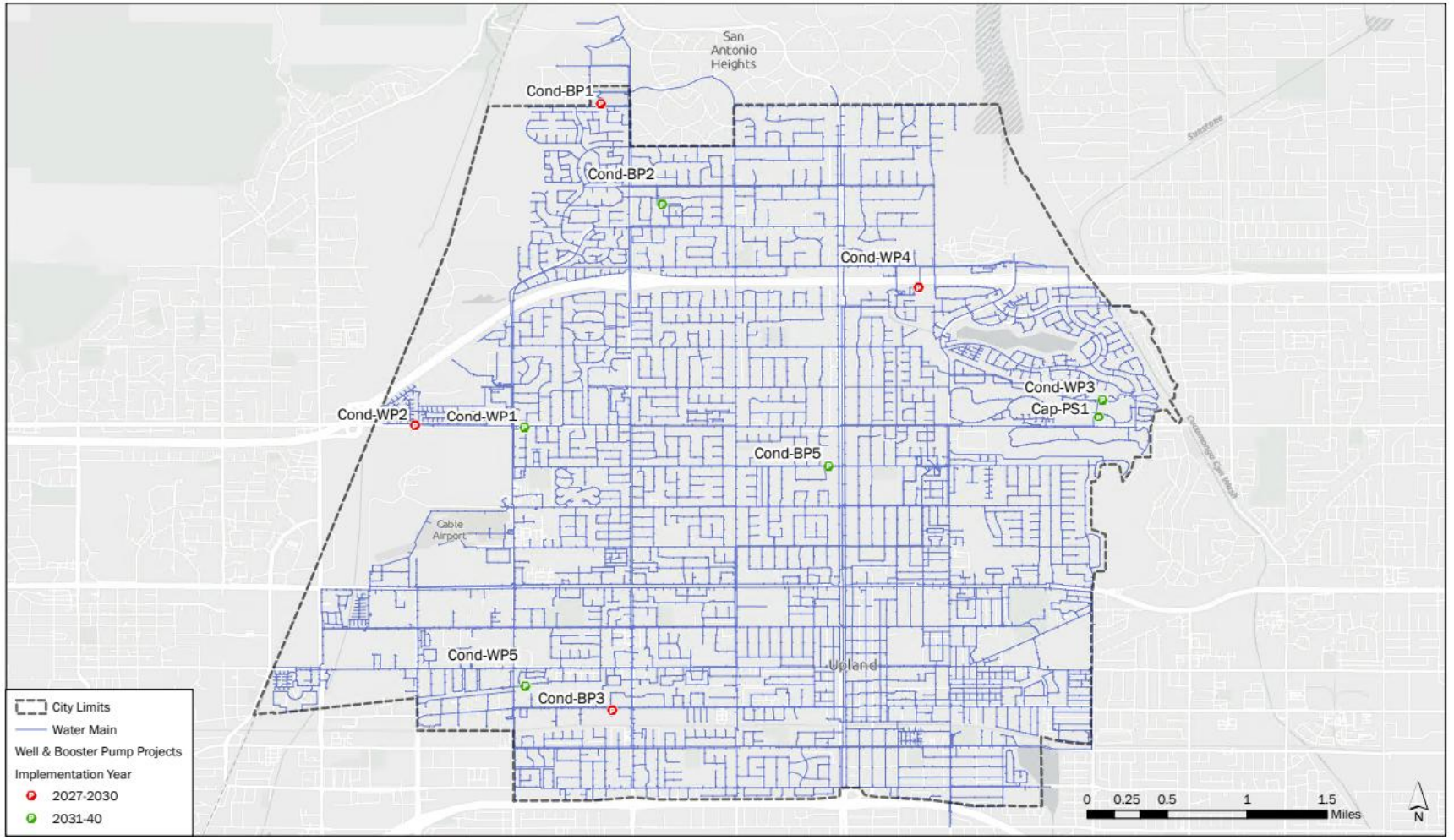


Figure 7-3. CIP well and booster pump projects

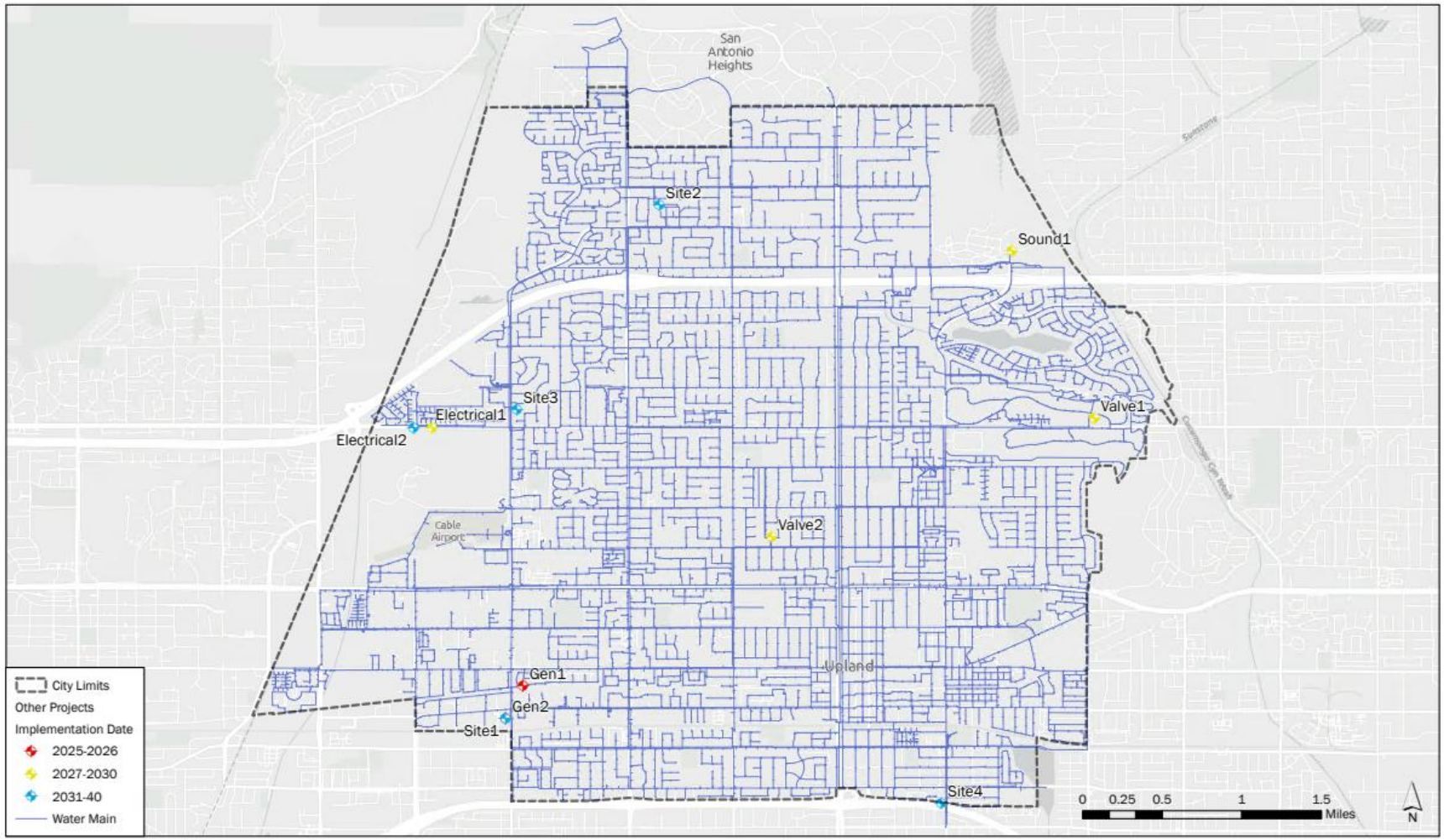


Figure 7-4. CIP other projects CIP phasing

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Table 7-2. CIP Projects

Project		Project Need	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	Notes
Water system capacity improvements							**$61,632,000**	
Capacity Improvements			**Diameter (in)**	**Length (LF)**	***Length (LF)***	***Length (LF)***		
Cap-FF-1	North of Burlington Northern Railroad (from N San Antonio Ave west to parking lot west of 968 W 9th St), and parking lots (south of W 9th St)	Addresses fire flow deficiency	8, 12	2,740	*2,740*		$2,953,000	To confirm some pipe ownership. Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-2	W Foothill Blvd (from N Campus Ave west to N Redding Way), N Redding Way (from W Foothill Blvd to W 11th St), and N 4th Ave (from E Foothill Blvd south for about 600')	Addresses fire flow deficiency and aging pipe	8, 12	8,190	*7,870*	*320*	$9,229,000	A portion of this project addresses a condition improvement.
Cap-FF-3	North of Burlington Northern Railroad (from parking lot west of A & A Food Services Co to parking lot near Micas Pro Roofers), and parking lot near Upland Events and Banquet Center (south of W 9th St)	Addresses fire flow deficiency	8	1,400	*1,400*		$1,277,000	Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-4	Parking lot (north of Arrow and 330' east of Loma Pl)	Addresses fire flow deficiency	12	350	*350*		$415,000	To confirm pipe ownership.
Cap-FF-5	Parking lot west of Fire Station 161 (southwest of E Arrow Hwy and N 2nd Ave)	Addresses fire flow deficiency	8	150	*150*		$138,000	To confirm some pipe ownership.
Cap-FF-6	W 9th St (from Benson Ave to N Mountain Ave)	Addresses fire flow deficiency	12	3,330	*3,330*		$3,945,000	
Cap-FF-7	North of W 9th St and 1,300' west of Mountain Ave	Addresses fire flow deficiency	12	640	*640*		$760,000	
Cap-FF-8	San Antonio Pl (from N San Antonio Ave west to dead end)	Addresses fire flow deficiency	8	690	*690*		$630,000	
Cap-FF-9	Orchard Dr dead end (east via easement to pipe in Extra Space Storage)	Addresses fire flow deficiency	8	80	*80*		$75,000	
Cap-FF-10	W G St (from N Euclid Ave west to alley west of N Laurel Ave)	Addresses fire flow deficiency	8	670	*670*		$611,000	
Cap-FF-11	Huntington Dr (from N Central Ave to N Loma Pl)	Addresses fire flow deficiency	12	1,240	*1,240*		$1,469,000	To confirm some pipe ownership.
Cap-FF-12	Alley by Marshalls (north of Palm Ave, west and north of building)	Addresses fire flow deficiency	8	630	*630*		$575,000	To confirm some pipe ownership.
Cap-FF-13	North of Burlington Northern Railroad (from N Campus Ave to N 10th Ave)	Addresses fire flow deficiency	8	1,380	*1,380*		$1,259,000	Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-14	Howard Access Rd (east of N Benson Ave) and easement at end of Howard Access Rd (south to Fairwood Way)	Addresses fire flow deficiency	8	1,420	*1,420*		$1,295,000	
Cap-FF-15	Cable Airport (northern pipeline, west of N Benson Ave to west of airport buildings)	Addresses fire flow deficiency	12	3,380	*3,380*		$4,004,000	To confirm some pipe ownership.
Cap-FF-16	Cable Airport (northern pipeline, west of N Benson Ave)	Addresses fire flow deficiency	8	240	*240*		$220,000	
Cap-FF-17	Gilmore Dr (north of E 8th St)	Addresses fire flow deficiency	8	500	*500*		$457,000	
Cap-FF-18	Holiday Rock office parking lot (west of N Benson Ave)	Addresses fire flow deficiency	8	250	*250*		$229,000	
Cap-FF-19	McArthur Way (north of W 9th St for about 300')	Addresses fire flow deficiency	8	300	*300*		$275,000	
Cap-FF-20	E 24th St (from N Campus Ave east to dead end past Fox Ridge Way)	Addresses fire flow deficiency	8	1,090	*1,090*		$995,000	
Cap-FF-21	College Commerce Way (north of W Arrow Rte) and pipe around storage facility (north of W Arrow Rte, 350' west of College Commerce Way)	Addresses fire flow deficiency	8, 12	1,920	*1,920*		$2,235,000	To confirm some pipe ownership.
Cap-FF-22	W 13th St (from N Benson Ave to Cable Airport) and southern piping at Cable Airport	Addresses fire flow deficiency	12	4,760	*4,760*		$5,639,000	To confirm some pipe ownership.
Cap-FF-23	Tesla parking lot (south of E 20th St, 700' west of Campus Ave)	Addresses fire flow deficiency	8	280	*280*		$257,000	To confirm some pipe ownership.
Cap-FF-24	Walkway north of Cascade Dr (north of San Bernardino Rd, 50' west of Cascade Dr)	Addresses fire flow deficiency	8	120	*120*		$111,000	
Cap-FF-25	Southeast of W Arrow Rte, 50' east of Loma Pl (around Dakota Creek Apartment Homes)	Addresses fire flow deficiency	8	1,960	*1,960*		$1,787,000	To confirm some pipe ownership.
Cap-FF-26	Corte Verde (south from W Arrow Hwy to Corte Caballo), Corte Hacienda (from Corte Rojo to about 250' east of Corte Verde), and Corte Rojo (from Corte Hacienda to Corte Santana)	Addresses fire flow deficiency	8	1,060	*1,060*		$968,000	

Table 7-2. CIP Projects

Project		Project Need	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	Notes
FF-Laterals	Hydrant lateral replacement program	Addresses fire flow deficiency	4, 6, 8	1,820	*1,820*		$1,580,000	Replacement of undersized hydrant laterals that are not connected to undersized distribution main.
PZ1-FF Ph2	Pressure Zone 1, Phase 2 Fire Flow Improvements	Addresses fire flow deficiency	8	7,850	*7,850*		$7,154,000	Low priority capacity improvement projects in Pressure Zone 1. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
PZ2-FF Ph2	Pressure Zone 2, Phase 2 Fire Flow Improvements	Addresses fire flow deficiency	8, 12	9,910	*9,910*		$9,939,000	Low priority capacity improvement projects in Pressure Zone 2. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
PZ3-FF Ph2	Pressure Zone 3, Phase 2 Fire Flow Improvements	Addresses fire flow deficiency	8	350	*350*		$320,000	Low priority capacity improvement projects in Pressure Zone 3. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
SmallDiam	Small diameter pipeline replacement in alleys.	Addresses fire flow deficiency		910	*910*		$831,000	The city identified a number of small diameter pipelines located in the alleyways between Campus and 11th and Arrow and 9th. These pipelines, primarily 2" and 3", galvanized steel, are of deteriorating condition and restrict service pressures to customers on these lines
Water system condition improvements							$1,526,313,000	
Pipeline Condition Improvements			Length (LF)					
Cond-P1	N Laurel Ave (from N Redding Way to W 11th St)	Replaces aging pipe and addresses fire flow deficiency	8	660	*60*	*600*	$602,000	A portion of this project addresses a capacity improvement.
Cond-P2	W 9th St (south side, 1,100' west of Mountain Ave to 585' west of Mountain Ave) and Mountain Plaza parking lot (from W 9th St around to N Mountain Ave)	Replaces aging pipe and addresses fire flow deficiency	8	1,720	*1,720*	*0*	$2,038,000	To confirm some pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P3	Elm Way (north of Cedar Ct) and Juniper Ave (north of Cedar Ct)	Replaces aging pipe and addresses fire flow deficiency	8	690	*690*	*0*	$630,000	This entire project address both capacity- and condition-related deficiencies.
Cond-P4	Norwood Ct (east of Brentwood Ave) and Brentwood Ave (from Norwood Ct to W 11th St)	Replaces aging pipe and addresses fire flow deficiency	8	1,090	*1,090*	*0*	$995,000	This entire project address both capacity- and condition-related deficiencies.
Cond-P5	Veterans Ct (west of N 13th Ave) and N 13th Ave (from Veterans Ct south about 150')	Replaces aging pipe and addresses fire flow deficiency	8, 12	920	*770*	*150*	$1,051,000	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P6	Fairwood Way (north of Winn Dr) and Glenwood Way (north of Winn Dr)	Replaces aging pipe and addresses fire flow deficiency	8	480	*90*	*390*	$439,000	A portion of this project addresses a capacity improvement.
Cond-P7	W 11th St (north side of street from 100' west of N Benson Ave for about 1,000' and south side of street for about 400') and north of W 11th St in Extra Space Storage site	Replaces aging pipe and addresses fire flow deficiency	8, 12	2,650	*1,570*	*1,080*	$3,124,000	To confirm pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P8	Pipeline around Foothill Self Storage (east of Meadowbrook)	Replaces aging pipe and addresses fire flow deficiency	8	1,560	*1,540*	*20*	$1,423,000	To confirm pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P9	W 9th St (from N Central Ave to S Loma Pl), N Central Ave (from Richton St south for about 300'), Vista Pl (from Huntington Dr to south of W 9th St), N Loma Pl (from Huntington Dr to south of W 9th St), and through parking lot near Foothill Animal Hospital (between Central Ave and Vista Pl)	Replaces aging pipe and addresses fire flow deficiency	8, 12	4,390	*4,260*	*130*	$4,483,000	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P10	W 9th St (from N Benson Ave west for about 1,500') and north of W 9th St to parking lot near McFadden Motorsports (for about 300')	Replaces aging pipe	12	1,560	*0*	*1,560*	$1,849,000	To confirm some pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P11	N Benson Ave (from Arrow Hwy to about 300' north of W 13th St) and W Foothill Blvd (from N Benson Ave to Central Ave)	Replaces aging pipe and addresses fire flow deficiency	8, 10, 12, 16	9,880	*300*	*9,580*	$15,420,000	Coordinate with paving plan. A portion of this project addresses a capacity improvement.
Cond-P12	W Foothill Blvd (from N Mountain Ave to N San Antonio Ave)	Replaces aging pipe and addresses fire flow deficiency	12	3,250	*3,250*	*0*	$4,986,000	Coordinate with paving plan. This entire project address both capacity- and condition-related deficiencies.
Cond-P13	San Bernardino Rd (from E Arrow Hwy to about 300' east of N 11th Ave)	Replaces aging pipe and addresses fire flow deficiency	8	1,060	*1,060*	*0*	$968,000	This entire project address both capacity- and condition-related deficiencies.

Table 7-2. CIP Projects

Project		Project Need	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	Notes
Cond-P14	W 9th St (north side from Lucerne Way to Euclid Ave and south side from Laurel Ave to Euclid Ave) and alley by Colonial Gardens Apartments (from W 9th St to W A St)	Replaces aging pipe and addresses fire flow deficiency	8, 16	1,760	*0*	*1,760*	$2,142,000	
Cond-P15	S Euclid Ave (from E 7th St to E 9th St)	Replaces aging pipe and addresses fire flow deficiency	8	2,660	*0*	*2,660*	$3,148,000	
Cond-P16	Alley between N Laurel Ave and Euclid Ave (north of Vernon Dr for about 120')	Replaces aging pipe and addresses fire flow deficiency	8	120	*0*	*120*	$111,000	
Cond-P17	N Laurel Ave (from W 16th St to W 17th St)	Replaces aging pipe and addresses fire flow deficiency	8	1,380	*70*	*1,310*	$1,259,000	A portion of this project addresses a capacity improvement.
Cond-P18	W Buffington St (from N San Antonio Ave to Elaine Way), Derby Way/Baxter Way/Anton Way (north of W Buffington St), Coolcrest Ave (from W Buffington to north of W 19th St), W 19th St (from 100' west of Danube Way to N San Antonio Ave), Danube Way/Belmar Way/Abbie Way (north of W 19th St), and the easement at north end of Coolcrest Way west past Danube Way	Replaces aging pipe	8	6,810	*0*	*6,810*	$6,207,000	
Cond-P19	Parking lot (east of N Mountain Ave and south of SPPE trail)	Replaces aging pipe and addresses fire flow deficiency	8	640	*640*	*0*	$584,000	To confirm pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P20	Alley south of Vernon Dr (from N Palm Ave to alley east of N Laurel Ave)	Replaces aging pipe	8	620	*0*	*620*	$566,000	
Cond-P21	Silverwood Ave (from W Arrow Hwy to just south of Elmwood St) and Hallwood Ct (from Silverwood Ave west to dead end)	Replaces aging pipe	8	1,310	*0*	*1,310*	$1,551,000	
Cond-P22	Springfield St (from east of London Ave to east of Wilson Ave) and Wilson Ave (from W Foothill Blvd north about 600')	Replaces aging pipe and addresses fire flow deficiency	8	1,780	*610*	*1,170*	$1,623,000	A portion of this project addresses a capacity improvement.
Cond-P23	Olive St (from S Campus Ave to S 11th Ave)	Replaces aging pipe	8	1,570	*0*	*1,570*	$1,432,000	
Cond-P24	Magnolia Ave (from W 11th Ave south to end of dead end)	Replaces aging pipe and addresses fire flow deficiency	8	540	*30*	*510*	$493,000	A portion of this project addresses a capacity improvement.
Cond-P25	N Benson Ave (from W Foothill Blvd to north of W 13th St about 500') and W 13th St (from Cable Airport parking to just east of Maywood Ave)	Replaces aging pipe and addresses fire flow deficiency	8, 10, 12, 20	5,260	*1,350*	*3,910*	$7,741,000	A portion of this project addresses a capacity improvement.
Cond-P26	N Albright Ave (from W 14th St to W Cumberland St), W Emory Ct/W Stetson Ct (west of N Albright Ave)	Replaces aging pipe and addresses fire flow deficiency	8	1,470	*40*	*1,430*	$1,341,000	A portion of this project addresses a capacity improvement.
Cond-P27	W 18th St (from 150' west of Balboa Way to N San Antonio Ave), Balboa Way (north of W 18th St), and Albright Way (from north dead-end to about 300' south of W 18th St)	Replaces aging pipe and addresses fire flow deficiency	8	2,300	*110*	*2,190*	$2,097,000	A portion of this project addresses a capacity improvement.
Cond-P28	Harrison Ct (about 200' at eastern end of dead end)	Replaces aging pipe and addresses fire flow deficiency	8	230	*40*	*190*	$211,000	A portion of this project addresses a capacity improvement.
Cond-P29	S Euclid Ave (westside from 7th St to Olive St)	Replaces aging pipe and addresses fire flow deficiency	8	680	*680*	*0*	$621,000	This entire project address both capacity- and condition-related deficiencies.
Cond-P30	W 7th St (from Fredricks Ln west about 500') and pipe around Mountain Crest Apartments	Replaces aging pipe	8	2,220	*0*	*2,220*	$2,025,000	To confirm some pipe ownership.
Cond-P31	W 7th St (from 50' east of Barlow Way to about 300' west of Barlow) and Barlow Way (south of W 7th St)	Replaces aging pipe and addresses fire flow deficiency	8, 10	730	*380*	*350*	$719,000	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P32	Loma Pl (from W Arrow Rte to Woodlawn St) and Woodlawn St (about 350' on either side of Loma Pl)	Replaces aging pipe and addresses fire flow deficiency	8, 10, 12	1,500	*1,500*	*0*	$1,767,000	This entire project address both capacity- and condition-related deficiencies.
Cond-P33	W Arrow Rte (from N Central Ave about 1,200' west)	Replaces aging pipe and addresses fire flow deficiency	8, 10	1,080	*30*	*1,050*	$1,172,000	A portion of this project addresses a capacity improvement.
Cond-P34	Alley west of Upland Town Square (north of W Foothill Blvd about 600')	Replaces aging pipe and addresses fire flow deficiency	8	570	*530*	*40*	$675,000	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P35	Alley east of Dalia's pizza (south from W Foothill Blvd about 300') and roadway at north end of development (west of alley for about 200')	Replaces aging pipe and addresses fire flow deficiency	8	560	*320*	*240*	$663,000	The majority of this project address both capacity- and condition-related deficiencies.

Table 7-2. CIP Projects

Project		Project Need	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	Notes
Cond-P36	W Foothill Blvd (northern most pipe from Central St east about 500' and northern pipe from Central St to N Benson Ave)	Replaces aging pipe	10	1,360	*0*	*1,360*	$1,488,000	Existing 6" pipe to be abandoned with laterals reconnected to 10"
Cond-P37	Parking lot (north of W Foothill Blvd 225' east of Mulberry Ave)	Replaces aging pipe and addresses fire flow deficiency	8	510	*510*	*0*	$605,000	To confirm pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P38	Wedgewood Ave (south of Woodbury Ct to dead end)	Replaces aging pipe and addresses fire flow deficiency	8	280	*260*	*20*	$257,000	
Cond-P-Ph2	Pipe condition improvement projects: Phase 2	Replaces aging pipe	8 - 24	142,700	0	142,700	$180,491,000	
Cond-P-Ph3	Pipe condition improvement projects: Phase 3	Replaces aging pipe	8 - 36	74,300	0	74,300	$101,166,000	
Cond-P-Ph4	Pipe condition improvement projects: Phase 4	Replaces aging pipe	8 - 36	1,189,500	0	1,189,500	$1,164,858,000	Represents replacement of all pipes not being replaced by other CIP projects. This placeholder, long-term project was developed to support long-term planning.
Storage Reservoir Condition Improvements			Volume (MG)					
Cond-T1	Reservoir 2	Roof needs improvement		5.0			$283,000	
Cond-T2	Reservoir 10	Roof needs improvement		1.5			$293,000	
Cond-T3	Reservoir 4	Roof needs improvement		0.2			$614,000	
Cond-T4	Reservoir 16	New roof, concrete and steel repairs, and new drainage		10.0			$3,900,000	City identified additional improvements needed since completion of Harper and Associates report.
Cond-T5	Reservoir 12	Replace coating, address corrosion and metal loss		4.0			$4,445,000	
Cond-T6	Reservoir 13	Replace coating, address corrosion and metal loss		5.4			$3,166,000	
Cond-T7	Reservoir 14	Replace coating, address corrosion and metal loss		0.2			$387,000	
Cond-T8	Reservoir 7	Replace coating, address corrosion and metal loss		1.5			$1,296,000	
Cond-T9	Reservoir 3	Roof walkway and ridge repair, joint sealant		4.3			$230,000	
Cond-T10	Reservoir 13A	Address corrosion and joint sealant		5.6			$138,000	
Cond-T11	Reservoir 12A	Address corrosion and joint sealant		5.0			$145,000	
Cond-T12	Reservoir 4	Address moisture on roof		0.2			$122,000	
Cond-T13	Reservoir 11	Address corrosion		0.2			$439,000	
Cond-T14	Reservoir 10	Install cathodic protection		1.5			$1,314,000	
Cond-T15	Reservoir 2	Install cathodic protection		5.0			$2,314,000	

Table 7-2. CIP Projects

Project		Project Need	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	Notes
Pump Condition Improvements				**Size (HP)**				
Cond-BP1	Plant 2, Booster 3	Improve pump efficiency		50			$331,000	Replace pump
Cond-BP2	Plant 3, Booster 1 and 2	Improve pump efficiency		125			$1,466,000	Replace pump
Cond-BP3	Plant 12 Boosters and Electrical Panel	Upgrade electrical panel and address aging pumps		100			$1,789,000	Upgrade electrical panel. Rehab split case booster pumps (#1, 2, and 3)
Cond-BP4	Upland Foothills Booster 2	Address aging infrastructure		40			$895,000	Pump rehab and install dedicated flush line that ties into storm drain on Mountain.
Cond-BP5	15th St Transfer	Upgrade electrical panel and cooling system		200			$753,000	Upgrade electrical panel, service pump, and upgrade cooling system inside vault. Also need to move service laterals off of 16-inch transmission line to distribution line.
Cond-WP1	Lemon Heights 4, Well Pump	Improve pump efficiency		150			$376,000	
Cond-WP2	Mountain View 4, Well Pump	Improve pump efficiency		25			$123,000	
Cond-WP3	Upland Foothills, Well Pump	Improve pump efficiency		40			$173,000	
Cond-WP4	Well 20, Well Pump	Address aging infrastructure		50			$209,000	City staff identified this project as high priority
Cond-WP5	Plant 10, Well 3, Well Pump	Address broken pump		60			$814,000	Well 3 (Plant 10): Replace well pump (in kind). Install dedicated flush line to Benson.
Other Projects							$4,917,000	
Gen1	Plant 10 (Well 3), New Generator	Provide backup power		200 kW			$408,000	
Gen2	Plant 11 (Well 8), New Generator	Provide backup power		200 kW			$408,000	
Valve1	Plant 5 Cla-Val upgrade	Upgrade valving to improve reliability		16-in			$132,000	City staff identified this project as high priority
Valve2	Van Drop Line: install Cla-Val	Upgrade valving to improve operation and reliability		16-in			$356,000	Van Drop Line: Modify 16-inch mainline and install 16-inch Cla-Val with a vault to replace 16-inch gate valve that is currently used to throttle the Van Drop Line.
Electrical1	West End 3/4 electrical panel upgrade	Upgrade electrical panel		600A			$455,000	
Sound1	Well 15 sounding line replacement	Replace aging infrastructure		n/a			$192,000	
Site1	Plant 11 (Well 8)	Site security and beautification improvements		10,000 SF			$503,000	
Site2	Plant 3 North Side	Site security and beautification improvements		7,000 SF			$1,467,000	
Site3	City Well 17	Site security and beautification improvements		10,000 SF			$765,000	
Site4	Plant 14	Site security and beautification improvements		10,000 SF			$231,000	
Valve-Eval	Pneumatic tank upgrade evaluation study.	System evaluation		n/a			$200,000	Evaluate upgrading pneumatic tanks with Cla-Val at Plants 2, 3, 4, 10, and 12
Storage-Eval	System storage evaluation study.	System evaluation		n/a			$200,000	Conduct study to review potential use of extra storage capacity at Plant 5 and evaluate secondary reservoir construction to help alleviate water storage needs at Reservoirs 2 and 16.
CIP Total							**$1,592,862,000**	
Pipe Length Total (feet)			**1,545,260**					

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The following captures an overview of the projects included in the CIP. Project cost estimates and additional details can be found in Table 7-2 and Appendix G.

- Pipeline R&R projects were developed for those projects at or nearing the end of their useful life and elevated if city staff have identified leaks in recent years. Should it be determined that the pipes identified in these projects are still in good condition, the replacement projects may be deferred, and other improvements can be elevated. As mentioned in the previous section, a more detailed pipeline condition and replacement optimization study is recommended to help prioritize pipeline replacements.
- The city has indicated that all new pipelines, other than hydrant and service laterals, should be a minimum of 8-inch diameter. Therefore, condition improvement projects do not include like-for-like diameter replacements for distribution pipes under 8-inches.
- In parallel to this master plan effort, the city is developing its road paving plan. When possible, pipeline improvement projects and road paving projects should be coordinated to avoid digging recently re-paved streets and to more efficiently utilize the city's available funds.[5] Based on discussions with city staff, it was determined that pipeline projects presented in this master plan should bear the full burden of street improvements, and that cost savings achieved through coordination of the pipeline and paving projects will be realized in the street improvement budget. At this time, it is expected that pipeline projects on Foothill Boulevard and Benson Avenue will be coordinated with paving efforts (noted in Table 7-2). Additional coordination will be determined.
- 17 pipeline projects include pipes that may be located on private property and not within a city easement. At this time, ownership and responsibility of those pipelines could not be confirmed. This will be further investigated to determine whether the city will be responsible to implement and bear the cost of the recommended improvements.
- 3 capacity improvement projects include new proposed pipes in easement near the railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented to achieve targeted capacity improvements.

7.2.1 CIP Phasing

Within each improvement category, projects were prioritized into three phases: near-term, mid-term and long-term. The city has already finalized its CIP through 2026, so near-term extends from 2027-2030, with mid-term extending from 2031-2040, and long-term covering projects after 2040.

Due to the city's budget and staffing limitations, the target annual spend for the CIP was set to start at $16M and gradually rise as the city ramps up its CIP implementation capacity. Should the city secure additional funding and/or determine that sufficient staffing is available, projects in the CIP may be shifted up from mid-term to near-term. Higher priority projects that were shifted to the mid-term and should be elevated if possible have been identified as such in Table 7-2.

As shown in Figure 7-5 and Figure 7-6, most of the proposed improvement costs come from the condition improvement category. Facilities rehabilitation and replacement (R&R) improvements account for over 80 percent of the total, $455 million CIP cost through the long-term and 56 percent of the $149 million CIP through the mid-term. Figure 7-5 provides a breakdown of the CIP by project type through mid-term (2040), with $83 million associated with R&R, $61 million associated with capacity improvements, and $4.5 million associated with other projects.

[5] Per city Ordinance No. 1841, roads should not be excavated within 60 months (5 years) of paving unless public health and safety require the work to be permitted.

Near-Term Projects

As summarized in Table 7-2 and shown in Figure 7-5, the cost for near-term projects is around $70 million, which includes about $53 million for pipeline improvements, $12 million for storage improvements, $2.5 million for well and booster pump improvements, and $1.5 million for other projects.

Mid-Term Projects

Mid-Term projects include year's 2031 through 2040. As summarized in Table 7-2 and shown in Figure 7-5 the cost for mid-term projects is nearly $80 million, which about $70 million for pipeline improvements, $2.6 million for storage improvements, $4.5 million for well and booster pump improvements, and $3 million for other projects.

Long-Term Projects

Long-Term projects include projects slated for implementation after the year 2040. As summarized in Table 7-2 and shown in Figure 7-7, the cost for long-term projects is about $1.4 billion with the vast majority associated with pipeline R&R projects representing gradual replacement of pipes across the rest of the system not addressed in the near- and mid-term. Excluding the Phase 4 pipe condition replacements—which is a project developed to capture and start planning for the replacement of all city pipes—the for the long-term projects is about $280 million, with around $260 million associated with pipeline R&R projects. About $17 million is associated with low priority capacity improvements where the available fire flow was less than 5 percent below the requirement, or the deficiency was due only to an undersized lateral. The remaining $4 million will cover low-priority storage reservoir condition improvements.

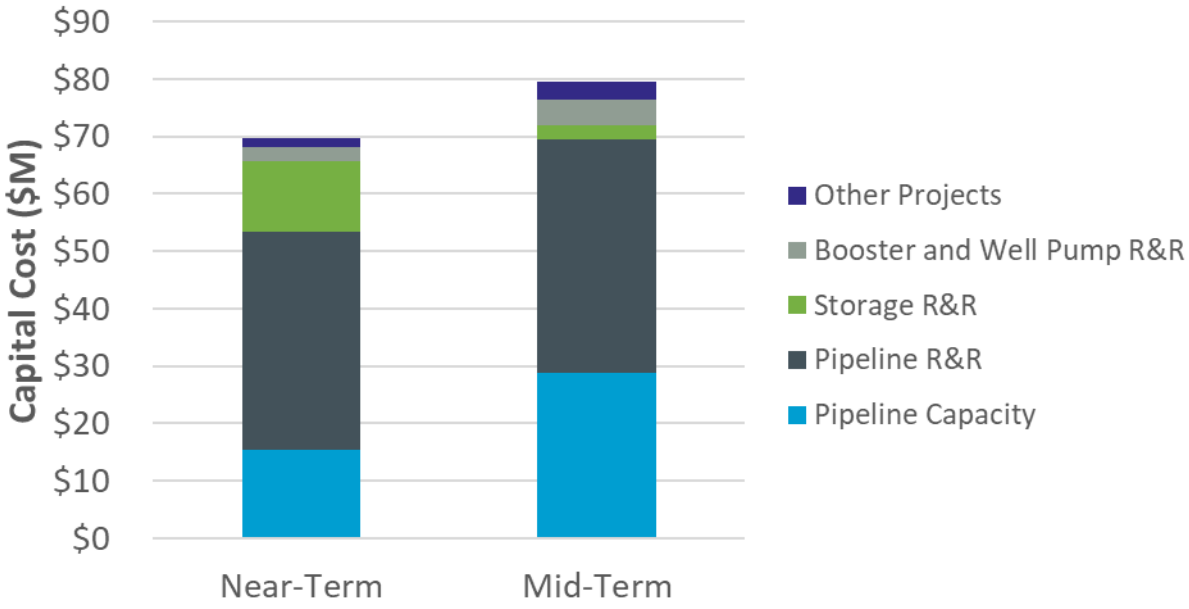


Figure 7-5. Water CIP by improvement category and phase (excludes long-term projects)

Pipeline capacity and R&R projects may address a combination of both capacity- and condition-related deficiencies.

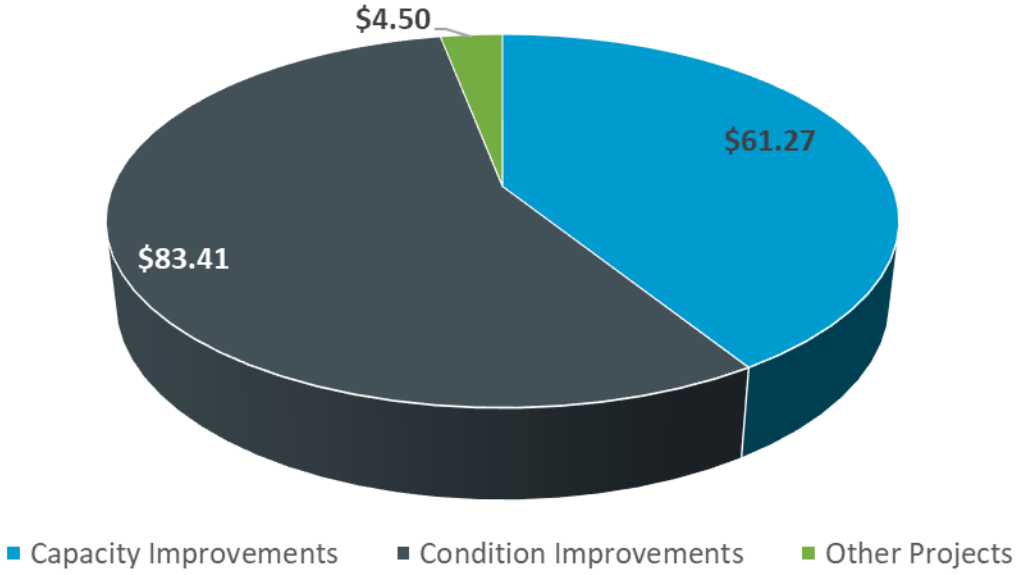


Figure 7-6. Water CIP cost ($M) by facility type (excludes long-term projects)

This budget breakdown allocates the cost of pipeline projects based on the length associated with capacity versus condition improvements (see Table 7-2)

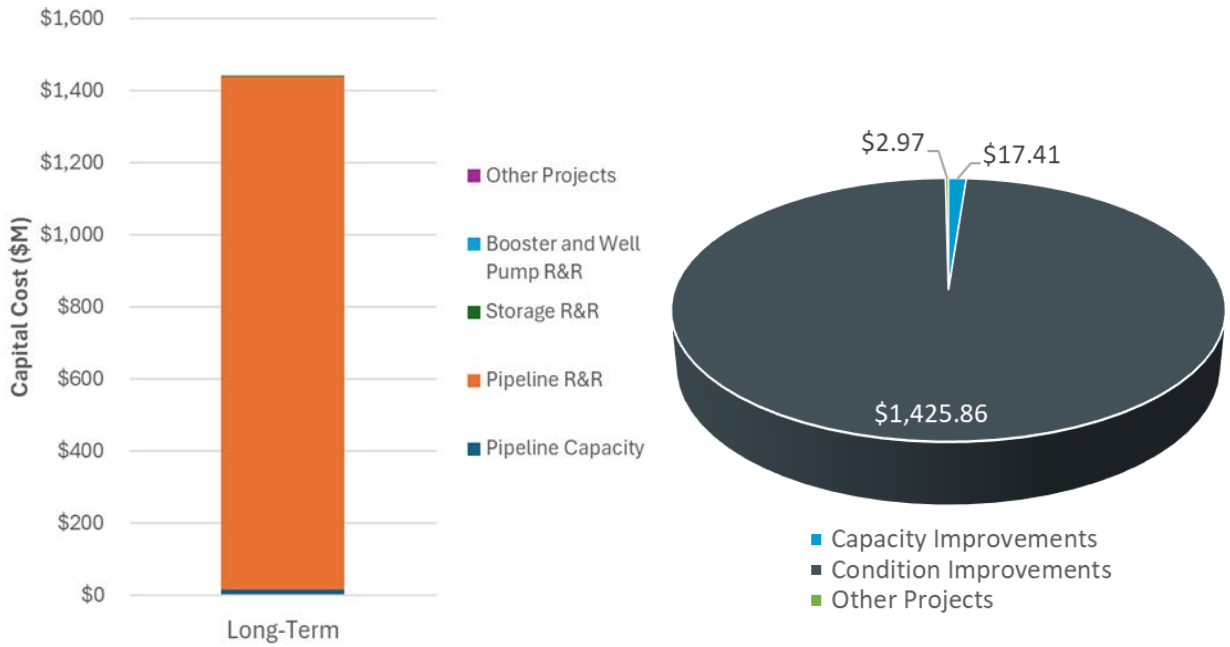


Figure 7-7. Water CIP cost ($M) by category and facility type - long-term projects only

This budget breakdown allocates the cost of pipeline projects based on the length associated with capacity versus condition improvements (see Table 7-2)

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Table 7-3. CIP Phasing

Project	Phase	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	CIP Phasing						Notes
							Near-Term				Mid-Term	Long-Term	
							2027	2028	2029	2030	2031-40	2041 & Beyond	
Water system capacity improvements						**$61,632,000**	**$0**	**$4,615,000**	**$6,409,000**	**$4,363,000**	**$28,833,000**	**$17,413,000**	
Capacity Improvements		**Diameter (in)**	**Length (LF)**	***Length (LF)***	***Length (LF)***								
Cap-FF-1	2030	8, 12	2,740	*2,740*		$2,953,000	$0	$0	$0	$2,953,000	$0	$0	To confirm some pipe ownership. Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-2	2028/2029	8, 12	8,190	*7,870*	*320*	$9,229,000	$0	$4,614,500	$4,614,500	$0	$0	$0	A portion of this project addresses a condition improvement.
Cap-FF-3	2031-40	8	1,400	*1,400*		$1,277,000	$0	$0	$0	$0	$1,277,000	$0	Priority in 2031-40 phasing. Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-4	2029	12	350	*350*		$415,000	$0	$0	$415,000	$0	$0	$0	To confirm pipe ownership.
Cap-FF-5	2029	8	150	*150*		$138,000	$0	$0	$138,000	$0	$0	$0	To confirm some pipe ownership.
Cap-FF-6	2031-40	12	3,330	*3,330*		$3,945,000	$0	$0	$0	$0	$3,945,000	$0	Priority in 2031-40 phasing
Cap-FF-7	2030	12	640	*640*		$760,000	$0	$0	$0	$760,000	$0	$0	
Cap-FF-8	2029	8	690	*690*		$630,000	$0	$0	$630,000	$0	$0	$0	
Cap-FF-9	2030	8	80	*80*		$75,000	$0	$0	$0	$75,000	$0	$0	
Cap-FF-10	2029	8	670	*670*		$611,000	$0	$0	$611,000	$0	$0	$0	
Cap-FF-11	2031-40	12	1,240	*1,240*		$1,469,000	$0	$0	$0	$0	$1,469,000	$0	Priority in 2031-40 phasing. To confirm some pipe ownership.
Cap-FF-12	2030	8	630	*630*		$575,000	$0	$0	$0	$575,000	$0	$0	To confirm some pipe ownership.
Cap-FF-13	2031-40	8	1,380	*1,380*		$1,259,000	$0	$0	$0	$0	$1,259,000	$0	Project includes new pipeline in easement near railroad. If easement cannot be obtained, alternative pipeline upsizes may be implemented.
Cap-FF-14	2031-40	8	1,420	*1,420*		$1,295,000	$0	$0	$0	$0	$1,295,000	$0	
Cap-FF-15	2031-40	12	3,380	*3,380*		$4,004,000	$0	$0	$0	$0	$4,004,000	$0	To confirm some pipe ownership.
Cap-FF-16	2031-40	8	240	*240*		$220,000	$0	$0	$0	$0	$220,000	$0	
Cap-FF-17	2031-40	8	500	*500*		$457,000	$0	$0	$0	$0	$457,000	$0	
Cap-FF-18	2031-40	8	250	*250*		$229,000	$0	$0	$0	$0	$229,000	$0	
Cap-FF-19	2031-40	8	300	*300*		$275,000	$0	$0	$0	$0	$275,000	$0	
Cap-FF-20	2031-40	8	1,090	*1,090*		$995,000	$0	$0	$0	$0	$995,000	$0	
Cap-FF-21	2031-40	8, 12	1,920	*1,920*		$2,235,000	$0	$0	$0	$0	$2,235,000	$0	To confirm some pipe ownership.
Cap-FF-22	2031-40	12	4,760	*4,760*		$5,639,000	$0	$0	$0	$0	$5,639,000	$0	To confirm some pipe ownership.
Cap-FF-23	2031-40	8	280	*280*		$257,000	$0	$0	$0	$0	$257,000	$0	To confirm some pipe ownership.
Cap-FF-24	2031-40	8	120	*120*		$111,000	$0	$0	$0	$0	$111,000	$0	
Cap-FF-25	2031-40	8	1,960	*1,960*		$1,787,000	$0	$0	$0	$0	$1,787,000	$0	To confirm some pipe ownership.
Cap-FF-26	2031-40	8	1,060	*1,060*		$968,000	$0	$0	$0	$0	$968,000	$0	

Table 7-3. CIP Phasing

Project	Phase	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	CIP Phasing						Notes
							Near-Term				Mid-Term	Long-Term	
							2027	2028	2029	2030	2031-40	2041 & Beyond	
FF-Laterals	2031-40	4, 6, 8	1,820	*1,820*		$1,580,000	$0	$0	$0	$0	$1,580,000	$0	Replacement of undersized hydrant laterals that are not connected to undersized distribution main.
PZ1-FF Ph2	2041 & Beyond	8	7,850	*7,850*		$7,154,000	$0	$0	$0	$0	$0	$7,154,000	Low priority capacity improvement projects in Pressure Zone 1. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
PZ2-FF Ph2	2041 & Beyond	8, 12	9,910	*9,910*		$9,939,000	$0	$0	$0	$0	$0	$9,939,000	Low priority capacity improvement projects in Pressure Zone 2. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
PZ3-FF Ph2	2041 & Beyond	8	350	*350*		$320,000	$0	$0	$0	$0	$0	$320,000	Low priority capacity improvement projects in Pressure Zone 3. These improvements should be revisited and broken out into specific projects in 5-10 years. Low priority capacity improvement projects address hydrants that currently achieve 95% or more of the required fire flow.
SmallDiam	2031-40		910	*910*		$831,000	$0	$0	$0	$0	$831,000	$0	The city identified a number of small diameter pipelines located in the alleyways between Campus and 11th and Arrow and 9th. These pipelines, primarily 2" and 3", galvanized steel, are of deteriorating condition and restrict service pressures to customers on these lines
Water system condition improvements						**$1,526,313,000**	**$15,131,000**	**$11,302,000**	**$11,798,000**	**$14,577,000**	**$47,646,000**	**$1,425,859,000**	
Pipeline Condition Improvements		**Diameter (in)**	**Length (LF)**	***Length (LF)***	***Length (LF)***								
Cond-P1	2031-40	8	660	*60*	*600*	$602,000	$0	$0	$0	$0	$602,000	$0	A portion of this project addresses a capacity improvement.
Cond-P2	2031-40	8	1,720	*1,720*	*0*	$2,038,000	$0	$0	$0	$0	$2,038,000	$0	To confirm some pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P3	2028	8	690	*690*	*0*	$630,000	$0	$630,000	$0	$0	$0	$0	This entire project address both capacity- and condition-related deficiencies.
Cond-P4	2029	8	1,090	*1,090*	*0*	$995,000	$0	$0	$995,000	$0	$0	$0	This entire project address both capacity- and condition-related deficiencies.
Cond-P5	2029	8, 12	920	*770*	*150*	$1,051,000	$0	$0	$1,051,000	$0	$0	$0	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P6	2029	8	480	*90*	*390*	$439,000	$0	$0	$439,000	$0	$0	$0	A portion of this project addresses a capacity improvement.
Cond-P7	2030	8, 12	2,650	*1,570*	*1,080*	$3,124,000	$0	$0	$0	$3,124,000	$0	$0	To confirm pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P8	2030	8	1,560	*1,540*	*20*	$1,423,000	$0	$0	$0	$1,423,000	$0	$0	To confirm pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P9	2030	8, 12	4,390	*4,260*	*130*	$4,483,000	$0	$0	$0	$4,483,000	$0	$0	The majority of this project address both capacity- and condition-related deficiencies.

Table 7-3. CIP Phasing

Project	Phase	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	CIP Phasing						Notes
							Near-Term				Mid-Term	Long-Term	
							2027	2028	2029	2030	2031-40	2041 & Beyond	
Cond-P10	2031-40	12	1,560	*0*	*1,560*	$1,849,000	$0	$0	$0	$0	$1,849,000	$0	To confirm some pipe ownership. The majority of this project address both capacity- and condition-related deficiencies.
Cond-P11	2027/2028	8, 10, 12, 16	9,880	*300*	*9,580*	$15,420,000	$7,710,000	$7,710,000	$0	$0	$0	$0	Coordinate with paving plan. A portion of this project addresses a capacity improvement.
Cond-P12	2027	12	3,250	*3,250*	*0*	$4,986,000	$4,986,000	$0	$0	$0	$0	$0	Coordinate with paving. This entire project address both capacity- and condition-related deficiencies.
Cond-P13	2029	8	1,060	*1,060*	*0*	$968,000	$0	$0	$968,000	$0	$0	$0	This entire project address both capacity- and condition-related deficiencies.
Cond-P14	2031-40	8, 16	1,760	*0*	*1,760*	$2,142,000	$0	$0	$0	$0	$2,142,000	$0	
Cond-P15	2031-40	8	2,660	*0*	*2,660*	$3,148,000	$0	$0	$0	$0	$3,148,000	$0	
Cond-P16	2031-40	8	120	*0*	*120*	$111,000	$0	$0	$0	$0	$111,000	$0	
Cond-P17	2031-40	8	1,380	*70*	*1,310*	$1,259,000	$0	$0	$0	$0	$1,259,000	$0	A portion of this project addresses a capacity improvement.
Cond-P18	2031-40	8	6,810	*0*	*6,810*	$6,207,000	$0	$0	$0	$0	$6,207,000	$0	
Cond-P19	2031-40	8	640	*640*	*0*	$584,000	$0	$0	$0	$0	$584,000	$0	To confirm pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P20	2031-40	8	620	*0*	*620*	$566,000	$0	$0	$0	$0	$566,000	$0	
Cond-P21	2031-40	8	1,310	*0*	*1,310*	$1,551,000	$0	$0	$0	$0	$1,551,000	$0	
Cond-P22	2031-40	8	1,780	*610*	*1,170*	$1,623,000	$0	$0	$0	$0	$1,623,000	$0	A portion of this project addresses a capacity improvement.
Cond-P23	2031-40	8	1,570	*0*	*1,570*	$1,432,000	$0	$0	$0	$0	$1,432,000	$0	
Cond-P24	2031-40	8	540	*30*	*510*	$493,000	$0	$0	$0	$0	$493,000	$0	A portion of this project addresses a capacity improvement.
Cond-P25	2031-40	8, 10, 12, 20	5,260	*1,350*	*3,910*	$7,741,000	$0	$0	$0	$0	$7,741,000	$0	Priority in 2031-40 phasing. A portion of this project addresses a capacity improvement.
Cond-P26	2031-40	8	1,470	*40*	*1,430*	$1,341,000	$0	$0	$0	$0	$1,341,000	$0	A portion of this project addresses a capacity improvement.
Cond-P27	2031-40	8	2,300	*110*	*2,190*	$2,097,000	$0	$0	$0	$0	$2,097,000	$0	A portion of this project addresses a capacity improvement.
Cond-P28	2031-40	8	230	*40*	*190*	$211,000	$0	$0	$0	$0	$211,000	$0	A portion of this project addresses a capacity improvement.
Cond-P29	2031-40	8	680	*680*	*0*	$621,000	$0	$0	$0	$0	$621,000	$0	This entire project address both capacity- and condition-related deficiencies.
Cond-P30	2031-40	8	2,220	*0*	*2,220*	$2,025,000	$0	$0	$0	$0	$2,025,000	$0	To confirm some pipe ownership.
Cond-P31	2028	8, 10	730	*380*	*350*	$719,000	$0	$719,000	$0	$0	$0	$0	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P32	2030	8, 10, 12	1,500	*1,500*	*0*	$1,767,000	$0	$0	$0	$1,767,000	$0	$0	This entire project address both capacity- and condition-related deficiencies.
Cond-P33	2031-40	8, 10	1,080	*30*	*1,050*	$1,172,000	$0	$0	$0	$0	$1,172,000	$0	A portion of this project addresses a capacity improvement.

Table 7-3. CIP Phasing

Project	Phase	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	CIP Phasing						Notes
							Near-Term				Mid-Term	Long-Term	
							2027	2028	2029	2030	2031-40	2041 & Beyond	
Cond-P34	2027	8	570	*530*	*40*	$675,000	$675,000	$0	$0	$0	$0	$0	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P35	2027	8	560	*320*	*240*	$663,000	$663,000	$0	$0	$0	$0	$0	The majority of this project address both capacity- and condition-related deficiencies.
Cond-P36	2031-40	10	1,360	*0*	*1,360*	$1,488,000	$0	$0	$0	$0	$1,488,000	$0	Existing 6" pipe to be abandoned with laterals reconnected to 10"
Cond-P37	2027	8	510	*510*	*0*	$605,000	$605,000	$0	$0	$0	$0	$0	To confirm pipe ownership. This entire project address both capacity- and condition-related deficiencies.
Cond-P38	2031-40	8	280	*260*	*20*	$257,000	$0	$0	$0	$0	$257,000	$0	
Cond-P-Ph2	2041 & Beyond	8 - 24	142,700	*0*	*142,700*	$180,491,000	$0	$0	$0	$0	$0	$180,491,000	
Cond-P-Ph3	2041 & Beyond	8 - 36	74,300	*0*	*74,300*	$101,166,000	$0	$0	$0	$0	$0	$101,166,000	
Cond-P-Ph4	2041 & Beyond	8 - 36	1,189,500	*0*	*1,189,500*	$1,164,858,000	$0	$0	$0	$0	$0	$1,164,858,000	Represents replacement of all pipes not being replaced by other CIP projects. This placeholder, long-term project was developed to support long-term planning.
Storage Reservoir Condition Improvements			**Volume (MG)**										
Cond-T1	2027		5.0			$283,000	$283,000	$0	$0	$0	$0	$0	
Cond-T2	2031-40		1.5			$293,000	$0	$0	$0	$0	$293,000	$0	Priority in 2031-40 phasing
Cond-T3	2030		0.2			$614,000	$0	$0	$0	$614,000	$0	$0	
Cond-T4	2029		10.0			$3,900,000	$0	$0	$3,900,000	$0	$0	$0	City identified additional improvements needed since completion of Harper and Associates report.
Cond-T5	2029		4.0			$4,445,000	$0	$0	$4,445,000	$0	$0	$0	
Cond-T6	2030		5.4			$3,166,000	$0	$0	$0	$3,166,000	$0	$0	
Cond-T7	2031-40		0.2			$387,000	$0	$0	$0	$0	$387,000	$0	Priority in 2031-40 phasing
Cond-T8	2031-40		1.5			$1,296,000	$0	$0	$0	$0	$1,296,000	$0	Priority in 2031-40 phasing
Cond-T9	2031-40		4.3			$230,000	$0	$0	$0	$0	$230,000	$0	
Cond-T10	2031-40		5.6			$138,000	$0	$0	$0	$0	$138,000	$0	
Cond-T11	2031-40		5.0			$145,000	$0	$0	$0	$0	$145,000	$0	
Cond-T12	2031-40		0.2			$122,000	$0	$0	$0	$0	$122,000	$0	
Cond-T13	2041 & Beyond		0.2			$439,000	$0	$0	$0	$0	$0	$439,000	
Cond-T14	2041 & Beyond		1.5			$1,314,000	$0	$0	$0	$0	$0	$1,314,000	
Cond-T15	2041 & Beyond		5.0			$2,314,000	$0	$0	$0	$0	$0	$2,314,000	
Pump Condition Improvements			**Size (HP)**										
Cond-BP1	2028		50			$331,000	$0	$331,000	$0	$0	$0	$0	
Cond-BP2	2031-40		125			$1,466,000	$0	$0	$0	$0	$1,466,000	$0	
Cond-BP3	2028		100			$1,789,000	$0	$1,789,000	$0	$0	$0	$0	Upgrade electrical panel. Rehab split case booster pumps (#1, 2, and 3)
Cond-BP4	2031-40		40			$895,000	$0	$0	$0	$0	$895,000	$0	Pump rehab and install dedicated flush line that ties into storm drain on Mountain.

Table 7-3. CIP Phasing

Project	Phase	Proposed Size		Size of Capacity Improvement	Size of Condition Improvement	CIP Cost Estimate	CIP Phasing						Notes
							Near-Term				Mid-Term	Long-Term	
							2027	2028	2029	2030	2031-40	2041 & Beyond	
Cond-BP5	2031-40		200			$753,000	$0	$0	$0	$0	$753,000	$0	Upgrade electrical panel, service pump, and upgrade cooling system inside vault. Also need to move service laterals off of 16-inch transmission line to distribution line.
Cond-WP1	2031-40		150			$376,000	$0	$0	$0	$0	$376,000	$0	
Cond-WP2	2028		25			$123,000	$0	$123,000	$0	$0	$0	$0	
Cond-WP3	2031-40		40			$173,000	$0	$0	$0	$0	$173,000	$0	
Cond-WP4	2027		50			$209,000	$209,000	$0	$0	$0	$0	$0	City staff identified this project as high priority
Cond-WP5	2031-40		60			$814,000	$0	$0	$0	$0	$814,000	$0	Well 3 (Plant 10): Replace well pump (in kind). Install dedicated flush line to Benson.
Other Projects						**$4,917,000**	**$356,000**	**$587,000**	**$0**	**$592,000**	**$2,966,000**	**$0**	
Gen1	2025		200 kW			$408,000	$0	$0	$0	$0	$0	$0	New backup generator at Plant 10
Gen2	2025		200 kW			$408,000	$0	$0	$0	$0	$0	$0	New backup generator at Plant 11
Valve1	2028		16-in			$132,000	$0	$132,000	$0	$0	$0	$0	City staff identified this project as high priority
Valve2	2027		16-in			$356,000	$356,000	$0	$0	$0	$0	$0	Van Drop Line: Modify 16-inch mainline and install 16-inch Cla-Val with a vault to replace 16-inch gate valve that is currently used to throttle the Van Drop Line.
Electrical1	2028		600A			$455,000	$0	$455,000	$0	$0	$0	$0	West End 3/4 electrical panel upgrade
Sound1	2030		n/a			$192,000	$0	$0	$0	$192,000	$0	$0	Well 15
Site1	2031-40		10000 SF			$503,000	$0	$0	$0	$0	$503,000	$0	Well 8 (Plant 11)
Site2	2031-40		7000 SF			$1,467,000	$0	$0	$0	$0	$1,467,000	$0	Plant 3 North Side
Site3	2031-40		10000 SF			$765,000	$0	$0	$0	$0	$765,000	$0	City Well 17 Site
Site4	2031-40		10000 SF			$231,000	$0	$0	$0	$0	$231,000	$0	Plant 14
Valve-Eval	2030		n/a			$200,000	$0	$0	$0	$200,000	$0	$0	Evaluate upgrading pneumatic tanks with Cla-Val at Plants 2, 3, 4, 10, and 12
Storage-Eval	2030		n/a			$200,000	$0	$0	$0	$200,000	$0	$0	Conduct study to review potential use of extra storage capacity at Plant 5 and evaluate secondary reservoir construction to help alleviate water storage needs at Reservoirs 2 and 16.
CIP Total						**$1,592,862,000**	**$15,487,000**	**$16,504,000**	**$18,207,000**	**$19,532,000**	**$79,445,000**	**$1,443,272,000**	
Annual Cost ($/year)							$15,487,000	$16,504,000	$18,207,000	$19,532,000	$7,945,000	$18,041 ,000	
Pipe Length Total (feet)							**4,890**	**1,420**	**5,410**	**14,190**	**65,370**	**1,435,910**	
Annual Pipe Length (feet/year)							**4,890**	**1,420**	**5,410**	**14,190**	**6,500**	**17,900**	

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7.3 Other Projects and Considerations

While this master plan effort is the most comprehensive system assessment the city has conducted to date, there are additional projects and efforts needed to continue to improve and maintain the water and recycled water systems. In addition to the system improvements identified as part of this master plan effort, the city has identified three key sets of next steps:

1. **Conduct detailed facility condition assessments** – building on the Harper and Associates review of the storage reservoirs; the city plans to conduct detailed facility assessments for the well and booster pumps and other key facilities. These assessments will provide additional information to support the city's prioritization of system maintenance and improvement projects.
2. **Conduct additional strategic supply and distribution planning** – building on the supply and distribution assessment presented in this master plan, the city may further evaluate regional supply and distribution operations and scenarios and engage with regional partners to identify opportunities to better utilize groundwater and other supplies.
3. **Implement additional projects and fill equipment needs** – In parallel to the CIP presented in the master plan, city staff conducted a comprehensive review to identified additional system and equipment needs, including one-time repairs and recurring maintenance as well as staffing gaps (see below). These recommendations will be presented outside of the Master Plan.
4. **Expand public works staff to support increased resiliency and emergency response** – Additional staffing will ensure round-the-clock operational readiness, especially during wildfire-related runoff events or groundwater fluctuations that can spike water quality concerns.
5. **Expand public works staff to facilitate the implementation of the CIP for the water and wastewater systems and the continued operation and maintenance of its utilities** - Based on a review of independent and internal organizational assessment findings, the current staffing structure does not support effective CIP delivery or sustainable maintenance. The city conducted a regional survey of cities and special districts with similar characteristics and functions of the City of Upland (e.g., population and utility responsibilities) to compare the current staffing levels to other agencies. The results of that survey found that other agencies have 0.85 full time equivalent (FTE) employees in the utility division and 1.35 FTE in the public works division per 1,000 residents in the service area. Comparatively, the city currently employs 0.46 FTEs in the utility division and 0.51 FTEs in the public works division, shortfalls of 46 and 62 percent, respectively, or about 31 and 67 FTEs.

   The total shortfall of nearly 100 FTEs highlights the city's need to hire staff to align with service demands, improve operational efficiency, and enhance long-term sustainability. Further, the city's internal review identified the need to re-organize the staffing structure. The goal of the new organizational structure will be to improve the leadership structure, enhance CIP delivery (shifting to a more proactive approach), and institute better regulatory compliance, customer service, and facilities management.

   As of June 2025, the City Council has approved the Phase 1 Staffing Plan to add 8 positions to support Public Works and deliver more efficient CIP execution. The city is continuing to review its staffing structure and needs and will be proposing additional staffing enhancements.

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Section 8

Limitations

This document was prepared solely for the City of Upland (city) in accordance with professional standards at the time the services were performed and in accordance with the contract between the city and Brown and Caldwell dated September 22, 2022. This document is governed by the specific scope of work authorized by the city; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the city and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Further, Brown and Caldwell make no warranties, express or implied, with respect to this document, except for those, if any, contained in the agreement pursuant to which the document was prepared. All data, drawings, documents, or information contained this report have been prepared exclusively for the person or entity to whom it was addressed and may not be relied upon by any other person or entity without the prior written consent of Brown and Caldwell unless otherwise provided by the Agreement pursuant to which these services were provided.

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Section 9

References

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California Department of Water Resources, *Documentation for Provisional Data Released as Part of Making Conservation a California Way of Life Proposed Regulation (Version 1.1),* 2023.

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Appendix A: City Local Input (Development) Spreadsheet

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Jurisdiction	TAZ*			2019 Totals						Reference only: GROWTH (2019-2050) Adopted 2020 RTP/SCS Distribution						GROWTH (2019-2050) Preliminary 2024 RTP/SCS Distribution						**GROWTH (2019-2050): Local Input 2024 RTP/SCS Distribution						2050 Totals						Notes
	Tier 3 (2020 RTP)	Tier3 (SCAG 2024)	Tier3 (New)	SF	MF	HH	R	NR	E	SF	MF	HH	R	NR	E	SF	MF	HH	R	NR	E	SF	MF	HH	R	NR	E	SF	MF	HH	R	NR	E	
Upland	53637101	53637101	53637101	380	5	385	450	730	1180	0	52	52	0	0	0	0	67	67	-70	70	0	0	67	67	-70	70	0	380	72	452	380	800	1,180	
Upland	53622101	53622101	53622101	138	1329	1467	650	882	1532	10	144	154	78	39	117	140	288	428	-69	187	118	0	50	50	-69	187	118	138	1,379	1,517	581	1,069	1,650	TAZ area built out. Open space is City park (Cabrillo Park and AYSO Soccer Fields).
Upland	53622201	53622201	53622201	28	194	222	214	1796	2010	0	262	262	156	390	546	0	178	178	85	462	547	0	319	319	85	462	547	28	513	541	299	2,258	2,557	Housing Element Site Inventory - Sites # 51, 53, 62, 103 - 319 MF units
Upland	53622301	53622302	53622301	0	120	120	117	883	1000	0	787	787	27	117	144	0	144	144	20	100	120	0	302	302	20	100	120	0	422	422	137	983	1,120	Housing Element Site Inventory - Sites #4, 9, 52, 1000 - 302 MF units
Upland	53622302	53622303	53622302	72	163	235	26	302	328	0	66	66	9	2	12	0	136	136	4	35	39	0	0	0	4	35	39	72	163	235	30	337	367	Built out, other than permanent City-owned detention basin
Upland	53622303	53622301	53622303	41	486	527	76	101	177	0	0	0	21	0	21	0	0	0	12	9	21	0	58	58	12	9	21	41	544	585	88	110	198	Housing Element Site Inventory - Site #82 - 58 MF Units
Upland	53622401	53622401	53622401	85	400	485	95	1046	1141	0	101	101	28	117	145	0	70	70	16	128	144	0	0	0	16	128	144	85	400	485	111	1,174	1,285	Primarily Industrial Zoning that doesn't allow residential. Property owner of largest CO/MU center in TAZ area has zone change application submitted to amend zoning to CI/MU to allow more industrial uses in center. Residential unlikely.
Upland	53622501	53622501	53622501	83	561	644	69	183	252	0	84	84	41	10	51	1	171	172	34	16	50	1	75	76	34	16	50	84	636	720	103	199	302	Housing Element Site Inventory - Site #91 - 75 MF Units
Upland	53623101	53623101	53623101	1	0	1	143	1535	1678	0	47	47	37	10	47	0	0	0	16	214	230	0	0	0	16	214	230	1	0	1	159	1,749	1,908	
Upland	53623102	53623102	53623102	2	0	2	211	388	599	0	0	0	51	332	383	0	0	0	23	59	82	0	0	0	23	59	82	2	0	2	234	447	681	
Upland	53623103	53623103	53623103	57	10	67	108	836	944	0	0	0	0	12	12	0	44	44	12	117	129	0	0	0	12	117	129	57	10	67	120	953	1,073	Area is in Airport Land Use Compatibility Zone - No housing permitted. Vacant area is designated open space.
Upland	53623201	53623201	53623201	629	0	629	1	75	76	0	41	41	16	0	16	83	402	485	0	14	14	0	0	0	0	14	14	629	0	629	1	89	90	Built out residential area
Upland	53623301	53623301	53623301	307	492	799	128	761	889	0	157	157	39	41	80	16	1058	1074	2	79	81	0	0	0	2	79	81	307	492	799	130	840	970	Built out, no housing element site inventory sites in area. Growth numbers not consistent with zoning.
Upland	53627101	53627101	53627103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upland	53631101	53631103	53631101	351	2	353	0	23	23	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	5	5	351	2	353	0	28	28	
Upland	53631102	53631101	53631102	174	29	203	137	105	242	0	787	787	78	58	136	0	12	12	42	8	50	0	0	0	42	8	50	174	29	203	179	113	292	Open space owned by City for future sports park. No area zoned for 12 new MF units.
Upland	53631103	53631102	53631103	703	0	703	145	253	398	0	0	0	0	0	0	16	96	112	45	36	81	0	0	0	45	36	81	703	0	703	190	289	479	No Housing Element Site Inventory sites, built out area.
Upland	53631201	53631202	53631201	210	0	210	1	151	152	4	0	4	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	215	0	215	1	151	152	Housing Element Site Inventory - Sites #10, 61 - 5 SF
Upland	53631202	53631201	53631202	317	0	317	0	126	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317	0	317	0	126	126	
Upland	53631301	53631301	53631301	350	0	350	0	182	182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350	0	350	0	182	182	
Upland	53631302	53631302	53631302	517	0	517	0	38	38	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	517	0	517	0	38	38	No Housing Element Site Inventory sites, no multi-family zoning in this TAZ. Built out SF neighborhood in SF zoning.
Upland	53632101	53632103	53632101	140	0	140	1	3	4	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	140	0	140	1	3	4	Built out single family residential development
Upland	53632102	53632105	53632102	460	0	460	11	43	54	0	0	0	0	0	0	0	0	0	5	-5	0	0	0	0	5	-5	0	460	0	460	16	38	54	
Upland	53632103	53632102	53632103	338	0	338	12	44	56	0	0	0	0	0	0	0	22	22	0	0	0	0	0	0	0	0	0	338	0	338	12	44	56	Built out single family residential development
Upland	53632104	53632104	53632104	284	0	284	8	32	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	284	0	284	8	32	40	
Upland	53632105	53632101	53632105	253	0	253	31	116	147	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	253	0	253	31	116	147	Built out single family residential development, no multi-family zoning
Upland	53632201	53632203	53632201	162	1	163	20	6	26	8	0	8	0	0	0	0	5	5	-5	5	0	4	0	4	-5	5	0	166	1	167	15	11	26	Housing Element Site Inventory - Sites # 11, 58, 59, 60 - 4 SF
Upland	53632202	53632202	53632202	233	3	236	21	161	182	21	0	21	0	0	0	0	0	0	-5	5	0	1	0	1	-5	5	0	234	3	237	16	166	182	Housing Element Site Inventory - Site # 50 - 1 SF
Upland	53632203	53632201	53632203	168	12	180	0	11	11	4	0	4	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	171	12	183	0	11	11	Housing Element Site Inventory - Site #49 - 3 SF
Upland	53632301	53632301	53632301	245	0	245	0	6	6	0	0	0	0	23	23	0	8	8	0	5	5	0	0	0	0	5	5	245	0	245	0	11	11	Built out SF Residential area and mines. No available area zoned for 8 new MF units.
Upland	53632302	53632302	53632302	302	1	303	0	20	20	26	0	26	0	0	0	0	2	2	0	18	18	32	0	32	0	18	18	334	1	335	0	38	38	Housing Element Site Inventory - Site #88. Area zoned mining, SF Residential, and open space.
Upland	53634101	53634102	53634101	194	109	303	22	441	463	43	0	43	20	17	37	0	0	0	-3	45	42	0	102	102	-3	45	42	194	211	405	19	486	505	Housing Element Site Inventory - Site #99 - 102 MF units
Upland	53634102	53634101	53634102	355	42	397	0	206	206	0	0	0	0	22	22	0	0	0	0	18	18	1	0	1	0	18	18	356	42	398	0	224	224	Housing Element Site Inventory - Site #65 - 1 SF
Upland	53634201	53634201	53634201	98	223	321	82	650	732	0	105	105	39	94	133	0	306	306	14	118	132	0	136	136	14	118	132	98	359	457	96	768	864	Housing Element Site Inventory - Site #102 - 136 MF units
Upland	53634301	53634302	53634301	121	69	190	127	751	878	0	210	210	62	78	140	0	54	54	7	123	130	0	232	232	7	123	130	121	301	422	134	874	1,008	Housing Element Site Inventory - Site #69 - 232 MF units
Upland	53634302	53634301	53634302	206	256	462	331	339	670	0	0	0	76	16	91	0	100	100	20	80	100	0	0	0	20	80	100	206	256	462	351	419	770	TAZ area built out. Open space is permanent City Park (Citrus Park)
Upland	53634401	53634401	53634401	101	1083	1184	582	183	765	0	367	367	117	35	152	0	70	70	63	90	153	0	0	0	63	90	153	101	1,083	1,184	645	273	918	TAZ area is built out in residential areas. Remaining areas are commercial.
Upland	53636101	53636102	53636101	304	242	546	185	2315	2500	78	105	183	44	97	142	0	423	423	-32	231	199	0	350	350	-32	231	199	304	592	896	153	2,546	2,699	Housing Element Site Inventory - Site #64, 92
Upland	53636102	53636101	53636102	5	256	261	49	1281	1330	0	157	157	27	140	168	0	0	0	-9	115	106	0	144	144	-9	115	106	5	400	405	40	1,396	1,436	Housing Element Site Inventory - Sites #7, 93 - 144 - MF units
Upland	53636201	53636201	53636201	427	252	679	196	3125	3321	0	57	57	47	39	86	0	0	0	-79	165	86	0	19	19	-79	165	86	427	271	698	117	3,290	3,407	Housing Element Site Inventory - Site #71
Upland	53636301	53636301	53636301	106	799	905	16	788	804	10	52	63	7	5	12	0	0	0	3	10	13	1	52	53	3	10	13	107	851	958	19	798	817	Housing Element Site Inventory - Sites # 12, 73, 101 - 1 SF, 52 MF
Upland	53637101	53637101	53637101	380	5	385	450	730	1180	0	52	52	0	0	0	0	67	67	-70	70	0	0	67	67	-70	70	0	380	72	452	380	800	1,180	
Upland	53637201	53637201	53637201	208	393	601	385	1381	1766	10	320	330	-39	38	-1	31	744	775	11	-11	0	0	50	50	11	-11	0	208	443	651	396	1,370	1,766	Residential area built out, no housing inventory sites in TAZ
Upland	53637301	53637302	53637301	373	0	373	0	226	226	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	373	1	374	0	226	226	
Upland	53637302	53637301	53637302	503	0	503	0	27	27	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	503	1	504	0	27	27	
Upland	53639101	53639102	53639103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upland	53639201	53639203	53639203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upland	53642101	53642102	53642101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upland	53646201	53646202	53646204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upland	53648101	53648102	53648101	269	230	499	25	301	326	3	157	161	19	0	19	0	48	48	6	35	41	0	421	421	6	35	41	269	651	920	31	336	367	Housing Element Site Inventory - Sites #2, 3, 16, 48, 84, 85, 86, 94, 95, 98 and 105 - 391 MF units
Upland	53648102	53648101	53648102	0	283	283	60	480	540	0	829	829	58	31	90	0	0	0	14	54	68	0	792	792	14	54	68	0	1,075	1,075	74	534	608	Housing Element Site Inventory - Sites #1, 27, 28, 29, 31, 32, 39, 49, 41, 43, 104 - 792 MF units
Upland	53648201	53648202	53648201	179	103	282	0	30	30	0	0	0	0	0	0	0	2	2	0	0	0	1	0	1	0	0	0	180	103	283	0	30	30	Housing Element Site Inventory - Site #20 - 1 SF unit
Upland	53648202	53648201	53648202	185	85	270	0	19	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185	85	270	0	19	19	
Upland	53648301	53648302	53648301	118	31	149	5	30	35	0	315	315	0	0	0	0	4	4	-2	2	0	0	245	245	-2	2	0	118	276	394	3	32	35	Housing Element Site Inventory - Sites #6, 45, 46 - 245 MF units
Upland	53648302	53648301	53648302	105	105	210	5	144	149	0	0	0	0	0	0	0	0	0	-3	3	0	1	0	1	-3	3	0	106	105	211	2	147	149	Housing Element Site Inventory - Site #63 - 1 SF unit
Upland	53648401	53648402	53648401	0	16	16	55	107	162	0	315	315	76	19	96	0	0	0	37	63	100	0	181	181	37	63	100	0	197	197	92	170	262	Housing Element Site Inventory - Sites #33, 34, 35, 36, 37, 38, 42
Upland	53648402	53648401	53648402	94	12	106	0	44	44	-5	0	-5	0	33	33	0	0	0	0	27	27	2	0	2	0	27	27	96	12	108	0	71	71	Housing Element Site Inventory - Sites # 54 and 97 - 2 SF units
Upland	53650101	53650101	53650101	82	638	720	176	1022	1198	0	105	105	58	386	444	0	141	141	-23	467	444	0	100	100	-23	467	444	82	738	820	153	1,489	1,642	Housing Element Site Inventory - Sites #5, 47, 57
Upland	53650201	53650201	53650201	272	143	415	33	541	574	51	105	156	37	39	76	0	0	0	-5	83	78	0	50	50	-5	83	78	272	193	465	28	624	652	Housing Element Site Inventory - Sites #22, 68, 80 - 50 MF units
Upland	53650301	53650301	53650301	69	201	270	5	856	861	0	192	192	0	195	195	0	28	28	-2	196	194	0	141	141	-2	196	194	69	342	411	3	1,052	1,055	Housing Element Site Inventory - Site #79 - 141 MF units
Upland	53650401	53650401	53650401	268	400	668	12	379	391	10	52	63	0	78	78	3	60	63	-3	81	78	10	186	196	0	78	78	278	586	864	12	457	469	Housing Element Site Inventory - Sites #19, 72, 74, 76, 77, 78, 96
Upland	53650501	53650501	53650501	75	335	410	60	139	199	15	94	109	65	19	84	0	0	0	20	66	86	0	73	73	20	66	86	75	408	483	80	205	285	Housing Element Site Inventory - Sites #21, 24, 26, 44
Upland	53650601	53650602	53650601	120	50	170	118	151	269	0	0	0	16	24	40	0	0	0	11	2	13	1	10	11	11	2	13	121	60	181	129	153	282	Housing Element Site Inventory- Sites #55, 56 - 1SF, 10 MF units
Upland	53650602	53650601	53650602	0	25	25	121	1753	1874	0	52	52	47	16	62	0	0	0	11	80	91	0	58	58	11	80	91	0	83	83	132	1,833	1,965	Housing Element Site Inventory - Sites #23, 25 - 58 MF units
Upland	53654101	53654101	53654101	278	3	281	8	52	60	0	0	0	0	4	4	0	48	48	-1	7	6	0	135	135	-1	7	6	278	138	416	7	59	66	Housing Element Site Inventory - Site #89 - 135 MF units
Upland	53654102	53654102	53654102	657	209	866	186	1037	1223	0	84	84	39	78	117	12	355	367	-36	152	116	12	205	217	-36	152	116	669	414	1,083	150	1,189	1,339	Housing Element Site Inventory - Site #75, 81 - 205 MF units
Upland	53654201	53654202	53654201	195	5	200	0	91	91	0	0	0	0	0	0	0	209	209	0	20	20	0	0	0	0	20	20	195	5	200	0	111	111	No housing element sites in TAZ area. Open space is city-owned park (Sierra Vista Park). Developed SF zoned neighborhood.
Upland	53654202	53654201	53654202	404	267	671	264	342	606	0	52	52	117	39	156	0	136	136	34	100	134	0	136	136	34	100	134	404	403	807	298	442	740	Housing Element Site Inventory - Sites # 67, 70, 90
Upland	53655101	53655102	53655101	139	6	145	0	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	6	145	0	33	33	
Upland	53655102	53655103	53655102	228	8	236	10	60	70	3	0	3	0	0	0	0	0	0	-2	2	0	0	0	0	-2	2	0	228	8	236	8	62	70	
Upland	53655103	53655101	53655103	99	3	102	41	45	86	0	0	0	0	0	0	0	1	1	-7	7	0	58	1	59	-7	7	0	157	4	161	34	52	86	Housing Element Site Inventory - Site #87 - 58 SF
Upland	53655201	53655201	53655202	46	2	48	16	17	33	0	0	0	168	61	229	0	0	0	121	109	230	0	0	0	121	109	230	46	2	48	137	126	263	
Upland	53655301	53655301	53655301	45	2	47	80	2	82	0	0	0	0	0	0	0	0	0	7	1	8	0	0	0	7	1	8	45	2	47	87	3	90	
Upland	53655302	53655302	53655303	0	0	0	620	170	790	0	0	0	78	39	117	0	0	0	52	24	76	0	0	0	52	24	76	0	0	0	672	194	866	
Upland	53655302	53655303	53655304	0	0	0	364	179	543	0	0	0	0	0	0	0	0	0	30	22	52	0	0	0	30	22	52	0	0	0	394	201	595	
Upland	53656101	53656101	53656101	167	0	167	1	71	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	167	1	71	72	
Upland	53656102	53656102	53656102	408	0	408	0	84	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	408	0	408	0	84	84	
Upland	53656201	53656202	53656201	112	255	367	2	15	17	0	60	60	0	0	0	0	29	29	0	1	1	65	0	65	0	1	1	177	255	432	2	16	18	Housing Element Site Inventory - Site #13 - 65 SF
Upland	53656202	53656201	53656202	180	11	191	3	110	113	0	0	0	4	0	4	0	1	1	-1	5	4	0	1	1	-1	5	4	180	12	192	2	115	117	
Upland	53656301	53656301	53656302	1088	502	1590	234	426	660	0	326	326	8	0	8	0	244	244	-46	36	-10	0	244	244	-46	36	-10	1,088	746	1,834	188	462	650	
Upland	53665201	53665201	53665202	5	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	7	0	0	0	
City Total				**15,928**	**11,530**	**27,458**	**7,164**	**32,112**	**39,276**	**291**	**6,765**	**7,059**	**1,837**	**3,114**	**4,954**	**302**	**6,757**	**7,059**	**383**	**4,571**	**4,954**	**198**	**5516**	**5714**	**386**	**4568**	**4954**	**16,126**	**17,046**	**33,172**	**7,550**	**36,680**	**44,230**	
																				DELTA				**(1,345)**		**0**								
Upland Sphere (	53642102	53642104	53642102	206	7	213	4	78	82	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0	0	0	-2	2	0	0	0	0	-2	2	0	206	7	213	2	80	82	
Upland Sphere (	53642103	53642103	53642103	199	9	208	6	59	65	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	216	0	216	-2	2	0	5	0	0	-2	2	0	204	9	208	4	61	65	Built out Single family residential neighborhood. Potential for infill SF on limited vacant lots.
Upland Sphere (	53642101	53642101	53642104	203	8	211	0	29	29	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0	0	0	0	0	0	0	0	0	0	0	0	203	8	211	0	29	29	
Upland Sphere (	53642202	53642201	53642202	91	0	91	29	29	58	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0	0	0	-5	5	0	0	0	0	-5	5	0	91	0	91	24	34	58	
Upland Sphere (	53642201	53642202	53642203	386	0	386	6	215	221	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	6	0	6	-1	1	0	10	0	10	-1	1	0	396	0	396	5	216	221	Opportunity for infill SF on vacant lots
Upland Sphere (	53858201	53858201	53858202	92	2	94	0	25	25	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0	0	0	0	0	0	0	0	0	0	0	0	92	2	94	0	25	25	
Sphere Total				**1,177**	**26**	**1,203**	**45**	**435**	**480**	**0**	**0**	**0**	**0**	**0**	**0**	**222**	**0**	**222**	**(10)**	**10**	**0**	**15**	**0**	**10**	**-10**	**10**	**0**	**1,192**	**26**	**1,213**	**35**	**445**	**480**	

** Unhide for additional TAZ numbers*

*** Cells will turn orange when SF+MF does not equal HH and when R + NR does not equal E. City total HH and E will turn red when HH or E growth deviates from the control totals.*

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Appendix B: Statistical Summary of Historical (2020 Jan through 2022 May) Water Quality Characteristics

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Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
Chino Basin	City Well 20	Aggressiveness Index	None	NA	1	13	13	13	NA	13
		Alkalinity	mg/L CaCO3	NA	1	210	210	210	NA	210
		Barium	µg/L	1,000 (P)	1	74	74	74	NA	74
		Chromium	µg/L	50 (P)	1	1.3	1.3	1.3	NA	1.3
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	560	560	560	NA	560
		Fluoride	mg/L	2 (P)	1	0.35	0.35	0.35	NA	0.35
		Gross Alpha	pCi/L	15 (P)	3	5.3	28	12.87	13.11	23.46
		Langelier Index	None	NA	1	0.76	0.76	0.76	NA	0.76
		MTBE	µg/L	13 (P)	1	2	2	2	NA	2
		Magnesium	mg/L	NA	1	17	17	17	NA	17
		Nitrate	mg/L N	45 (P)	11	6.2	6.8	6.39	0.21	6.7
		Odor	TON	3 (S)	1	1	1	1	NA	1
		Potassium	mg/L	NA	1	2	2	2	NA	2
		Radium 226	pCi/L	NA	2	0.3	0.4	0.35	NA	0.39
		Radium 228	pCi/L	NA	1	1	1	1	NA	1
		Sodium	mg/L	NA	1	18	18	18	NA	18
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	370	390	380	NA	388
		Turbidity	NTU	5 (S)s	1	0.93	0.93	0.93	NA	0.93
		Uranium	pCi/L	NA	2	3.4	3.5	3.45	NA	3.49
		Uranium	µg/L	NA	2	5.1	5.2	5.15	NA	5.19
		pH	Units	NA	3	6.7	7.9	7.23	0.61	7.74
	City Well 3	DBCP	µg/L	0.2 (P)	13	0.03	0.04	0.03	0.01	0.04
		Nitrate	mg/L N	45 (P)	13	11	15	11.46	1.13	12
	City Well 7A	Alkalinity	mg/L CaCO3	NA	1	160	160	160	NA	160
		Arsenic	µg/L	10 (P)	1	1.2	1.2	1.2	NA	1.2
		Barium	µg/L	1,000 (P)	1	43	43	43	NA	43

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	11	11	11	NA	11
		Chloroform	µg/L	NA	47	0.5	1.3	0.69	0.16	0.86
		Chromium	µg/L	50 (P)	1	1.9	1.9	1.9	NA	1.9
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	410	410	410	NA	410
		Copper	µg/L	1,300 (AL)	1	17	17	17	NA	17
		DBCP	µg/L	0.2 (P)	1	0.02	0.02	0.02	NA	0.02
		Fluoride	mg/L	2 (P)	1	0.29	0.29	0.29	NA	0.29
		Freon 12	µg/L	NA	102	0.52	3	1.38	0.51	2
		Magnesium	mg/L	NA	1	10	10	10	NA	10
		Molybdenum	µg/L	NA	1	3.3	3.3	3.3	NA	3.3
		Nitrate	mg/L N	45 (P)	115	6.6	9	7.14	0.35	7.5
		PCE	µg/L	5 (P)	113	8.6	30	14.71	3.68	18.8
		Perchlorate	µg/L	6 (P)	49	2	4.5	2.22	0.39	2.5
		Sodium	mg/L	NA	1	15	15	15	NA	15
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	24	24	24	NA	24
		TCE	µg/L	5 (P)	115	1.2	3.2	1.74	0.35	2
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	260	290	275	NA	287
		TTHMs	µg/L	80 (P)	47	0.5	1.3	0.69	0.16	0.86
		Toluene	µg/L	150 (P)	1	15.9	15.9	15.9	NA	15.9
		Turbidity	NTU	5 (S)	1	0.35	0.35	0.35	NA	0.35
		Vanadium	µg/L	50 (NL)	1	5	5	5	NA	5
		pH	Units	NA	3	7	7.8	7.4	0.4	7.72
	City Well 8	Alkalinity	mg/L CaCO3	NA	1	180	180	180	NA	180
		Barium	µg/L	1,000 (P)	1	52	52	52	NA	52

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	18	18	18	NA	18
		Chromium	µg/L	50 (P)	1	2	2	2	NA	2
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	570	570	570	NA	570
		DBCP	µg/L	0.2 (P)	72	0.02	0.07	0.04	0.01	0.06
		Fluoride	mg/L	2 (P)	1	0.28	0.28	0.28	NA	0.28
		Magnesium	mg/L	NA	1	20	20	20	NA	20
		Molybdenum	µg/L	NA	1	2.8	2.8	2.8	NA	2.8
		Nitrate	mg/L N	45 (P)	77	10	20	11.57	1.4	13
		Sodium	mg/L	NA	1	15	15	15	NA	15
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	50	50	50	NA	50
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	340	400	370	NA	394
		Vanadium	µg/L	50 (NL)	1	4.9	4.9	4.9	NA	4.9
		pH	Units	NA	3	6.8	7.9	7.3	0.56	7.76
Cucamonga Basin	City Well 15	Alkalinity	mg/L CaCO3	NA	1	160	160	160	NA	160
		Arsenic	µg/L	10 (P)	1	1.2	1.2	1.2	NA	1.2
		Barium	µg/L	1,000 (P)	1	39	39	39	NA	39
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	vv5.2	5.2	5.2	NA	5.2
		Chromium	µg/L	50 (P)	1	1.4	1.4	1.4	NA	1.4
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	390	390	390	NA	390
		Fluoride	mg/L	2 (P)	1	0.4	0.4	0.4	NA	0.4
		Magnesium	mg/L	NA	1	8	8	8	NA	8
		Molybdenum	µg/L	NA	1	3.2	3.2	3.2	NA	3.2
		Nitrate	mg/L N	45 (P)	2	2.7	2.8	2.75	NA	2.79
		Odor	TON	3 (S)	1	1	1	1	NA	1

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Sodium	mg/L	NA	1	13	13	13	NA	13
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	26	26	26	NA	26
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	230	270	250	NA	266
		Turbidity	NTU	5 (S)	1	1.2	1.2	1.2	NA	1.2
		Vanadium	µg/L	50 (NL)	1	4.5	4.5	4.5	NA	4.5
		pH	Units	NA	3	6.9	7.9	7.4	0.5	7.8
Six Basin	City Well 1A	TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	1	310	310	310	NA	310
	City Well 5	Alkalinity	mg/L CaCO3	NA	1	260	260	260	NA	260
		Barium	µg/L	1,000 (P)	1	57	57	57	NA	57
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	9.8	9.8	9.8	NA	9.8
		Chloroform	µg/L	NA	1	1.2	1.2	1.2	NA	1.2
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	590	590	590	NA	590
		Copper	µg/L	1,300 (AL)	1	2.3	2.3	2.3	NA	2.3
		Fluoride	mg/L	2 (P)	1	0.31	0.31	0.31	NA	0.31
		Magnesium	mg/L	NA	1	20	20	20	NA	20
		Molybdenum	µg/L	NA	1	2.2	2.2	2.2	NA	2.2
		Nitrate	mg/L N	45 (P)	2	3.6	3.9	3.75	NA	3.87
		Sodium	mg/L	NA	1	12	12	12	NA	12
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	29	29	29	NA	29
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	350	360	355	NA	359
		TTHMs	µg/L	80 (P)	1	1.2	1.2	1.2	NA	1.2
		Turbidity	NTU	5 (S)	1	0.28	0.28	0.28	NA	0.28
		Vanadium	µg/L	50 (NL)	1	3.3	3.3	3.3	NA	3.3
		pH	Units	NA	3	6.6	7.7	7.1	0.56	7.56

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
	Lemon Heights Well 3	Nitrate	mg/L N	45 (P)	1	4.9	4.9	4.9	NA	4.9
	Lemon Heights Well 4	Alkalinity	mg/L CaCO3	NA	1	260	260	260	NA	260
		Barium	µg/L	1,000 (P)	1	60	60	60	NA	60
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	2	48	48	48	NA	48
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	720	720	720	NA	720
		Fluoride	mg/L	2 (P)	1	0.23	0.23	0.23	NA	0.23
		Gross Alpha	pCi/L	15 (P)	1	5.1	5.1	5.1	NA	5.1
		Magnesium	mg/L	NA	1	22	22	22	NA	22
		Nitrate	mg/L N	45 (P)	39	4.2	5.4	5.15	0.28	5.4
		Sodium	mg/L	NA	1	12	12	12	NA	12
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	2	41	41	41	NA	41
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	410	490	450	NA	482
		Turbidity	NTU	5 (S)	1	1.4	1.4	1.4	NA	1.4
		pH	Units	NA	3	6.4	7.7	7	0.66	7.54
	Upland Foothill Well 3	Alkalinity	mg/L CaCO3	NA	1	280	280	280	NA	280
		Barium	µg/L	1,000 (P)	1	52	52	52	NA	52
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	2	6.5	6.5	6.5	NA	6.5
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	620	620	620	NA	620
		Copper	µg/L	1,300 (AL)	1	3.5	3.5	3.5	NA	3.5
		Fluoride	mg/L	2 (P)	1	0.28	0.28	0.28	NA	0.28
		Gross Alpha	pCi/L	15 (P)	1	3	3	3	NA	3
		Magnesium	mg/L	NA	1	21	21	21	NA	21
		Molybdenum	µg/L	NA	1	2.1	2.1	2.1	NA	2.1
		Nitrate	mg/L N	45 (P)	37	1.9	5.8	2.96	0.91	4.26

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Radium 226	pCi/L	NA	1	0.32	0.32	0.32	NA	0.32
		Radium 228	pCi/L	NA	7	0.45	1.19	0.77	0.27	1.06
		Sodium	mg/L	NA	1	9.7	9.7	9.7	NA	9.7
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	2	37	37	37	NA	37
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	370	390	380	NA	388
		Turbidity	NTU	5 (S)	1	0.64	0.64	0.64	NA	0.64
		Uranium	pCi/L	NA	1	3.9	3.9	3.9	NA	3.9
		Uranium	µg/L	NA	1	5.9	5.9	5.9	NA	5.9
		pH	Units	NA	3	6.5	7.8	7.07	0.67	7.62
	West End Well 3	Alkalinity	mg/L CaCO3	NA	1	160	160	160	NA	160
		Barium	µg/L	1,000 (P)	11	32	43	37.36	3.23	40
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	4.9	4.9	4.9	NA	4.9
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	380	380	380	NA	380
		Copper	µg/L	1,300 (AL)	3	2.1	14	6.13	6.81	11.66
		Fluoride	mg/L	2 (P)	1	0.25	0.25	0.25	NA	0.25
		Magnesium	mg/L	NA	1	12	12	12	NA	12
		Nitrate	mg/L N	45 (P)	2	1.5	2	1.75	NA	1.95
		Sodium	mg/L	NA	1	6.8	6.8	6.8	NA	6.8
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	29	29	29	NA	29
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	230	280	255	NA	275
		Turbidity	NTU	5 (S)	1	0.29	0.29	0.29	NA	0.29
		Zinc	µg/L	5,000 (S)	1	29	29	29	NA	29
		pH	Units	NA	3	7	7.9	7.43	0.45	7.8
	West End Well 4	Alkalinity	mg/L CaCO3	NA	1	160	160	160	NA	160

Table B-1. Historical Water Quality Characteristics of Upland Water Sources										
Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Barium	µg/L	1,000 (P)	11	29	61	33	9.4	33
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	7.2	7.2	7.2	NA	7.2
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	390	390	390	NA	390
		Copper	µg/L	1,300 (AL)	9	2.1	4	2.94	0.72	3.92
		Fluoride	mg/L	2 (P)	1	0.24	0.24	0.24	NA	0.24
		Gross Alpha	pCi/L	15 (P)	1	4.6	4.6	4.6	NA	4.6
		Magnesium	mg/L	NA	1	10	10	10	NA	10
		Molybdenum	µg/L	NA	1	2.2	2.2	2.2	NA	2.2
		Nitrate	mg/L N	45 (P)	2	1.3	1.5	1.4	NA	1.48
		Sodium	mg/L	NA	1	7.9	7.9	7.9	NA	7.9
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	25	25	25	NA	25
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	2	230	240	235	NA	239
		Turbidity	NTU	5 (S)	1	0.1	0.1	0.1	NA	0.1
		Vanadium	µg/L	50 (NL)	1	3.8	3.8	3.8	NA	3.8
		pH	Units	NA	3	6.9	7.7	7.33	0.4	7.64
Surface Water	SAC WTP - Raw	Aggressiveness Index	None	NA	1	12.8	12.8	12.8	NA	12.8
		Alkalinity	mg/L CaCO3	NA	1	150	150	150	NA	150
		Aluminum	µg/L	1,000 (P)	1	23	23	23	NA	23
		Arsenic	µg/L	10 (P)	1	1	1	1	NA	1
		Barium	µg/L	1,000 (P)	1	35	35	35	NA	35
		Chloride	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	1.1	1.1	1.1	NA	1.1
		Conductivity	µS/cm/cm	900 (Rec), 1,600 (Upper), 2,200 (STM)	1	340	340	340	NA	340
		Fluoride	mg/L	2 (P)	1	0.31	0.31	0.31	NA	0.31
		Iron Total ICAP	mg/L	NA	1	0.01	0.01	0.01	NA	0.01

Table B-1. Historical Water Quality Characteristics of Upland Water Sources

Source	Well	Parameter	Unit	MCL/NL/AL/RL	Count	Min	Max	Average	Standard Deviation	90th Percentile
		Langelier Index	None	NA	1	0.9	0.9	0.9	NA	0.9
		Magnesium	mg/L	NA	1	10	10	10	NA	10
		Nitrate	mg/L N	45 (P)	1	0.17	0.17	0.17	NA	0.17
		Potassium	mg/L	NA	1	1.8	1.8	1.8	NA	1.8
		Sodium	mg/L	NA	1	5.8	5.8	5.8	NA	5.8
		Sulfate	mg/L	250 (Rec), 500 (Upper), 600 (STM)	1	25	25	25	NA	25
		TDS	mg/L	500 (Rec), 1,000 (Upper), 1,500 (STM)	1	170	170	170	NA	170
		pH	Units	NA	3	7	8.4	7.63	0.71	8.22

A.I. = aggressive index
pCi = picocuries
NTU = nephelometric turbidity unit
SU = standard unit
NL = notification level
AL = action level
RL = response level
(P) = primary MCL
(S) = secondary MCL
Rec = recommended
Upper = upper limit
STM = short-term maximum
PFOA = perfluoroalkyl octanoic acid
PFOS = perfluoroalkyl sulfonic acid
TOC = total organic carbon

Appendix C: 2017 AWWA Water Audit

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AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

American Water Works Association.
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? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Upland
Reporting Year: 2017 1/2017 - 12/2017

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<---------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

				Pcnt:	Value:	
Volume from own sources:	7	3,081.205	acre-ft/yr	9	-37.798	acre-ft/yr
Water imported:	5	15,973.203	acre-ft/yr	9	-157.982	acre-ft/yr
Water exported:	4	178.742	acre-ft/yr	3		acre-ft/yr
WATER SUPPLIED:		**19,071.446**	acre-ft/yr			

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:	
Billed metered:	7	17,610.556	acre-ft/yr			
Billed unmetered:	9	72.013	acre-ft/yr			
Unbilled metered:	9	276.744	acre-ft/yr			
Unbilled unmetered:	6	2.000	acre-ft/yr		2.000	acre-ft/yr
AUTHORIZED CONSUMPTION:		**17,961.313**	acre-ft/yr			

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption) **1,110.133** acre-ft/yr

Apparent Losses

				Pcnt:	Value:	
Unauthorized consumption:		47.679	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	7	729.557	acre-ft/yr	3.92%		acre-ft/yr
Systematic data handling errors:	5	44.026	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: **821.262** acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **288.871** acre-ft/yr

WATER LOSSES: **1,110.133** acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: **1,388.877** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	9	255.6	miles
Number of active AND inactive service connections:	9	20,826	
Service connection density:		81	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 5 100.0 psi

COST DATA

Total annual cost of operating water system:	10	$24,886,170	$/Year	
Customer retail unit cost (applied to Apparent Losses):	5	$1.86	$/100 cubic feet (ccf)	
Variable production cost (applied to Real Losses):	5	$720.43	$/acre-ft	☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 65 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported
2: Customer retail unit cost (applied to Apparent Losses)
3: Variable production cost (applied to Real Losses)

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Appendix D: Water Model Development TM

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Technical Memorandum

18500 Von Karman Avenue
Suite 800
Irvine, CA 92612

Phone: 714-730-7600

Prepared for: City of Upland

Project Title: City of Upland Water and Recycled Water Master Plan

Project No.: 159202

Technical Memorandum

Subject: Water Distribution System Model Development

Date: December 3, 2024

To: Ed Diggs, Jose Aguilar, Marc Warner, Norberto Ferreira, City

From: Amy Martin, Brown and Caldwell

Prepared by: _____
Meagan O'Hare; Colin Ricks, PE (Utah)

Reviewed by: _____
Ian Jaffe, PE

Limitations:

This document was prepared solely for The City of Upland in accordance with professional standards at the time the services were performed and in accordance with the contract between The City of Upland and Brown and Caldwell dated September 12, 2022. This document is governed by the specific scope of work authorized by The City of Upland; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by The City of Upland and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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Section 1: Introduction

A hydraulic model is a simplified representation of the real potable water distribution system. Hydraulic models can be used to assess the capacity of a distribution system and perform various analyses. In conjunction with a potable water system master plan update, Brown and Caldwell (BC) created an updated computer model for the City of Upland (city) using the latest data from the city's Geographic Information System (GIS) database.

This technical memorandum (TM) describes the methods and data that were used to create the model including: the modeling software and workflow, model element information, demand allocation, and quality assurance protocols. Model calibration is also documented in this TM.

The city's hydraulic model was created using Innovyze's InfoWater Pro. InfoWater Pro is an ArcGIS-based water distribution system modeling software and is used widely throughout distribution system planning, analysis, and design.

Section 2: Model Facilities

This section provides an overview of the major elements of the hydraulic model (junctions, pipes, tanks, reservoirs, pumps, valves) and describes the updates made to the model facilities based on GIS data. The model was constructed using the city's latest GIS data—provided in 2023 and maintained by Nobel Systems—and the city's previous model—last updated in 2017. System piping was added to the new model based on the GIS data while the tank, reservoir, pump, and valve facilities were imported from the city's previous model and updated based on a review of the current GIS data and information gathered from the city.

Facility information that is used in the computer calculations (such as roughness coefficients), or that can be useful to the model user (such as installation data) is stored as attributes in the database files of the model. Table 2-1 describes the model attributes that apply to all facilities. The data processing and model attributes specific to each element type are described in the following sub-sections. A system schematic and overview map is provided in Figure 2-1 and Figure 2-2, respectively.

Table 2-1. Common Attributes

Attribute	Value
ID	An alphanumeric unique identifier. The prefix indicates element type and a unique identifier includes text describing the facility or a unique number.
Description	A text description for tanks, pumps, junctions, pipes, and valves.
Year of Installation	Year installed. This value is used to specify that a facility will be active in a scenario. For example, a facility with an installation year of 2020 or before will be active in a 2020 scenario. Facilities with a blank value will not be active. Year of installation was assigned based on the INSTALLDAT field in the GIS data provided. Where installation years are unknown or for junctions, which are not actually constructed as described in the next section, an installation year of 1900 was assigned.
Year of Retirement	Year retired. This value is used to specify that a facility will be retired (not active) in a scenario. By default, this field was set to 9999; only facilities that will be retired are assigned a value less than that. For example, a facility with a retirement year of 2020 or before will not be active in a 2020 scenario.

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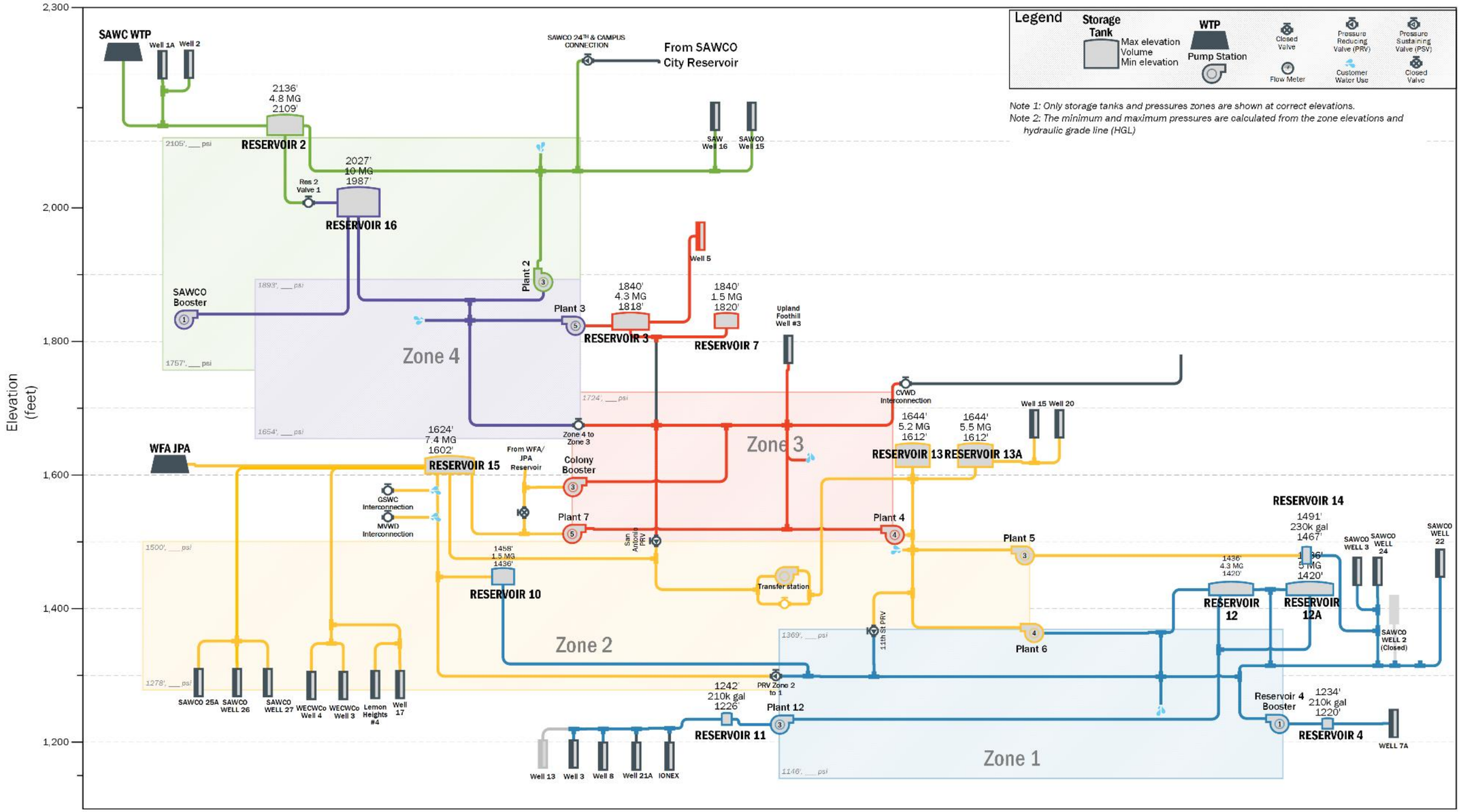


Figure 2-1. System Schematic

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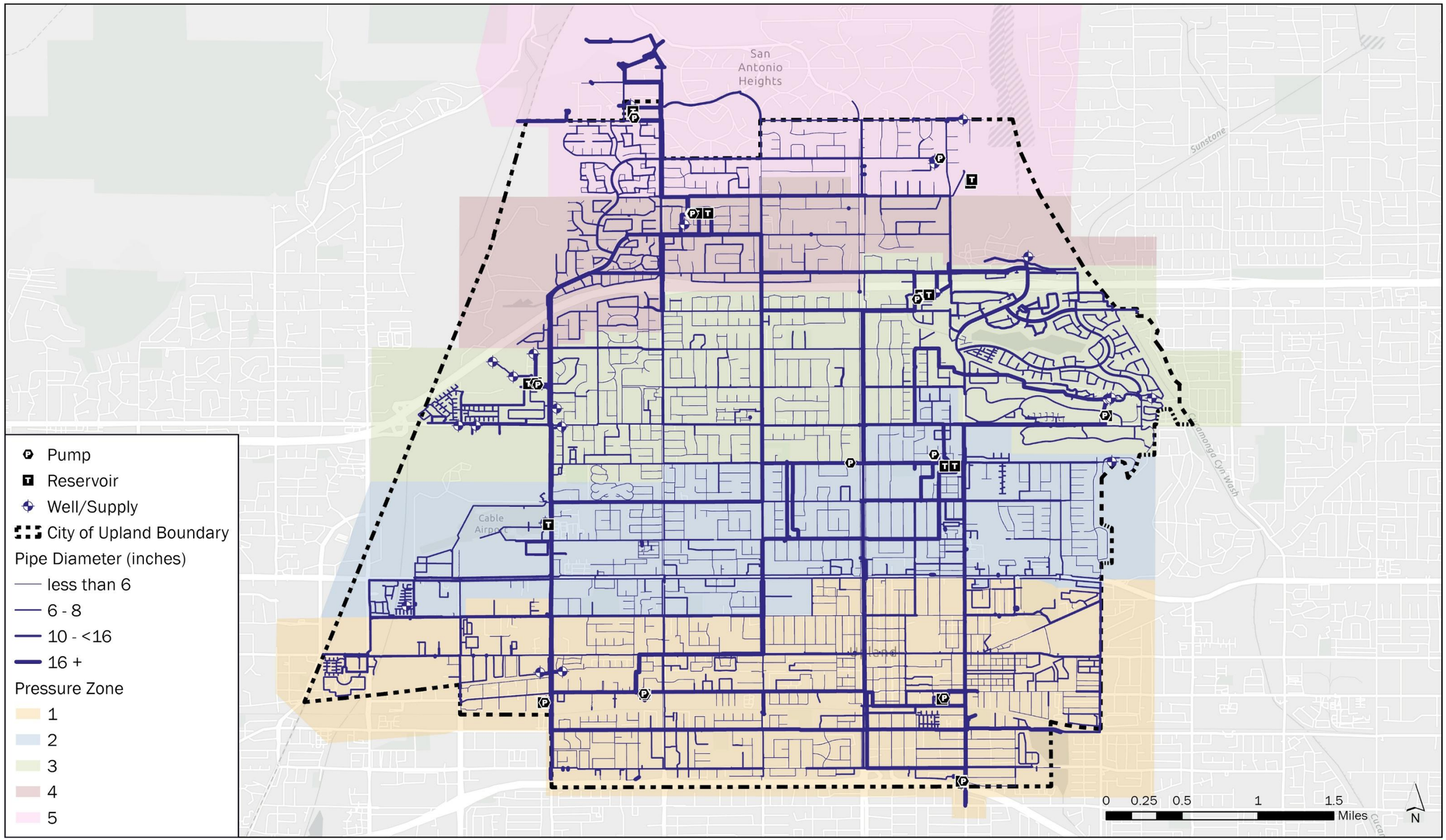


Figure 2-2. Modeled System

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2.1 Junctions

Junction nodes represent locations in the model where there are changes in pipe diameter, pipe connections, intersections, dead ends, water system valves, water control valves and hydrant locations. Required input parameters for junctions include elevations and demands, if applicable. Junctions were created using InfoWater connectivity tools. Associated elevations were assigned from USGS elevation data. Demands and demand patterns, which are discussed in further detail in Section 4 of this TM, were allocated to the junctions. Table 2-2 lists the attributes of the junctions and a description of each attribute.

Table 2-2. Junction Attributes

Attribute	Value
ID[a]	An alphanumeric unique identifier with the letter "J" as the prefix followed by a numerical value (i.e. J10). Following the import of the updated GIS information, new Junctions were created. Junctions added to the InfoWater model were assigned a unique ID.
Demand 1	Existing system demand at the junction as allocated from the geocoded customer billing data. Section 4 summarizes the demand allocation process. Demand 1 was overwritten and used for future demands in the buildout scenarios.
Pattern 1	The diurnal (daily water use) pattern corresponding to Demand 1. These diurnals are described in further detail in Section 4.
Demand 2	Demand column 2 represents Non Revenue Water (NRW) in the system.
Pattern 2	The diurnal pattern corresponding to Demand 2. The same patterns from Demand 1 are used based on the area in which the junction falls.
Elevation	Elevation at the junction.
Zone	Pressure Zone

a. Demands 3 through 10 were not used in this model and set to zero or left blank.

2.2 Pipes

Pipes represent transmission mains and distribution system pipelines. Customer laterals and hydrant laterals are included in the model. Required input parameters include to/from node, diameter, length, and friction factor. Pipes were imported from the city's GIS data. The connectivity of the pipes was verified and cleaned-up as needed. A description of the clean-up work performed is described below followed by a summary of how the GIS attribute data was used in the model. Table 2-3 summarizes the attributes of the modeled pipes and a description of each attribute.

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Table 2-3. Pipe Attributes			
Attribute	**Value/ Description**		
ID	An alphanumeric unique identifier with the letter "P" as the prefix followed by a numerical value (i.e. P2). The GIS Facility ID was assigned to the pipes in the model. Pipes added to the InfoWater model were assigned a unique ID.		
Length	Length of the pipeline in the model calculated based on the GIS length of the pipe.		
Diameter	Nominal diameter from the GIS.		
Material	Pipe material from the GIS.		
Roughness	*Material*	*C Factor*	*Source*
	Default/Blank/Other[a]	130	Assumed
	Asbestos Cement	140	Linsley, Lindeburg
	Cast Iron[b]	130 (New) 120 (5-20 years old) 100 (20< years old)	Linsley, Lindeburg
	Ductile Iron	130	Linsley
	PVC[c]	140	AWWA, InfoWater
Minor Loss	Set to 0 unless a valve or other facility causes a known headloss at a specific location. The C Factor is more appropriate to account for losses due to bends and fittings because it accounts for losses based on the length of a pipe. If a Minor Loss is used, the same headloss is applied for short and long pipes.		
Check Valve	Set to "Yes" if there is a check valve on a pipe.		
Zone	Pressure Zone		

a. *Pipes with unspecified pipe material will be assigned a roughness factor that is typical for Cast Iron pipe. GIS data indicates that Cast Iron is the most common material in the system.*
b. *Values vary depending on age.*
c. *The lower end of the range of values is used to be conservative.*

2.2.1 Pipe Network Clean-Up

Pipes represented in GIS are frequently not set up correctly for the model to use. The following steps were completed to clean-up the pipe network in the model:

Deleted Short Pipes. The imported model pipes included a number of pipes with a length of 1 foot or less. Most of the short pipes were the result of GIS pipes that were not snapped directly to a water fitting feature. These short pipes interfere with the other clean-up procedures and add unnecessary calculation nodes to the model. All short pipes not connecting two water fitting features were deleted from the model. Pipes formerly connected by the small pipes were connected to each other at a common junction.

Corrected Connectivity. The model software requires junctions where pipelines intersect and connect. Many locations were identified in the GIS data where pipes are not split at connections. Many locations were also identified where pipe endpoints were drawn very close to each other but not snapped together. BC used tools provided in InfoWater to review these locations. Pipes were split and endpoints were connected where appropriate.

2.2.2 Pipe Attributes

Pipe attributes are used for hydraulic calculations and/or managing model data. To facilitate the transfer of data between the model and GIS, the Facility ID field – the unique identifier used in the city GIS data – was added to the model attributes. Pipes were re-assigned a unique identifier for the Model ID field in the model attributes.

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Model evaluations typically require the creation of pipes not contained in the GIS database. Pipes were added for the following reasons:

1. **Model simulation purposes only** – Representation of some facilities requires the addition of pipes that convey water from one model element to another, but the pipes may not represent an actual pipe in the system. For example, a pipe was added to represent the WFA JPA Supply to facilitate the connection between the actual supply and Reservoir 15 in the model.
2. **Future planning** – Pipes added to develop system improvements during the master planning process or represent future growth, if any.

InfoWater uses the Hazen-Williams equation to determine friction-related headloss. The roughness factor (C-Factor) used in the equation is assumed for each pipe based on pipe material, lining and age (if known). Lower factors equate to higher headloss. Pipes in the model were initially assigned C-Factors taken from industry standards. C-Factors of some pipes were adjusted during calibration, particularly in older areas of the system, to account for age.

2.3 Tanks

Model storage tanks are used to represent reservoirs and tanks within the distribution system. Required input parameters include base elevation, tank diameter, maximum and minimum water levels, and initial water levels. Tank information from the city's previous model was presented to the city for verification. These attributes were updated in the model as needed. Table 2-4 lists the model's tank attributes.

Table 2-4. Tank Attributes

Attribute	Value
ID	A unique identifier with "RESERVOIR_" as the prefix followed by the tank name (i.e. RESERVOIR_16).
Type	Type of tank, which can be set to cylindrical or variable area tank. The tank types in this model were all set to "Cylindrical" in this model.
Elevation	The elevation of the bottom of the tank.
Minimum Level	The minimum depth of water in the tank to which the tank can physically drain; set to 0 if unknown. Minimum water levels controlled by a pump or valve will be set by adding controls to the pump or valve.
Maximum Level	The maximum possible depth of water in the tank, set as the depth from the bottom of the tank to the tank overflow or the tank roof (if overflow depth was not available).
Initial Level	Set to an average depth of water in the tank at the start of a day. This value changes from one scenario to another and is based on observations from historical SCADA data.
Diameter	The tank diameter.
Zone	Pressure Zone

2.4 Reservoirs

The city's water treatment plants and groundwater wells are each modeled as a single fixed-head reservoir connected by a flow control valve or pump to regulate flow from the reservoir (water supply). The surface water treatment plant is represented as a fixed head reservoir connected to a flow control valve. The flow control valve is set equal to the flow from the WTP based on SCADA data. The groundwater wells are represented as a fixed head reservoir connected to a pump. Table 2-5 lists the model's reservoir attributes.

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Table 2-5. Reservoir and Supply Well Attributes	
Attribute	**Value**
ID	A unique identifier
Type	Type of reservoir, which can be set to fixed head reservoir or variable head reservoir. The reservoirs in this model were all set to "Fixed Head".
Head	The hydraulic grade line (HGL) of a supply point
Zone	Pressure Zone

2.5 Pumps

All distribution pumps (including lead, lag and stand-by) are included in the model. The city's previous water system model was used for general pump information. Results from multi-point pump tests performed from 2022 to 2023 were used to validate the pump information used in the model. BC verified the model information with review of SCADA data, when available. Table 2-6 lists the model's pump attributes.

Table 2-6. Pump Attributes	
Attribute	**Value**
ID	A unique identifier as the prefix followed by the pump or well number (i.e. PL5_B1). The following prefixes were used based on the type of pump: • "PL" – Booster pumps • "WELL" – Well pumps • "SAWCO" – SAWCO booster pump • "WEWCO" – WEWCO booster pump
Type	Set the pump type from the following, in order of preference: • Multiple Point Curve - The most accurate representation of a pump, used if a pump curve was available • Exponential 3-Point Curve - Three points define the pump curve • Design Point Curve - A single flow / head point • Constant Power Input – Pump horsepower, if no other information was available
Elevation	Pump elevation from the previous model, otherwise set the elevation from the Digital Elevation Model
Zone	Pressure Zone
Other Attributes	The following attributes depend on the selected pump type: • Multiple Point Curve • Curve - The pump curve • Exponential 3-Point Curve • Shutoff Head - Head at zero flow • Design Head, Design Flow - Pump design point • High Head, High Flow - Flow and head at upper end of normal operating range • Design Point Curve • Design Head, Design Flow - Pump design point

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2.6 Valves

The city's water distribution system includes isolation and pressure reducing valves. Isolation valves are modeled by adding controls to pipes in the model (i.e. by opening or closing a pipe). The pressure reducing valves are represented as control valves in the model based on information from the previous model and city staff. Table 2-7 lists the model's valve attributes.

Table 2-7. Valve Attributes

Attribute	Value
ID	A unique identifier
Type	Type of valve including pressure reducing valve, flow control valve, and purpose valve. The valves in this model include Pressure Reducing Valve (PRV) and Flow Control Valve (FCV). Dummy valves were added into the model for control purposes, and do not reflect actual valves in the system.
Elevation	Valve elevation supplied by previous city model.
Diameter	The diameter of the valve.
Setting	Settings are based on the previous model, input from the city, and model calibration. The setting is expressed in terms of pressure in pounds per square inch (psi) for PRVs and flow in gallons per minute (gpm) for FCVs.
Minor Loss	Minor loss coefficient, K. InfoWater calculates the minor loss as k(V*2)/2g. This field is optional and was not used in the model.
Zone	Pressure Zone

Section 3: Model Demands

Once the physical facilities of the model were constructed, the system demands were reviewed. Several demand sets for both the existing and future system, including average day demand (ADD) and maximum day demand (MDD), were developed. The different methods used for allocating those demands to the model nodes are described below followed by a discussion on the fire flow demand allocation methods.

3.1 Demand Peaking Factors

Demand peaking factors are used to scale average day demands to daily variation (diurnal patterns) as well as seasonal highs (MDD). The following sections describe the process used to develop the demand peaking factors.

3.1.1 Diurnal Pattern

A diurnal pattern, or diurnal curve, can be used in the model to represent the hourly demand variation throughout the day. Diurnal curves typically vary depending on usage type. Based on the city's available SCADA records, a diurnal pattern was developed for the upper pressure zones (Zones 4 and 5) and lower pressure zones (Zones 1, 2, and 3) of the system.

SCADA data included time series data of the tank levels, pump station run times and select groundwater well flows, which was used to calculate the total demand for each hour of the day. The demand at each time step was then normalized by the daily average demand, resulting in a peaking factor for each hour.

September 12, 2023 was selected as a representative 24-hour pattern. Figure 3-1**Error! Reference source not found.** and Figure 3-2 shows the upper area and lower area diurnal patterns, respectively, calculated from the September 12, 2023 data.

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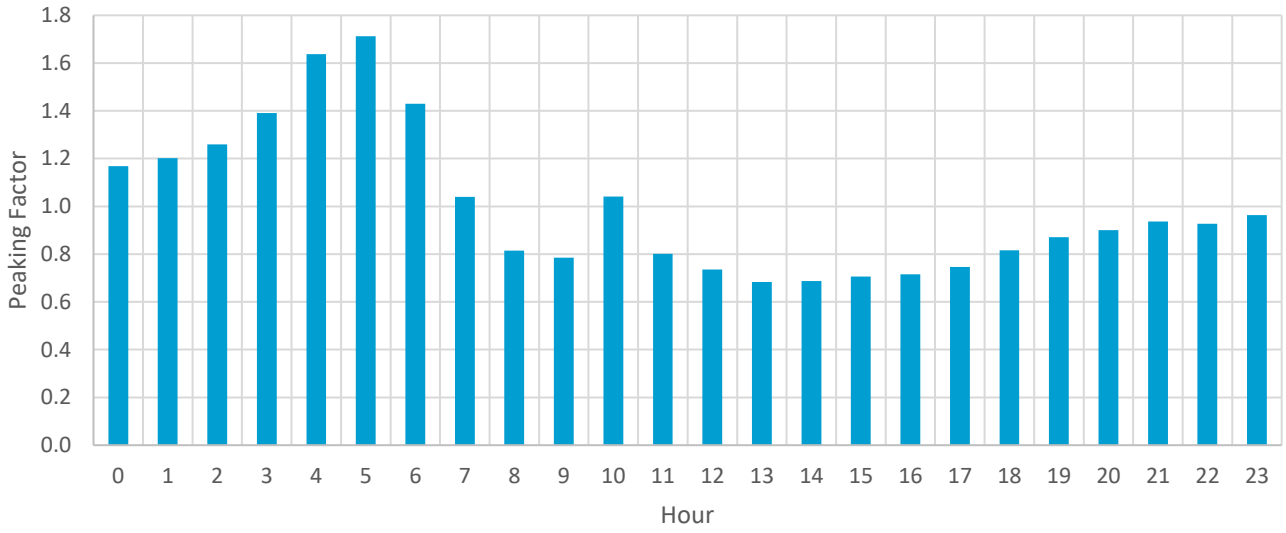


Figure 3-1. Upper zones diurnal pattern

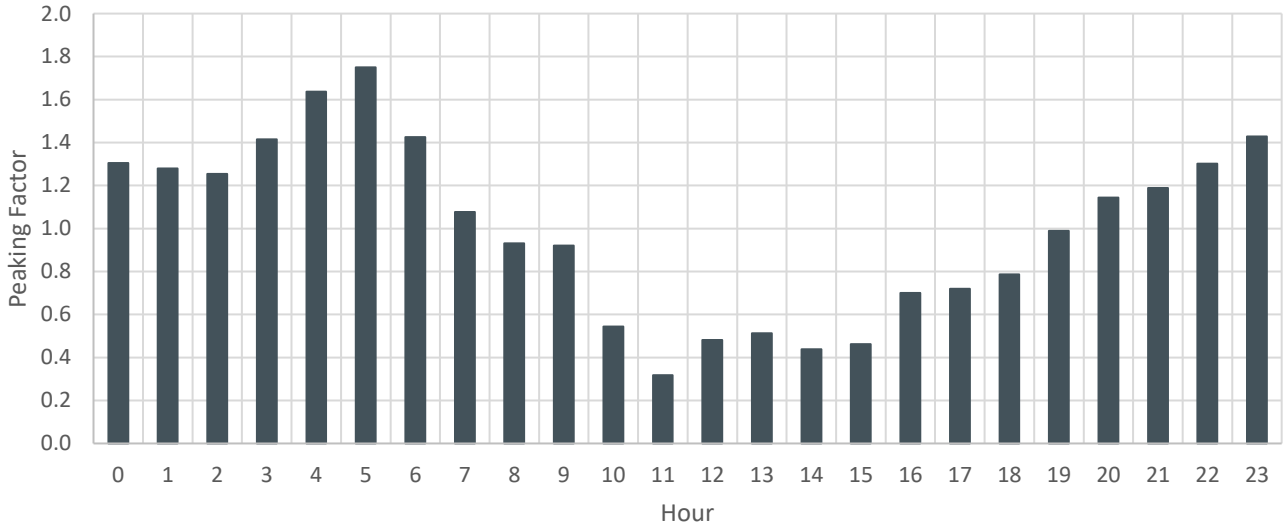


Figure 3-2. Lower zones diurnal pattern

3.1.2 Maximum Day Demand

Historical records are typically used to determine demand factors, such as Maximum Day Demand (MDD). The MDD factor represents the ratio of the largest daily demand to the ADD for the same year. As described in Section 3.2.1 of the Master Plan, The largest peaking factor in the most recent 10 years is 2.18, which was used for demand projections. The peak hour demand (PHD) occurs at the peak hour of the MDD, and is represented as the largest peaking factor in the diurnal.

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3.2 Existing System Demand Allocation

Demand allocation consists of assigning the customer demands and non-revenue water to the appropriate location in the model.

3.2.1 Customer Demand Calculation

The city provided customer billed water use data for January 2016 to December 2023. This data was used to calculate a base demand for each customer served by the water system, as detailed in Section 3 of the Water and Recycled Water Master Plan. For each existing demand scenario included in the model, the base customer demand in the model was then scaled up to match the total system demands. Further information on demand calculations and projections can be found in Section 3 of the Water and Recycled Water Master Plan.

3.2.2 Customer Demand Assignment

The calculated customer demand was assigned to the appropriate demand junction in the model. Demand junctions are designated as all nodes not on yard piping at facilities (e.g. WTP, reservoir piping, transmission pipes, well sites, or booster station sites). The city provided data showing the location of each customer. The customer locations were added to GIS and used to allocate demands to the model. This data was used to assign the calculated demands to the closest pipe in the model and then to the closest demand junction on that pipe. This process was followed for the existing demand conditions to be modeled (ADD and MDD).

The following steps summarize the demand allocation process that was followed for this project. Figure 3-3**Error! Reference source not found.** demonstrates the demand allocation process for an example system.

1. Obtain billing data (including location) for each customer and calculate the ADD and MDD for each customer.
2. Geocode (locate geographically) each of the customers by matching the customer to a parcel, street address, or GPS point.
3. Flag each junction in the model as a demand or non-demand junction. Non-demand junctions include transmission pipelines or yard piping (e.g., at pump stations).
4. Calculate the total demand at each demand junction as the sum of the demand for the customers closest to each junction.

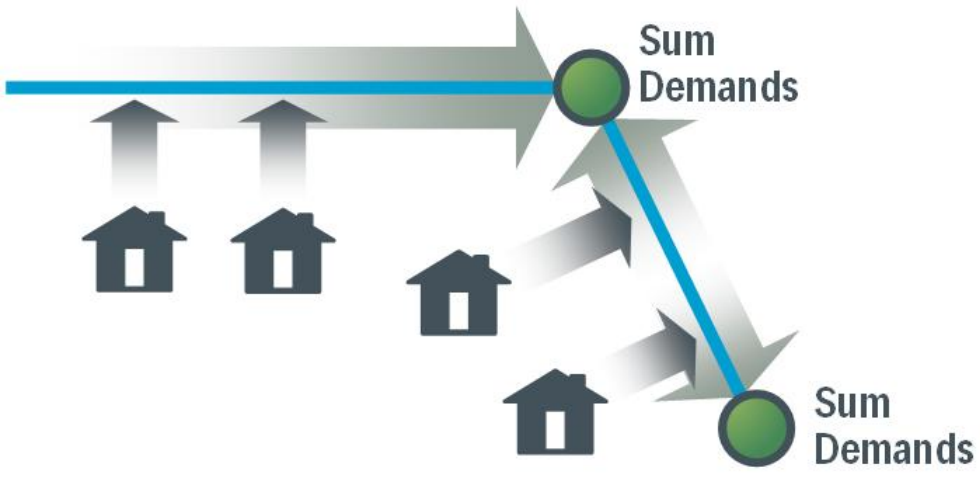


Figure 3-3. Demand Allocation from Billing Data

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3.3 Future System Demand Allocation

Future system demand allocation involves distributing the projected future system demands to the appropriate nodes in the model. The same demand allocation method detailed in Section 4.2.2 was used to allocate future demands to customers. Following a demand workshop with the city, two demand scenarios were modeled for future scenarios- a "high" demand scenario, and a "low" demand scenario. More information on demand development can be found in Section 3 of the Water and Recycled Water Master Plan. Table 3-1**Error! Reference source not found.** summarizes the high and low demand for each pressure zone for the existing and future model scenarios.

Table 3-1. Model Demand Totals

Pressure Zone	Existing 2024 MDD	Future 2045 MDD	
		High	Low
Zone 1	11.46	11.71	8.29
Zone 2	7.74	7.09	5.01
Zone 3	8.42	10.17	7.20
Zone 4	4.19	3.90	2.76
Zone 5	2.80	2.58	1.82
Total	34.61	35.45	25.08

3.4 Fire Flow Demand Allocation

Using the GIS data provided by the city, hydrants and hydrant laterals were brought into the model. Fire demands for hydrant in the water system service area were developed based on the fire flow requirement for the adjacent parcel. The fire demand requirements were based on information provided by the City of Upland Fire Department. Fire flow requirements by land use category are summarized in Table 3-2 and a figure illustrating the fire flow requirements by fire hydrant—based on the adjacent land use—is included in Figure 3-4**Error! Reference source not found.**.

Table 3-2. Fire Flow Requirements

Land Use	Minimum Fire Flow Required (gpm)	Minimum Duration (hours)
Low Density Residential	1,500	2
High Density (Multi-Family) Residential	3,500	3
Urban Mixed Use	1,500	2
Commercial	3,000	3
Institutional	3,000	3
Industrial	4,500	2
Parks / Vacant	1,000	2

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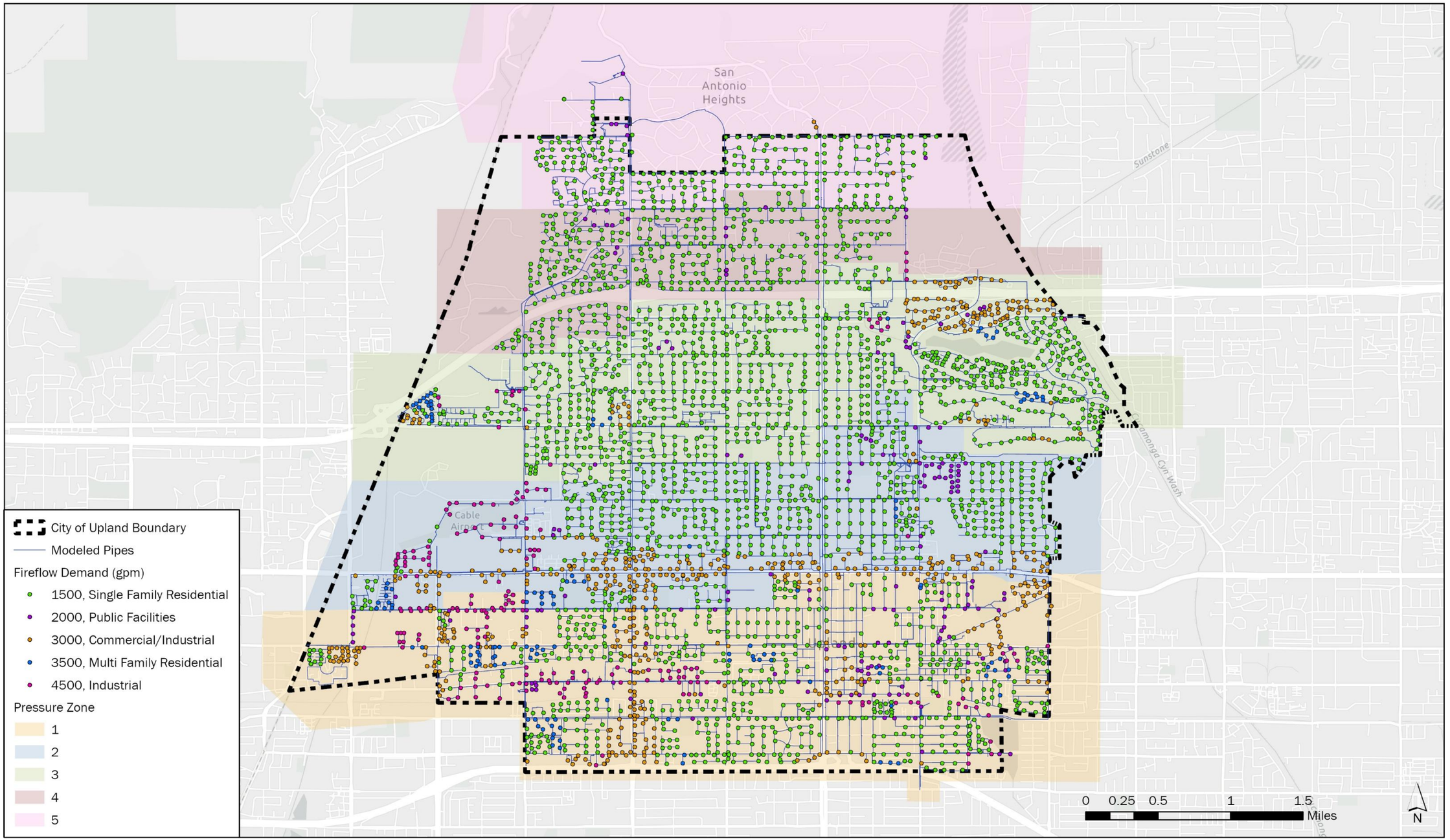


Figure 3-4. Fire Flow Requirement and Hydrant Locations

Section 4: Operating Characteristics and Calibration

This section provides an overview of the model controls, model calibration, and model scenarios.

4.1 Model Controls

Pump stations and PRVs typically include controls to maintain levels in storage tanks or pressure within the system. The controls used in the model area are based on discussions with city staff, adjusted during calibration as-needed. Per notes from city staff, the system is generally operated under two scenarios: wet weather, with more water supplied from the treatment plant and less pumping, and dry weather, with more groundwater pumping. Existing controls were maintained for future model scenarios. An overview of the system controls is included in Attachment C.

4.2 Model Calibration

The model was calibrated to ensure that model results are representative of actual system operations. The calibration process includes recording actual system performance, and then making appropriate adjustments to the computer model until the modeled results reflect the system data gathered during testing. Two types of calibration were performed: fire flow calibration and EPS calibration.

Due to the limited available of SCADA data, a Meter-Master data logger was utilized to provide additional data for model calibration. A summary of the available data for model calibration is included in section 4.2.2.

4.2.1 Fire Flow Calibration

Fire flow tests performed in the field provide a means to verify data used in the model, and a greater understanding of water system operation. Field testing can indicate errors in data used to develop the model, or show that conditions may exist in the field that are not otherwise known. Data obtained from field testing can be used to approximate roughness coefficients of pipelines, as roughness coefficients vary with age and pipe material. Brown and Caldwell created a calibration testing plan for collecting field data for the model calibration. The calibration plan is included in Appendix A. Hydrant testing was performed at 15 hydrants, 3 per zone, on September 12, 2023.

Calibration scenarios in the model were set up to represent the system on the day of testing. During calibration, changes were made to the model until pressures in the model better reflected the recorded field data from before and during the hydrant test. Changes included adjustments to pipe C factors to better represent pipe roughness changes due to age and adjustments to tank initial levels to better replicate the resulting pump operations during field testing. Example calibration results can be seen in Figure 4-1. A summary table of the fire flow calibration results is given in Table 4-1.

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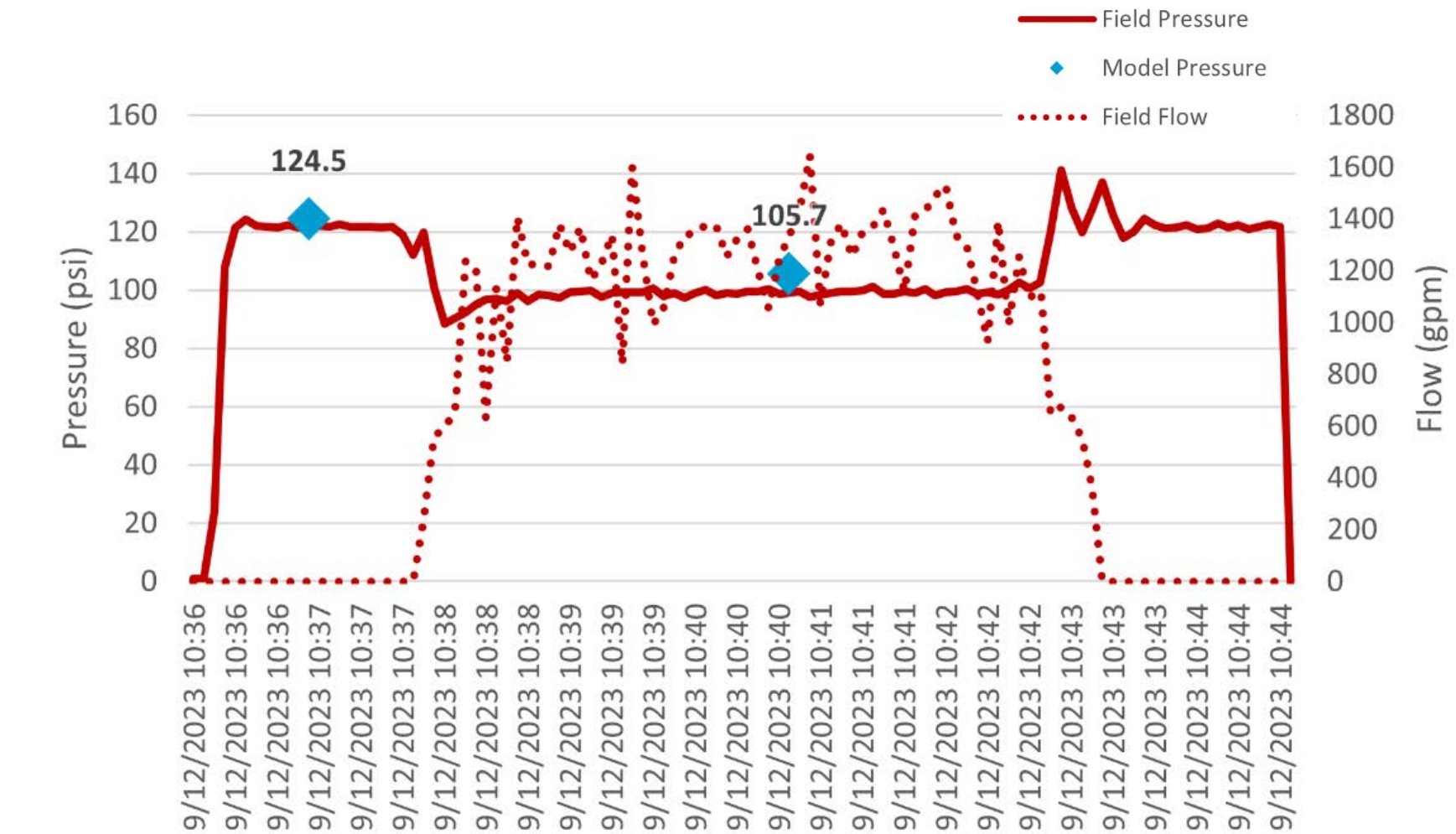


Figure 4-1. Example calibration results for hydrant test number 3

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Table 4-1. Fire Flow Calibration Results

Test No.	Location	Zone	Model Pressure Junction	Model Flow Junction	Pressure before Hydrant test (psi)			Pressure during hydrant test (psi)		
					Field	Model	Difference	Field	Model	Difference
1	Vallejo Way between W 23rd St and W 24th St	5	J15704	J15700	111.8	117.2	5.4	109.5	114.2	4.7
2	Julia Ct and N 2nd Ave	5	J15644	J15640	121.3	124.5	3.1	99.2	105.7	6.5
3	Highpoint St	5	J15554	J11778	50.8	54.3	3.5	49.6	51.8	2.2
4	W 21st St and Euclid Ave	4	J14028	J14026	110.6	111.5	0.9	98.7	104.5	5.8
5	N Kelly Ave and W 20th St	4	J11592	J11590	102.2	102.2	0.0	90.8	91.6	0.8
6	Canterbury Ct, between E 22nd St and E 21st St	4	J14832	J14828	123.4	124.5	1.1	105.9	110.5	4.6
7	Old Baldy way and Geyser St	3	J7112	J7114	116.9	116.6	-0.3	111.1	111.1	0.0
8	Vallejo Way and W 18th St	3	J2476	J10400	94.7	92.7	-2.0	90.8	89.7	-1.1
9	Palomino Ave and Rodeo Ct	3	J4066	J4064	143.3	140.4	-2.9	135.6	130.9	-4.7
10	N Albright Ave and Purdue St	2	J31942	J29992	91.7	86.3	-5.4	81.3	74.3	-7.0
11	Crofton Ct and Silverwood Ave	2	J22628	J21296	124.8	122.8	-2.0	115.4	114.3	-1.1
12	Juanita Ct and Monte Verde Ave	2	J29800	J32880	97.6	99.4	1.8	89.8	92.3	2.5
13	Juniper Ave and Cedar Ct	1	J17846	J14312	65.6	58.4	-7.2	57.9	51.1	-6.9
14	E 9th St and N 10th Ave	1	J24644	J19574	99.8	100.1	0.2	93.7	93.3	-0.5
15	Stillman Ave and W 7th St	1	J27698	J27700	111.6	111.8	0.2	105.6	104.9	-0.7

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4.2.2 EPS Calibration

An EPS calibration scenario was created in the model. The hydraulic model results were compared to SCADA data provided for the following facilities on September 13, 2023. Graphs comparing model results and SCADA data for each facility are shown in Appendix B. At the time of the model development, the city did not have SCADA data for any booster pump stations within the water system. SCADA data was available for the following facilities:

- Reservoir 10
- Reservoir 11
- Reservoir 12
- Reservoir 12A
- Reservoir 13
- Reservoir 13A
- Reservoir 15
- Reservoir 16
- Reservoir 2
- Reservoir 3
- Reservoir 4
- Well 8
- Well 7A
- Well 5
- Well 4
- Well 24
- SAWC Well 3
- SAWC Well 27a
- SAWC Well 26
- SAWC Well 24
- Well 4

4.2.3 Calibration Summary

After completion of the fire flow and EPS calibration, the model was determined to be well calibrated for its intended use. Considering the available system data, the trends in the SCADA data were consistent with the predicted planning level modeling results and provides a good approximation of system operations for capacity assessment. However, given the lack of full system SCADA data, the model may have some limitations. Without calibration to SCADA for pump status, pressures, or flows, additional calibration may be warranted prior to development and implementation of any pump improvement projects.

4.3 Model Scenarios

Following model calibration, multiple scenarios were created in the model to evaluate the system with the variety of operating characteristics that are experienced, for both existing and future conditions.

The MDD scenario is used as the basis to evaluate the system during peak hour demand, average of maximum day, and fire flow conditions.

Each scenario is developed as an extended period simulation (EPS) for model runs of 24 hours or more. An EPS scenario is created by simulating the fluctuation in demand over a 24-hour period with a diurnal usage pattern (Section 3.1.1) and by simulating the operational control strategy that the operators use with logical controls in the model for each of the pump stations, wells, and tank fill valves.

Model scenarios were created to represent operations of the water system during a wet year and a dry year. During a wet year, the city relies mostly on surface water, with water being supplied mostly from the San Antonio Canyon WTP to the highest elevation pressure zones, and flowing throughout the rest of the system from north to south through PRVs. During a dry year, the city uses more wells, and pumps water up through the system from pressure zone 1 in the south. However, during large rainstorms, high turbidity can result in water quality issues at the WTP, so the city may rely on the wells like in a dry year.

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A summary of the model scenarios is included in Table 4-2 and the assumed status of each facility for wet and dry year scenario is given in Appendix C.

Table 4-2. Model Scenarios

Scenario	Operating Condition	Demand Condition	System Demand (MGD)	Notes
Existing ADD Wet Year	Wet Year	Existing / ADD	17.08	
Existing ADD Dry Year	Dry Year	Existing /ADD	17.08	
Existing MDD Wet Year	Wet Year	Existing / MDD	37.23	
Existing MDD Dry Year	Dry Year	Existing /MDD	37.23	Also used for fire flow simulations.
Future ADD Wet Year	Wet Year	Future / ADD	16.26	
Future ADD Dry Year	Dry Year	Future / ADD	16.26	
Future MDD Wet Year	Wet Year	Future / MDD	35.45	
Future MDD Dry Year	Dry Year	Future / MDD	35.45	Also used for fire flow simulations.

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Attachment A: Field Testing Calibration Plan

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Technical Memorandum

Prepared for: City of Upland (City)

Project Title: Water and Recycled Water Master Plan

Project No.: 159202

Technical Memorandum

Subject: Field Calibration Plan

Date: August 31, 2023

To: Marc Warner, Utilities Supervisor

From: Ian Jaffe, Brown and Caldwell

Limitations:

This document was prepared solely for the City of Upland in accordance with professional standards at the time the services were performed and in accordance with the contract between the City and Brown and Caldwell dated September 22, 2022. This document is governed by the specific scope of work authorized by the City ; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Section 1: Introduction

This technical memorandum (TM) describes field testing for calibration of the City of Upland's water system model. The City and Brown and Caldwell (BC) will perform field testing and BC will use the results to calibrate the model. This TM discusses testing procedures, locations, required personnel, and equipment for flow testing and pressure data collection.

Field testing will consist of the following two types of tests:

1. Pressure and flow monitoring devices will be installed throughout the system to monitor pressures and flows during normal operation and during hydrant flow tests.
2. Hydrant flow tests will be performed at various sites within the water system. These are not the same as hydrant fire flow tests performed to determine available flow from a hydrant. The calibration flow tests are done to "stress" the distribution system so that the calibration data will reflect the system's reactions to a range of operating conditions. Before, after, and during the tests, pressure data will be recorded at a nearby hydrant (not the flow hydrant) and at select hydrants throughout the distribution system. The flow and pressure data will be used in conjunction to calibrate the hydraulic model.

The proposed testing schedule is listed in Table 1-1. This includes time to install and remove monitoring equipment from the system.

Table 1-1. Proposed Field Testing Schedule

Date	Approximate Time	Activity Description
September 11, 2023	7:00am – 4:00pm	• Install meter loggers and pressure loggers in water system
September 12, 2023	7:00am – 4:00pm	• Perform hydrant flow tests
September 13, 2023	7:00am – 4:00pm	• Perform remaining hydrant flow tests and remove all data loggers

1.1 Field Work Health and Safety Awareness

Brown and Caldwell prepares a Field Work Safety Plan (FWSP) for its personnel when BC personnel perform or assist with flow testing. The FWSP is provided in Attachment A for City reference.

1.2 Collection of Operating Data

A list of the known data points needing to be recorded are provided in Table 1-2. Based on discussions with City staff, supplemental meters, Meter-Masters, will be required to collect the necessary data for model calibration. BC will facilitate rental of the Meter-Master equipment and will be responsible for gathering data collected by the temporary meters. After the field flow testing, City staff will provide Excel files with SCADA data recorded during the calibration testing period.

Table 1-2. Required Data Points				
Facility	Status	Measurement	Source/Measurement Method*	Notes
SAWC WTP	Offline			Confirm status
SAWCO 24th & Campos Connection	Active	Flow	Meter Master	Assumed grouping to Meter Master #1
CVWD Interconnection	Offline			
GSWC Interconnection	Offline			
MVWD Interconnection	Offline			
WFA/JPA Reservoir	Active	Level	SCADA	Confirm operation- Is reservoir discharging into Upland system through colony booster?
Reservoir 11	Active	Level	SCADA	
Reservoir 10	Active	Level	SCADA	
Reservoir 4	Active	Level	SCADA	
Reservoir 12	Active	Level	SCADA	
Reservoir 12A	Active	Level	SCADA	
Reservoir 13	Active	Level	SCADA	
Reservoir 13A	Active	Level	SCADA	
Reservoir 15	Active	Level	SCADA	
Reservoir 3	Active	Level	SCADA	
Reservoir 7	Active	Level	SCADA	
Reservoir 16	Active	Level	SCADA	
Reservoir 2	Active	Level	SCADA	
Plant 2	Active	Flow or Status (on/off)	Pump testing, On/off data	
SAWCO Booster	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 14
Plant 3	Active	Flow or Status (on/off)	Pump testing, On/off data	
Colony Booster	Offline	Flow or Status (on/off)		
Plant 7	Active	Flow or Status (on/off)	Pump testing, On/off data	
Plant 4	Active	Flow or Status (on/off)	Pump testing, On/off data	
Plant 5	Offline	Flow or Status (on/off)		
Plant 6	Active	Flow or Status (on/off)	Pump testing, On/off data	
Reservoir 4 Booster	Offline	Flow or Status (on/off)		
Plant 12	Active	Flow or Status (on/off)	Pump testing, On/off data	

Table 1-2. Required Data Points				
Facility	Status	Measurement	Source/Measurement Method*	Notes
11th St PRV	Offline			
San Antonio PRV	Active		Unable to monitor	No Meter
Zone 2 to Zone 1 PRV	Active		Unable to monitor	No Meter
Ion Exchange Booster	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 11
Well 1A	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 2
Well 2	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 2
SAWCO Well 15	Offline			
SAWCO Well 16	Offline			
Upland Foothill Well #3	Offline			
Well 8	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 11
Well 3	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 11
Well 21A	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 11
SAWCO 25A	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 15
SAWCO Well 26	Active	Flow or Status (on/off)	Reservoir level, SAWCO SCADA	Directly serves Reservoir 15
SAWCO Well 27	Active	Flow or Status (on/off)	Reservoir level, SAWCO SCADA	Directly serves Reservoir 15
WECWCo Well 4	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 15
WECWCo Well 3	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 15
Lemon Heights #4	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 15
Well 17	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 15
Well 20	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 13A
Well 15	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 13
SAWCO Well 3	Offline			
SAWCO Well 24	Active	Flow or Status (on/off)	SAWCO SCADA	
SAWCO Well 22	Active	Flow or Status (on/off)	SAWCO SCADA	

Table 1-2. Required Data Points				
Facility	Status	Measurement	Source/Measurement Method*	Notes
Well 7A	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 4
Well 5	Active	Flow or Status (on/off)	Reservoir level	Directly serves Reservoir 3

*Wells directly serving Reservoirs do not need supplemented SCADA

Section 2: Hydrant Flow Tests

The personnel and equipment needed for the hydrant flow tests are described in this section.

2.1 Personnel

Table 2-1 lists the number of personnel needed from each organization and their respective duties. The flow testing is expected to be completed in three days.

Table 2-1. Personnel Requirements

Organization	Number of personnel	Duties
City of Upland	1 or 2	• Install test equipment • Conduct flow tests • Collect data • Operate hydrants for flow tests • Provide vehicle to transport City staff and equipment to each test location
BC	2	• Provide direction in the field • Record test results

2.2 Preparation

Prior to the testing, the City should ensure the following:

- Confirm site accessibility/compatibility for temporary flow metering (Meter-Masters).
- It is requested that the City check the hydrant flow test locations (described in Section 2.5) prior to the day of testing to ensure that each location is suitable.
- During field inspection or calibration testing, if any of the locations are found to be unsuitable or if a hydrant is inoperable, an alternate site will be discussed with BC and documented.
- Prior to field testing, ensure that all flows, pressures, and tank levels equipped with data recording devices (ie. SCADA, Meter Masters, Pressure Loggers) are functioning and recording correctly.

2.3 Equipment

Table 2-2 lists the equipment needed for the calibration testing. Equipment should be checked prior to the day of testing to verify that it is functional and accurate.

Table 2-2. Required Equipment for Calibration Testing

Item	Quantity	Provided By
Hydrant wrench	2	City
Valve key	1	City
Hydrant flow diffusers (Dechlorinating)	2	BC
Calibrated 200 psi pressure gauge w/ hydrant cap	3	BC
Calibrated pressure loggers w/ hydrant cap, 300 psi rated	25	BC

Table 2-2. Required Equipment for Calibration Testing		
Item	Quantity	Provided By
Valves on Hydrant Caps, Fittings	25	BC
Hose bib fitting	6	BC

2.4 Hydrant Flow Testing

2.4.1 Testing Procedures

Each hydrant flow test should follow the general procedures listed in Table 2-3. Each flow test involves two hydrants, one "flow" hydrant with a diffuser where flow is measured and one "pressure" hydrant equipped with a pressure gauge where pressure is monitored, before, during, and following the flow test. City personnel will record all data and comments for each test. During the testing period, any valves in the system that are known, or suspected, to be closed as well as any pipe breaks or other water system emergency should be noted and reported to a BC representative.

Table 2-3. Flow Test Procedures		
Step	General Description	Detailed Description
1.	City will verify test location	City will verify that the test locations match the locations on the map. If other hydrants are used, mark the test hydrants on the map. Alternatively, the test location may be skipped and noted for BC personnel to identify an alternative test location.
2.	City will attach the pressure gauge and logger to the pressure hydrant	City will flush the pressure hydrant and attach the pressure gauge and logger to the pressure hydrant as shown in Figure 2-1 with the hydrant valve fully opened so that the pressure gauge is reading the distribution system pressure.
3.	City will attach diffuser to the flow hydrant.	City will flush the flow hydrant and attach a hydrant diffuser to the hydrant with a pressure gauge and logger as shown in Figure 2-2.
4.	City Personnel #1 will record the pressure and time at the pressure hydrant	
5.	City Personnel #2 will open the flow hydrant	By mobile phone or hand signal, City Personnel #1 at the pressure hydrant will instruct City Personnel #2 at the flow hydrant to start flowing the hydrant. The hydrant is opened SLOWLY until a minimum 5 psi pressure (10 psi if possible) drop is observed at the pressure hydrant. If a sufficient pressure drop cannot be obtained, turn the hydrant off SLOWLY, add another diffuser to the other hydrant nozzle or a nearby hydrant (record which hydrant is used), and re-start the test at step 4.
6.	City Personnel #1 will record the pressure at the pressure hydrant and City Personnel #2 will record the flow from the flow hydrant	When the pressure at the pressure hydrant stabilizes (usually one to five minutes), City Personnel #1 at the pressure hydrant will record the time and pressure and will signal City Personnel #2 at the flow hydrant to record the flow.
7.	City Personnel #2 will close the flow hydrant	City Personnel #1 will instruct the flow hydrant to be closed SLOWLY.
8.	City Personnel #1 will record the pressure and time again at the pressure hydrant	
9.	City will remove the pressure gauges and hydrant diffusers	The bleed valve on the pressure gauge/pressure logger assembly will be opened before the hydrant valve is fully closed to prevent drawing a suction on and thereby damaging the equipment.



Figure 2-1. Pressure gauge and logger connected to the pressure hydrant



Figure 2-2. One or two flow diffusers connected to the flow hydrant

2.4.2 Test Locations

Figure 3-1 shows the location of the 15 flow tests related the hydraulic model calibration. Attachment B contains a figure for each field test identifying the proposed hydrants for each test. Table 2-4 below summarizes each hydrant test.

Table 2-4. Hydrant Test Locations

Hydrant Test #	Pressure Zone	Pressure/Flow Hydrant (FL)	Residual Hydrant (RP)	Street	Notes
1	5	D-6-121, D-6-112	D-6-120	Vallejo Way between W 23rd st and W 24th St	
2	5	D-7-105, D-7-114	D-7-106	Julia Ct and N 2nd Ave	
3	5	D-4-111, D-4-110	D-4-106	Highpoint St	
4	4	F-6-122, F-6-128	F-6-115	W 21st St and Euclid Ave	
5	4	G-5-128, G-5-134	G-5-126	N Kelly Ave and W 20th St	
6	4	F-7-113, F-7-114	F-7-116	Canterbury Ct, between E 22nd St and E 21st St	
7	3	I-9-116, I-9-123	I-9-113	Old Baldy way and Geyser St	
8	3	I-6-123, I-6-116	I-6-119	Vallejo Way and W 18th St	
9	3	L-4-145, L-4-132	L-4-143	Palomino Ave and Rodeo Ct	
10	2	N-5-119, N-5-126	N-5-111	N Albright Ave and Purdue St	
11	2	P-4-144, P-4-135	P-4-142	Crofton Ct and Silverwood Ave	
12	2	M-9-102, L-9-123	M-9-103	Juanita Ct and Monte Verde Ave	
13	1	Q-5-112, Q-5-110	Q-5-121	Juniper Ave and Cedar Ct	
14	1	R-8-149, S-8-109	R-8-149	E 9th St and N 10th Ave	
15	1	T-4-157, T-4-135	T-4-146	Stillman Ave and W 7th St	

2.4.3 Data Collection

Field data (hydrant pressure and flow) collected during the field flow tests will be recorded using printed hydrant testing forms provided by BC, as well as being recorded by BC staff on the Fulcrum mobile app. All other data needed for calibration will be downloaded from the City SCADA system, or by supplemental meter masters.

2.4.4 Operational Adjustments

During testing, system operations are assumed to be consistent with the facility active/inactive status summarized in Table 1-2. No operational adjustments will be required.

Section 3: Pressure Loggers

Field data will also be collected from pressure loggers placed on select hydrants in the distribution systems. Figure 3-1 shows the 5 locations where pressure loggers are to be placed in the system. A map of each pressure logger location is provided in Attachment C. Table 3-1 summarizes the pressure logger locations. Procedures for pressure logger installation are provided in Table 3-2.

Table 3-1. Pressure Logger Locations

Pressure Logger #	Pressure Zone	Pressure Hydrant	Alternate Hydrant	Location
PL-1	1	R-6-127	S-6-131	N San Antonio Ave, north of W 9th St
PL-2	2	N-6-119	M-6-138	N San Antonio Ave, north of W 13th St
PL-3	3	L-6-107	J-6-110	W 16th St and Vallejo Way
PL-4	4	F-6-125	F-6-101	W 21st St, east of N Palm Ave
PL-5	5	D-6-128	E-5-129	W 23rd St, east of N Redding Way

Table 3-2. Pressure Logger Test Procedures

Step	General Description	Detailed Description
1.	City will verify test location	City will verify that the test locations match the locations on the map. If other hydrants are used, mark the test hydrants on the map. Alternatively, the test location may be skipped and noted for BC personnel to identify an alternative test location. If there are no nearby alternative test location, ensure the new test location meets the following requirements: • The location is far from reservoirs, turnouts, and pressure reducing valves.
2.	City will attach the pressure logger to the test hydrant	At the beginning of the test period identified in Table 1-1, City will install all pressure loggers. At each location, City will flush the test hydrant and attach the hydrant cap/pressure logger assembly to one of the 2 ½ - inch nozzles of the test hydrant. After installing the pressure logger assembly, the hydrant valve nut will be operated to the fully open position so that the pressure gauge is reading the distribution system pressure. Check for leaks around the caps and the hydrant barrel. Tighten caps as necessary to eliminate leaks. If water is observed rising from the ground around the hydrant, operate the hydrant nut and return to the fully open position. If this does not eliminate the leak, make a note and a new location shall be identified by BC staff. Alternatively, a new location may be identified by City staff with the requirements described in Step 1.
3.	City will remove the pressure logger assemblies	At the end of the testing period identified in Table 1-1, City will remove the pressure logger assemblies. At each test hydrant, City will operate the hydrant valve nut to the fully closed position. The bleed valve on the pressure logger assembly will be opened before the hydrant valve is fully closed to prevent drawing a suction on and thereby damaging the equipment. The City will remove the pressure logger assembly and replace the hydrant cap. The pressure logger assembly will be returned to BC for data download within one working day of removal.

City of Upland
Field Calibration Plan
Hydrant Test and Pressure Logger Locations

Test #1
Test #2
Test #3
Test #4
Test #5
Test #6
Test #7
Test #8
Test #9
Test #10
Test #11
Test #12
Test #13
Test #14
Test #15
Pressure Logger 1
Pressure Logger 2
Pressure Logger 3
Pressure Logger 4
Pressure Logger 5
Foothill Fwy
San Bernardino Fwy
Cable Airport
College Heights
Upland
San Antonio Creek Channel
Cucamonga Channel
0
0.72
1.45
Miles
N

Pressure Zone
- 1
- 2
- 3
- 4
- 5

Piping by Pressure Zone
- 1
- 2
- 3
- 4
- 5

- City Limits
- Well/Supply
- Reservoir
- Pump
- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate

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Figure 3-1. Hydrant Test and Pressure Logger Location Overview

Attachment A: Field Work Safety Plan (FWSP)

Field Work Safety Plan (FWSP) – Short Form

This Health and Safety (H&S) Plan template is intended for Brown and Caldwell (BC) projects where low hazard activities that require limited H&S planning and controls (e.g. site walkthroughs, surveys, visits, client meetings, non-construction observation, etc.) will be conducted by BC personnel or subcontractors.

GENERAL INFORMATION	
Project Name: Water and Recycled Water Master Plan	**Project No:** 159202
Address of Project/Site: 460 N. Euclid Avenue Upland, CA 91786	
Client Name: City of Upland	
Project Manager (PM) Approval (*print and sign*): Amy Martin	**Date:** 9/7/2023
Safety Manager (SM) Approval (*print and sign*): Andrew Scowcroft, on behalf of Ken Hoff CSP, CHST	**Date:** 8/15/2023
Proposed Date(s) of Field Activities (*from/to*): September 11-September 13, 2023	
Description of Field Work Activities: Client facilitated field testing in the City of Upland Water System.	

EMERGENCY CONTACT INFORMATION			
Incident Intervention	(888) 449-7787	BC Project Manager (PM)	Amy Martin, (714) 689-4865
Local Police	911	BC Safety Manager (SM)	Ken Hoff, CSP, CHST (407) 661-9519 (c) (407) 399-9102
Local Hospital *(Route Map Attached)*	**San Antonio Regional Hospital 999 San Bernardino Rd Upland, CA 91786 Phone: 909-985-2811**	BC Electrical Safety Officer	Eric Campbell 206-749-2223 (c) 480-252-2095
		BC Risk Manager BC Workers Comp.	Yolanda Harden 925-210-2494 Casey Konrai 925-210-2228
Local Ambulance	911	Client Contact	Marc Warner, Norberto Ferreira 909-376-1190
Local Fire Dept.	911		

ADDITIONAL INFORMATION or CONTROLS
No confined space entry by BC personnel is permitted under this plan. **If a job cannot beNone done in a safe manner, it should not be undertaken. It is important for personnel involved with this project to understand that each person has the authority to call a halt to work or activities that have the potential to cause harm to persons, property or the environment. If an unsafe condition is encountered, each person has the right, responsibility and obligation**

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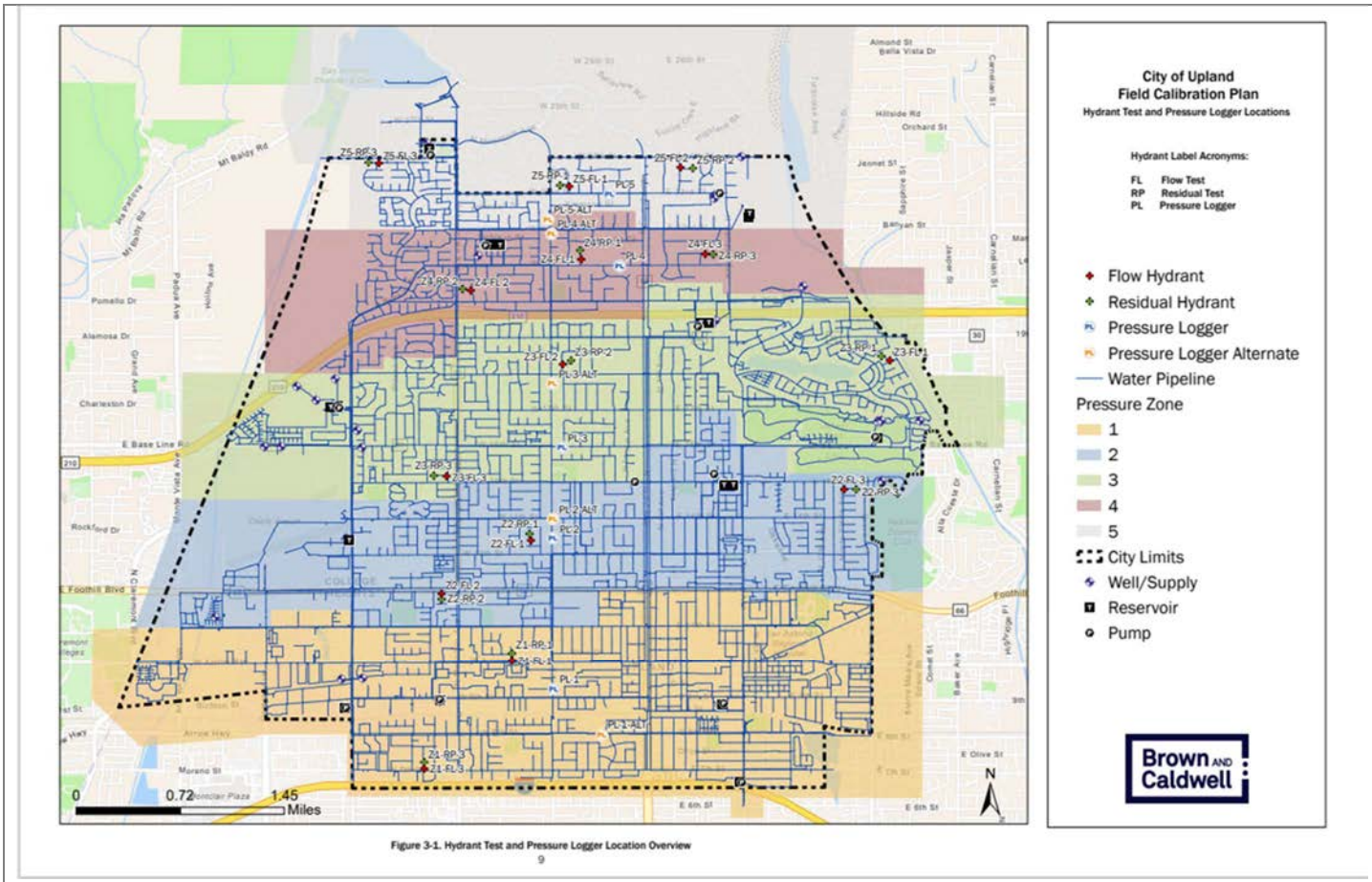


Figure 3-1. Hydrant Test and Pressure Logger Location Overview

9

Upland Service Area; we will be visiting select sites within this area.

POTENTIAL HAZARDS

(Click on box to select - check all that apply)

Physical Hazards:

☒ Driving/Vehicle Operation	☐ Work On or Near Roadways	☒ Slips, Trips and Falls
☐ Housekeeping	☒ Noise	☐ Materials and Equipment Handling or Lifting
☐ Overhead Utilities	☐ Underground Utilities	☐ Elevated Platforms/Working Surfaces
☐ Stairway or Ladder Use	☐ Portable Hand and Power Tools	☐ Removing/Replacing Manhole Covers
☐ Electrical Hazards	☐ Energy/System Isolation	☐ Personal Safety - Violence/Crime Prone Areas
☐ Arc Flash	☐ Equipment Refueling	☐ Personal Safety - Forested Areas
☐ Confined Spaces	☐ Excavations	☐ Personal Safety - Hunting Areas
☐ Heavy/Mobile Equipment	☐ Fire/Explosion	☐ Personal Safety - Shooting Ranges
☐ Drilling	☐ High-Pressure Hazards	☐ Preserved Laboratory Sample Kits
☐ ATV or UTV Use	☒ Working On or Near Water	☐ Groundwater Sampling
☐ Building Collapse	☐ Fatigue	☐ Working at Night
☐ Drum Handling	☐ Mobile Data Collection	☐ Wildfires and Smoke
☐ Other:	☐ Other:	☐ Other:

Chemical Hazards (specify):

NA

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Natural Phenomena Hazards:

- ☒ Sunburn
- ☒ Heat Stress
- ☐ Cold Stress
- ☐ Lightning/Electrical Storms
- ☐ Hurricanes/Nor' Easters
- ☐ Tornados and Strong/Straight Line Winds
- ☐ Earthquakes
- ☐ Flooding
- ☐ Snow/Freezing Rain
- ☐ Other:

Biological Hazards:

- ☐ Bloodborne Pathogens/Sanitary Waste
- ☐ Rodents
- ☐ Other Mammals/Predators
- ☐ Venomous Insects
- ☒ Mosquitoes
- ☐ Poisonous Plants
- ☐ Fire Ants (Venomous Insects)
- ☒ Ticks
- ☐ Phragmites
- ☐ Spiders/Scorpions
- ☐ Pets/Farm Animals
- ☐ Snakes
- ☐ Alligators
- ☐ Chiggers
- ☐ Other:
- ☐ **Valley Fever**

Other Hazards (specify)/Remarks:

Mosquitoes and Ticks are not hazards we will likely be encountering given the sites we will visit are maintained. However, be cautious if access to assets on locations require walking through tall grasses or bushes. Be aware of standing water and the possibility of mosquitoes in the area. Advise those on site to wear proper clothing covering legs and arms to mitigate these risks.

CONTROLS AND PERSONEL PROTECTIVE EQUIPMENT

(Click on box to select - check all that apply)

HAZARD AWARENESS

A FWSP briefing must be conducted and documented on the BC H&S Plan Review Acknowledgement form for all personnel covered by this H&S Plan along with completion of a Daily Tailgate Meeting for each day this project is active in the field. BC personnel are to eliminate or minimize their exposure to potentially hazardous conditions identified unless appropriate, SM-Approved hazard controls are in place.

Head/Eye/Foot Protection:

☒ ANSI-approved Hard Hat ☒ ANSI-approved Safety Glasses ☒ ASTM-approved Steel/Safety Toe Boots

☐ Rubber boots/Waders ☐ Other (specify):

Body Protection:

☒ ANSI-Approved High Visibility Vest ☐ Work Clothes ☐ Coveralls ☐ Other (specify):

Hand Protection:

☐ Leather ☐ Chemical (Nitrile) ☐ Other (specify):

Hearing Protection:

☒ Ear Plugs ☐ Ear Muffs ☐ Other (specify):

Miscellaneous Protection/Equipment:

☒ First Aid Kit ☒ Mobile Phone ☒ Fluids/Drinking Water ☐ Full Body Harness/Lanyard

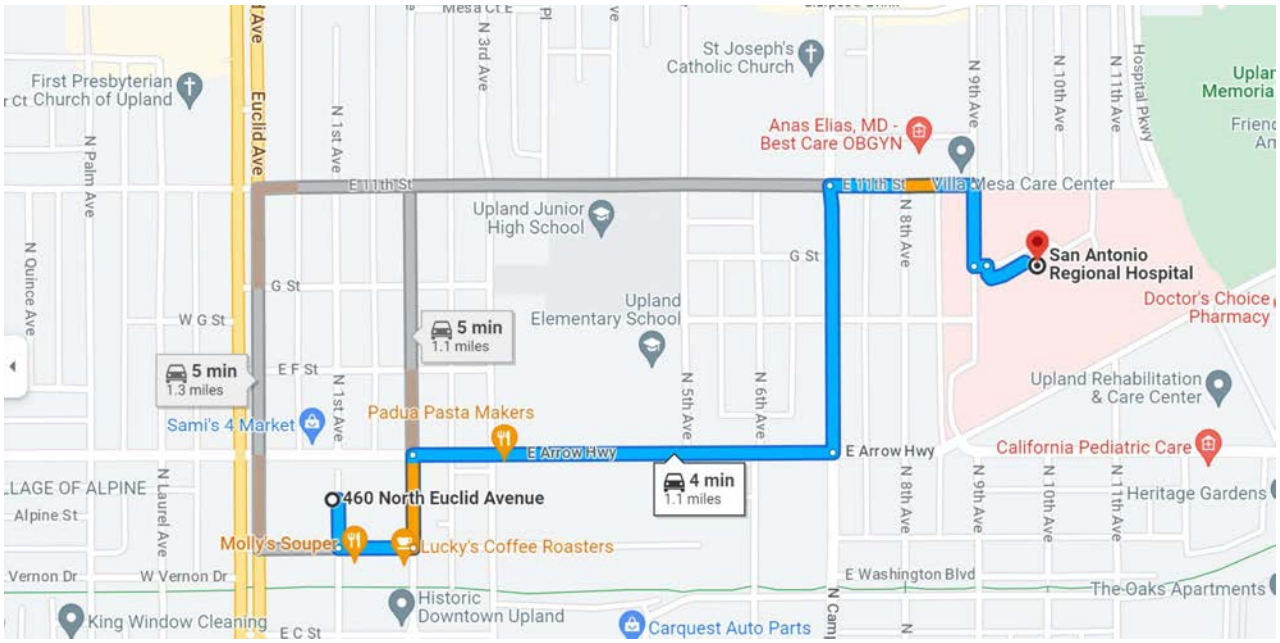
☐ Eyewash ☒ Sunscreen/Sunshade ☒ Insect/tick control ☐ Other (specify):

Other PPE/Equipment/Remarks:

None

HOSPITAL LOCATION MAP

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HOSPITAL DIRECTIONS:

460 N Euclid Ave
Upland, CA 91786

- Take D St and N 2nd Ave to E Arrow Hwy
  1 min (0.2 mi)
- Continue on E Arrow Hwy to E 11th St
  2 min (0.7 mi)
- Continue on E 11th St to your destination
  1 min (0.3 mi)

San Antonio Reg'l Hospital
999 San Bernardino Rd, Upland, CA 91786

HOSPITAL INFORMATION:

San Antonio Regional Hospital
999 San Bernardino Rd
Upland, CA 91786
Phone: 909-985-2811

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Acknowledgement Forms

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ACKNOWLEDGMENT FORM

Safety Plan and Site Orientation Acknowledgement	
Project Name: City of Upland Water and Recycled Water Master Plan	Project Number: 159202
Site Location: **Multiple Locations within City of Upland water system**	
Employee/Company Performing Review (Name/Signature):	Date of Review:

BC Employee Acknowledgement:

The following signatures indicate that these personnel have read and/or been briefed on this Safety Plan and understand the potential hazards/controls for the work to be performed.

Print	Sign	Date	Print	Sign	Date
Amy Martin			Marc Warner		
Ian Jaffe					
Colin Ricks					

Subcontractor Acknowledgment:

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors should operate equipment in accordance with their standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own Safety Plan for this project or other health and safety program documents for review.

BC's Safety Plan has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of BC's own employees at the site. A copy of BC's Safety Plan may be provided to subcontractors in an effort to help them identify expected conditions at the site and general site hazards. The subcontractor will remain responsible for identifying and evaluating hazards at the site as they pertain to their activities and for taking appropriate precautions. For example, BC's H&S Plan does not address specific hazards associated with tasks and equipment that are particular to the subcontractor's scope of work and site activities. (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on BC's Safety Plan to identify all hazards that may be present at the site. Subcontractor personnel are expected to comply fully with subcontractor's Health and Safety Plan and to observe the minimum safety guidelines applicable to their activities, which may be identified in the BC Safety Plan. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job site.

Print	Sign	Date	Print	Sign	Date

Daily Tailgate Review Forms

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DAILY TAILGATE REVIEW FORM

Tailgate Meeting Participation Acknowledgement	
Project Name: City of Upland Water and Recycled Water Master Plan	Project Number: 159202
Site Location: City of Upland, CA	
Employee/Company Performing Briefing (Name/Signature): Ian Jaffe/Colin Ricks	Date of Briefing:

PAUSE - Plan of the Day
(Describe the activities that are planned to be performed today. Discuss what is the worst that could happen?)

Driving to City of Upland offices in Upland, CA. There I will meet with field operations staff who will join me in installating equipment in the field. We will be performing hydrant flow testing. We will each be driving our own vehicle to the site and may consolidate into one vehicle. No confined space entry will occur.

THINK - Potential Hazards and Controls
(Describe the potential hazards and controls that may be associated with planned activities. Are all necessary precautions in place?)

Hazard Type	Site-Specific Hazard Discussion	Discussed Controls
☒ Physical	**We will be walking sites closed off to the public.**	**Watch your footing in unpaved areas, do not enter spaces marked as confined and do not enter areas with barriers unless authorized by the client and field staff to do so.**
☒ Natural	**May be sunny and hot outside**	**Make sure to wear sunscreen/protective clothing. Drink plenty of water and cool yourself down in your vehicle if you feel you are getting too hot.**
☐ Chemical		
☐ Biological		
☐ Electrical		
☐ Other (specify):		

GO - Only when work can be performed safely!

DAILY TAILGATE REVIEW FORM

Important Notice to Subcontractor(s):

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors shall operate equipment in accordance with their standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the Site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the Site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own H&S Plan for this project or other health and safety program documents for review.

This FWSP has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of BC's own employees at the site. A copy of the FWSP may be provided to subcontractors in an effort to help them identify expected conditions at the site and general site hazards. The subcontractor shall remain responsible for identifying and evaluating hazards at the site as they pertain to their activities and for taking appropriate precautions. For example, FWSP does not address specific hazards associated with tasks and equipment that are particular to the subcontractor's scope of work and site activities. (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on FSWP to identify all hazards that may be present at the Site. Subcontractor personnel are expected to comply fully with subcontractor's Health and Safety Plan and to observe the minimum safety guidelines applicable to their activities which may be identified in the FWSP. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job site.

Field Personnel Acknowledgement:

The following signatures indicate that these personnel (BC and Subcontractors) have read and/or been briefed on this Safety Plan and understand the potential hazards/controls for the work to be performed and have reviewed these hazards and/or task-specific hazards prior to commencing activities on a daily basis.

Print	Sign	Date	Print	Sign	Date
Ian Jaffe			**John Nobles (Optional)**		
Colin Ricks					

DAILY TAILGATE REVIEW FORM

Attachment B: Flow Test Locations

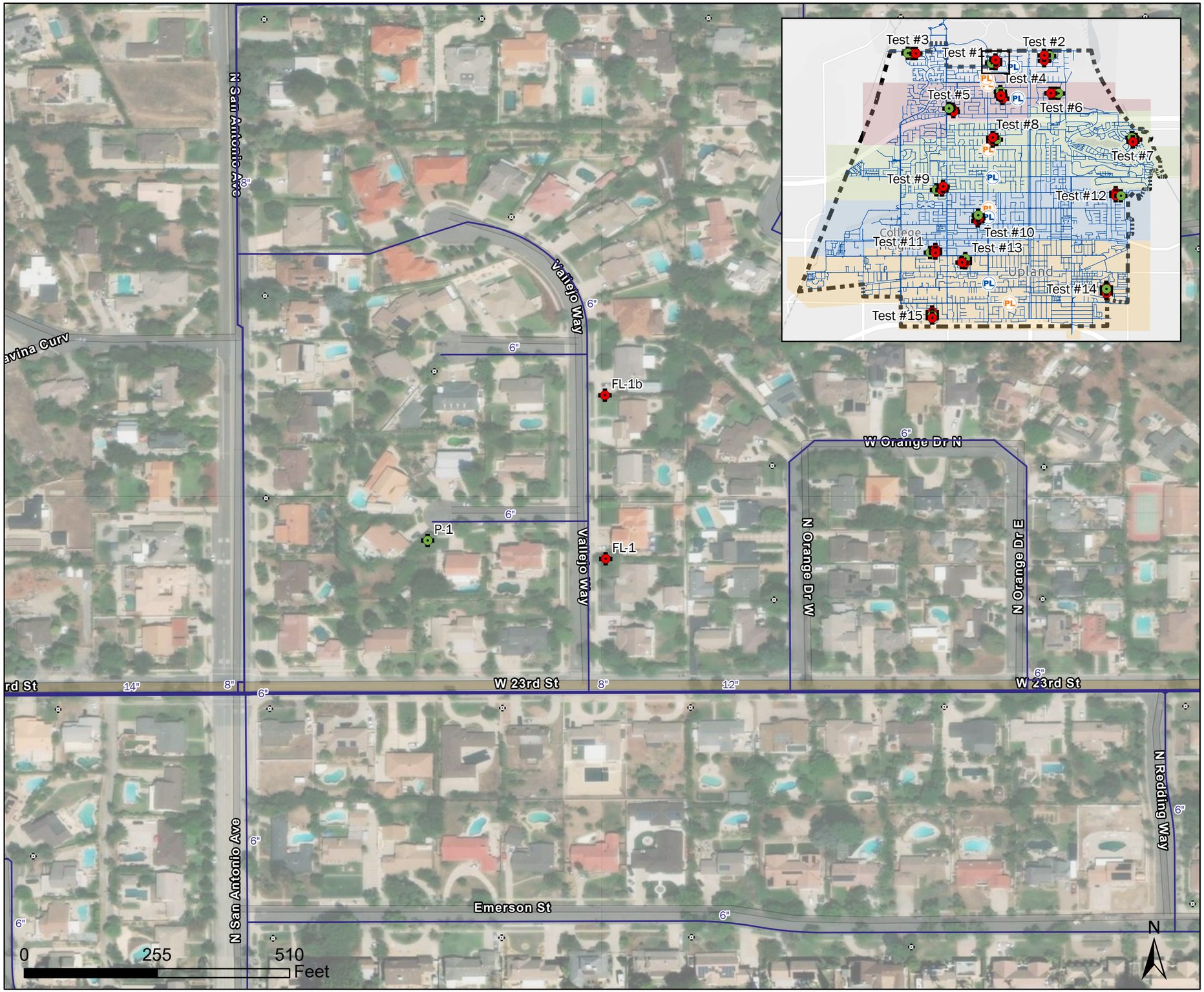


Figure B-1. Test 1

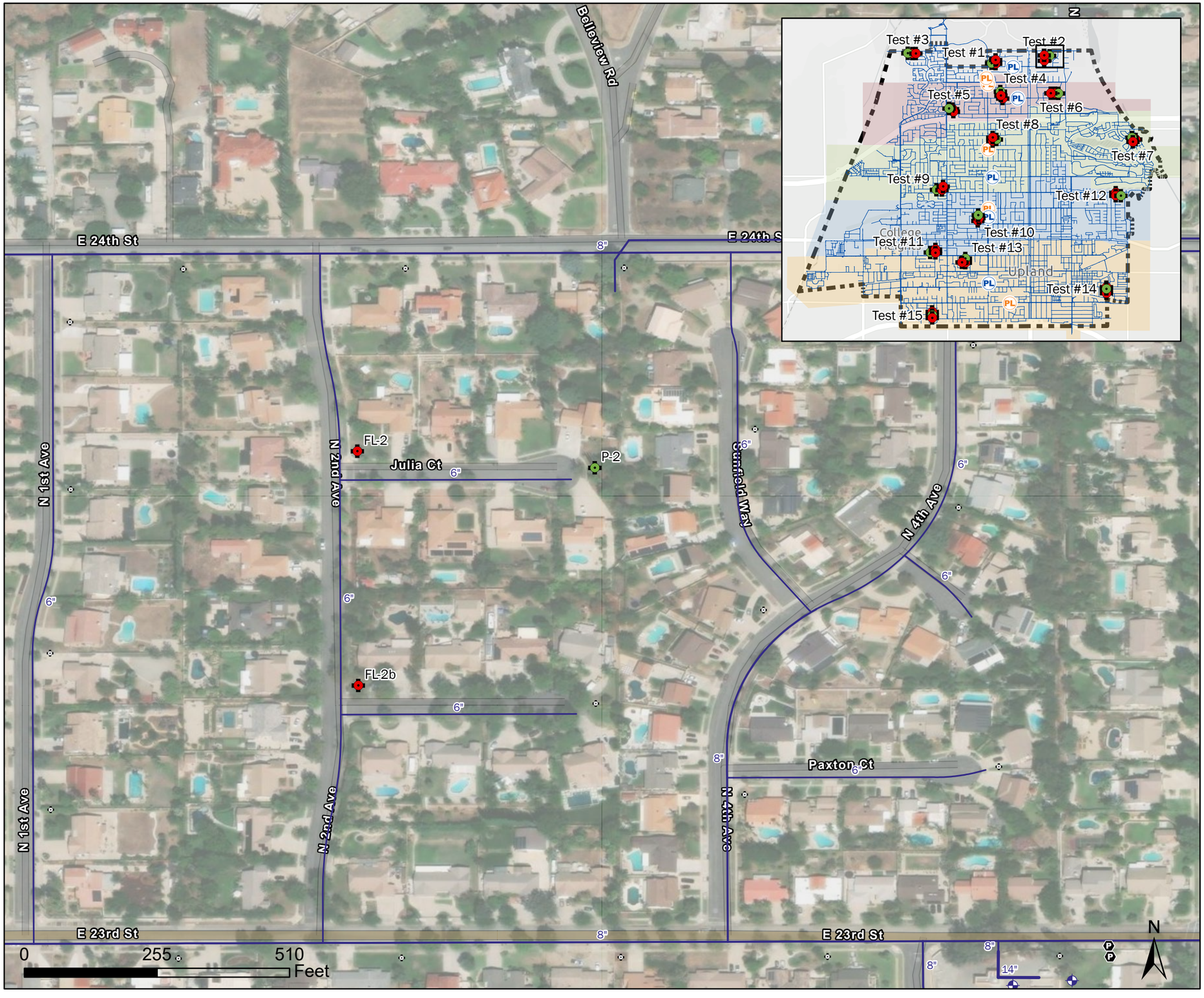
City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Well/Supply
- Pump
- Water Pipeline

Brown AND Caldwell

Figure B-2. Test 2

City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

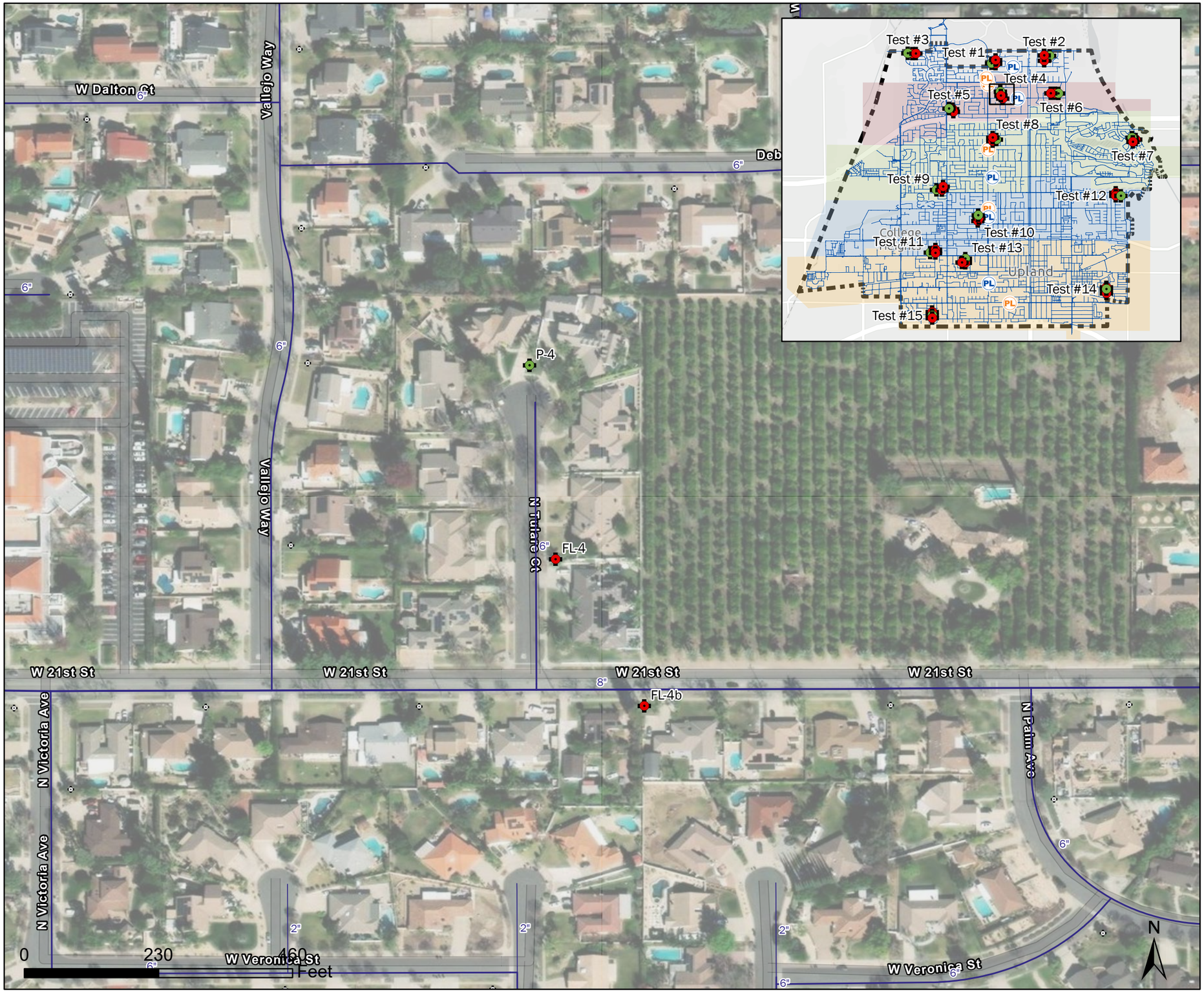
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Figure B-3. Test 3



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Figure B-4. Test 4

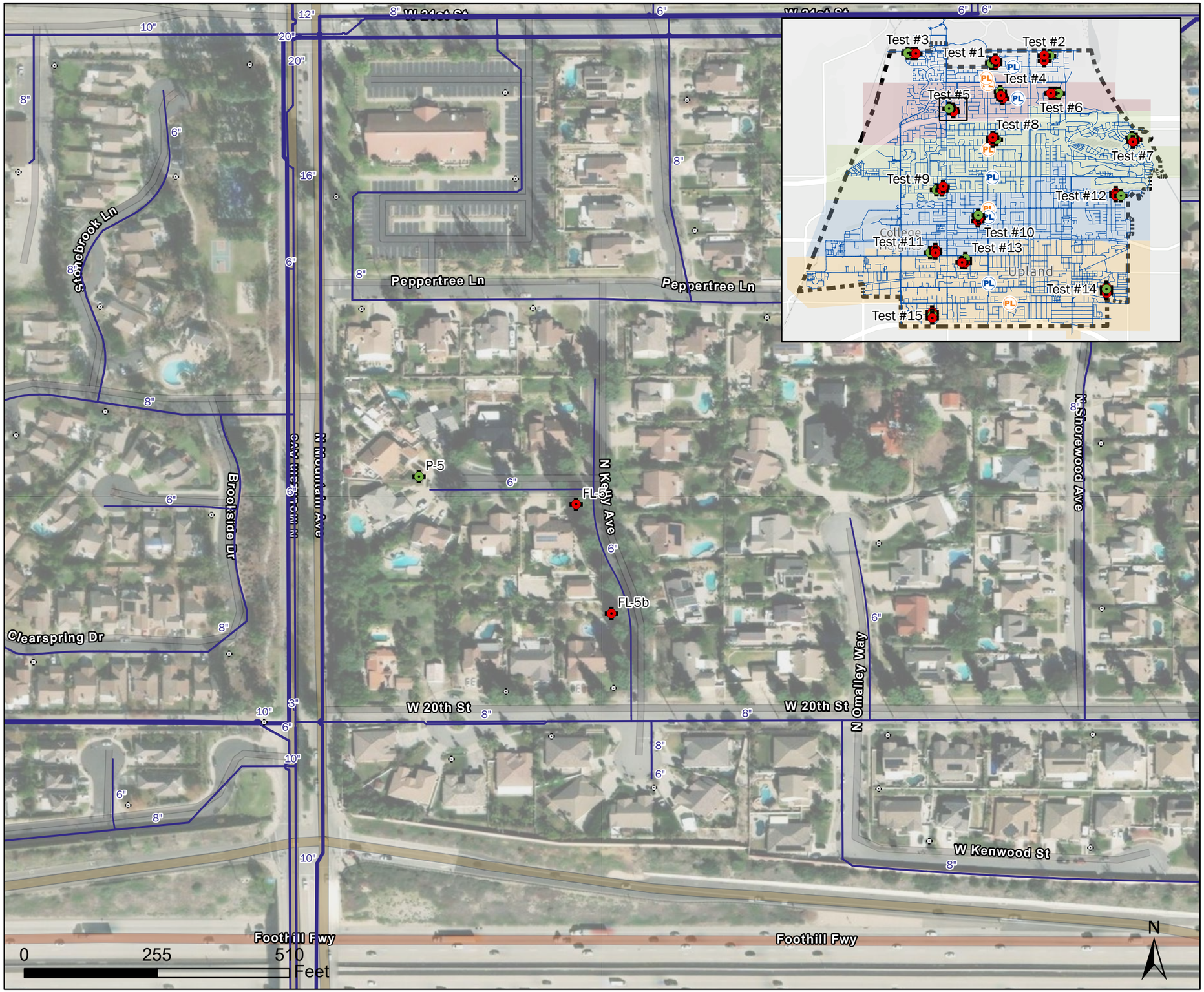


Figure B-5. Test 5

City of Upland
Field Calibration Plan

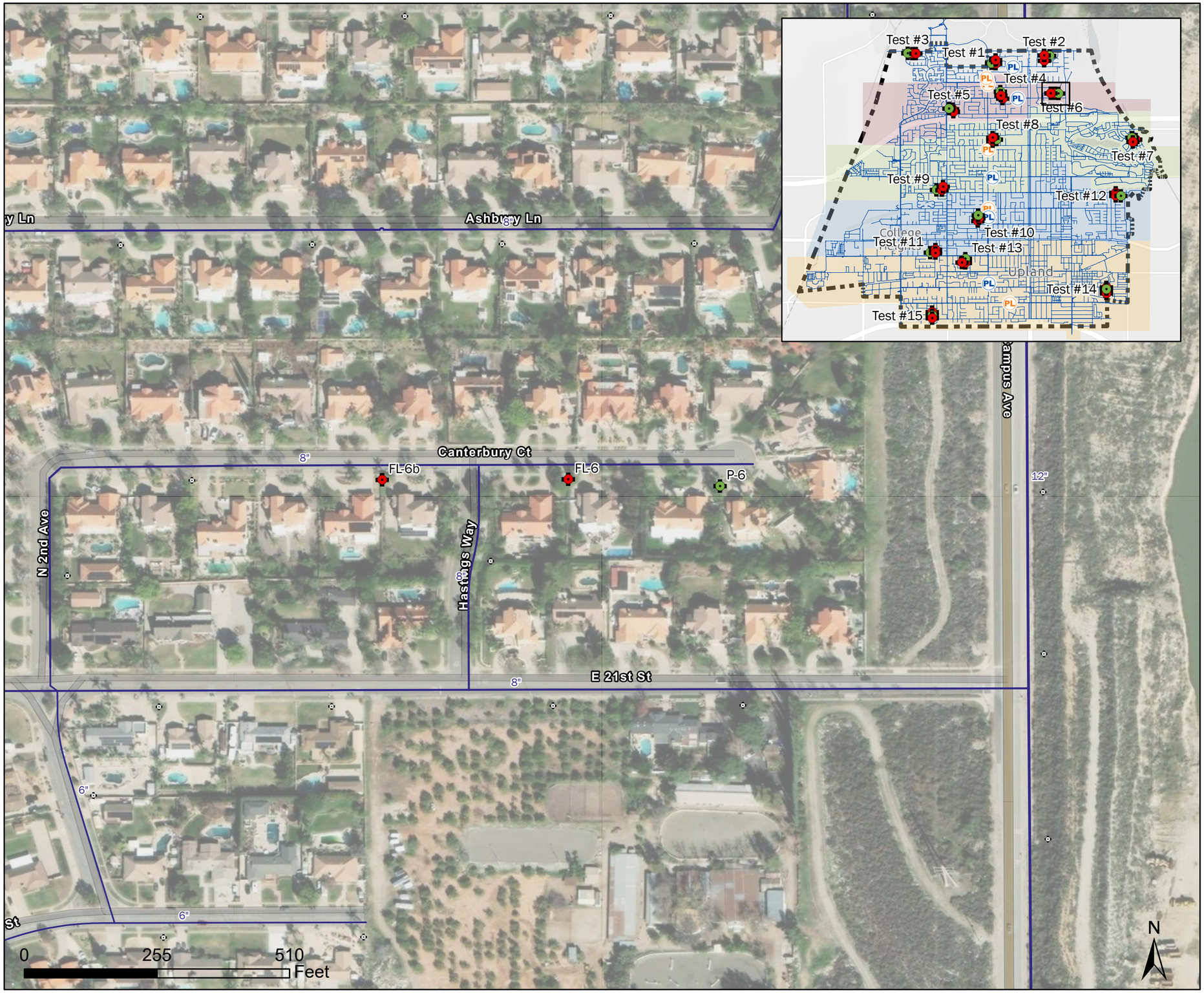
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Figure B-6. Test 6

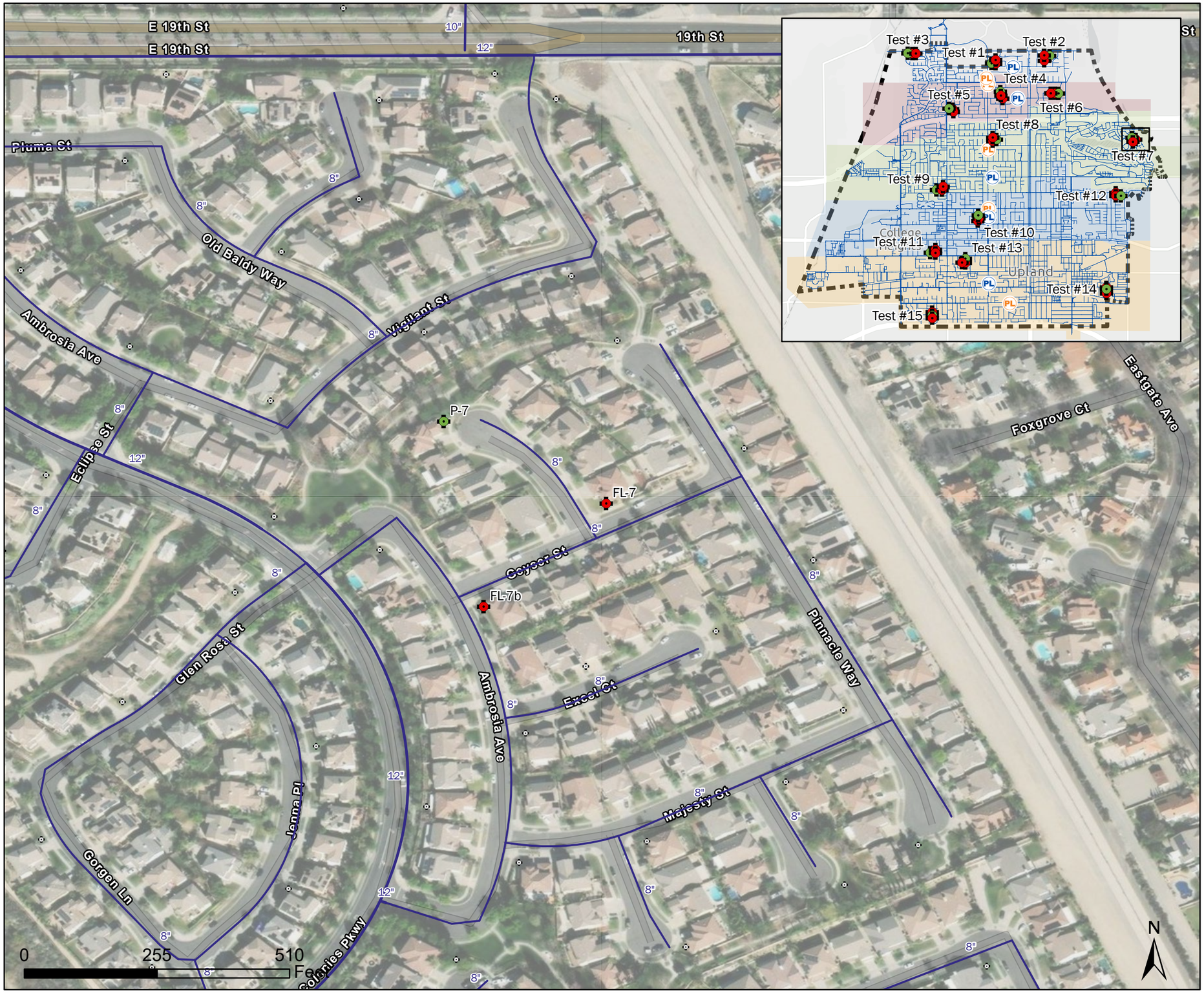


Figure B-7. Test 7

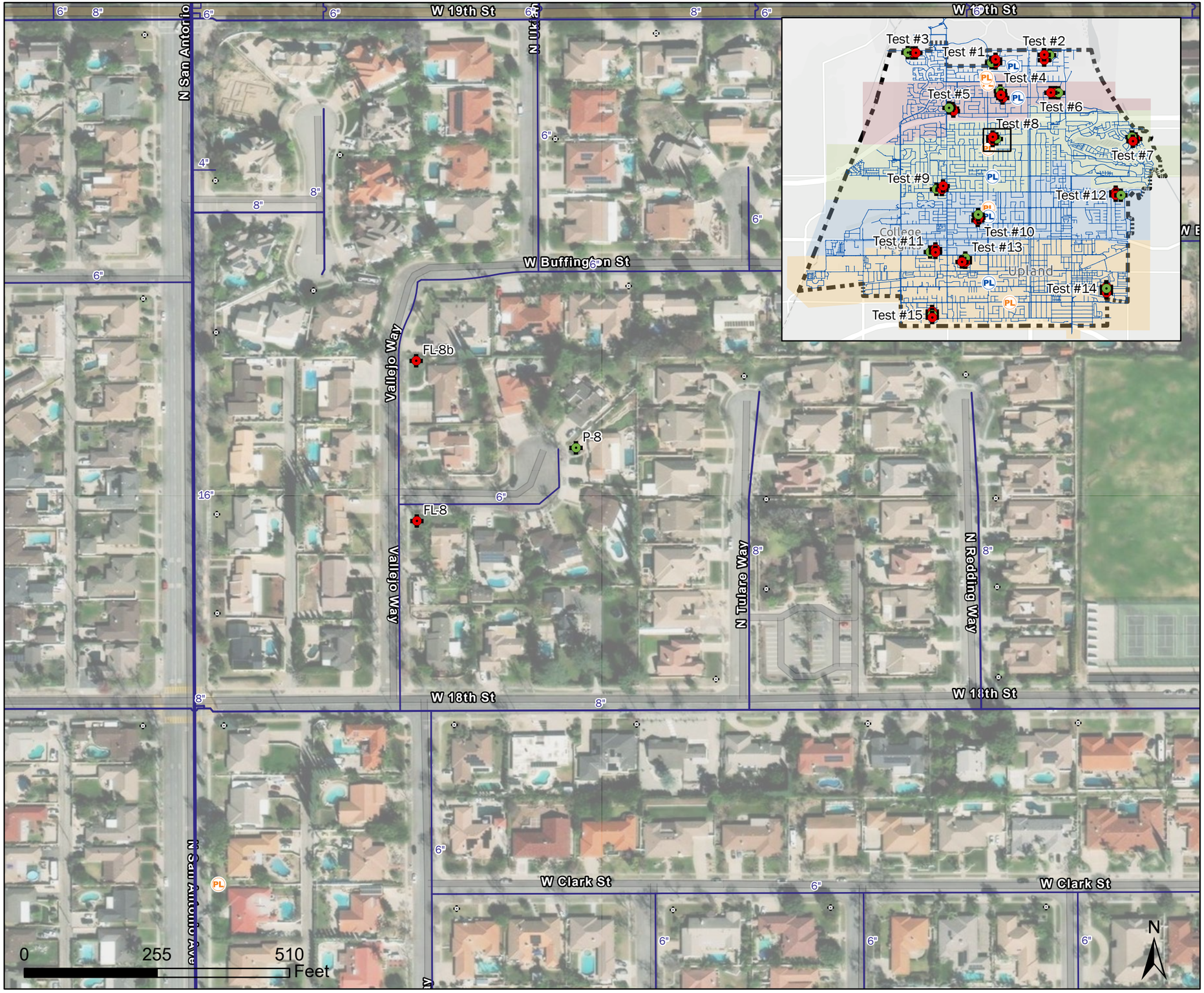
City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Tank
- Water Pipeline

Brown AND Caldwell



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

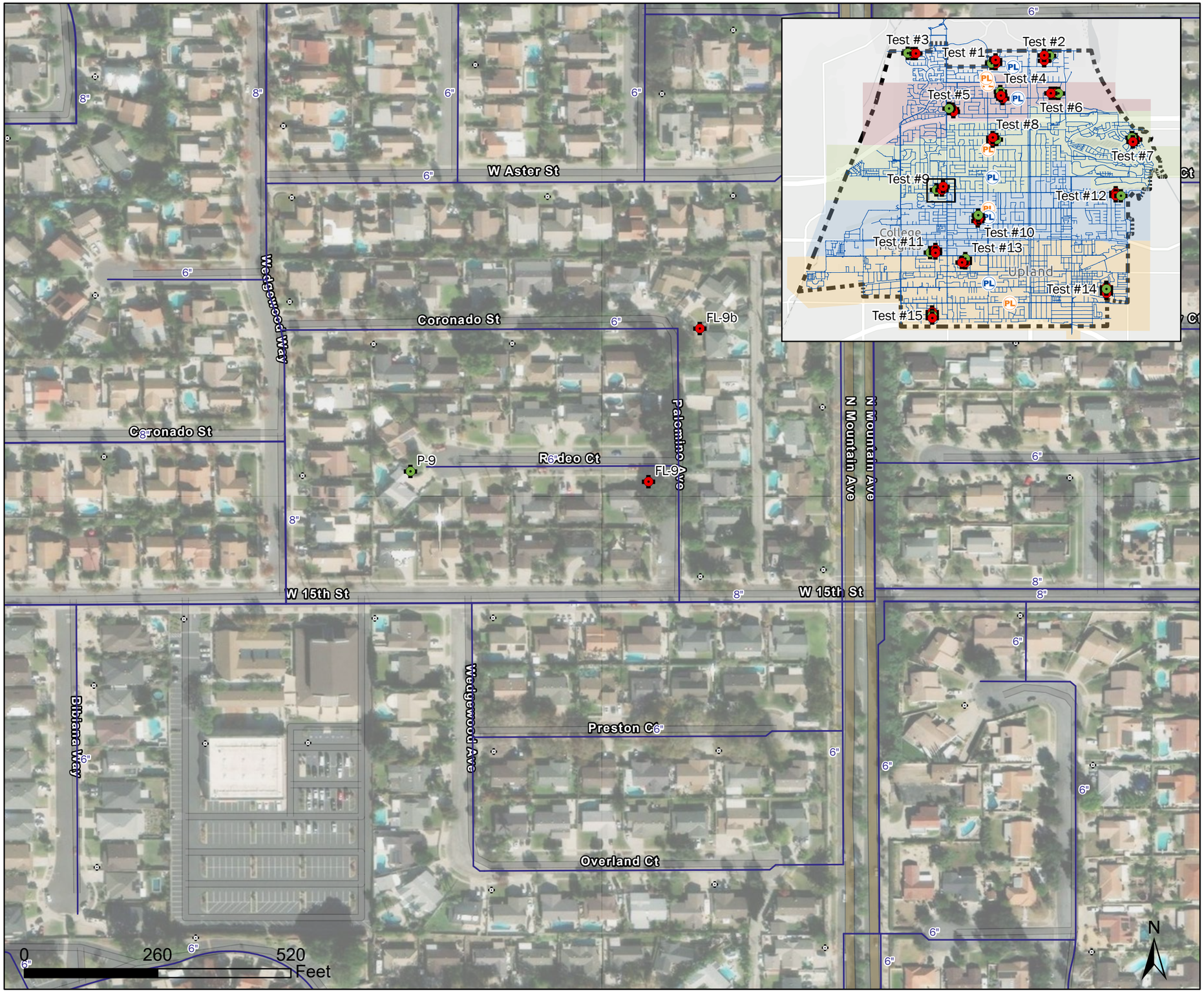
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure B-8. Test 8



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

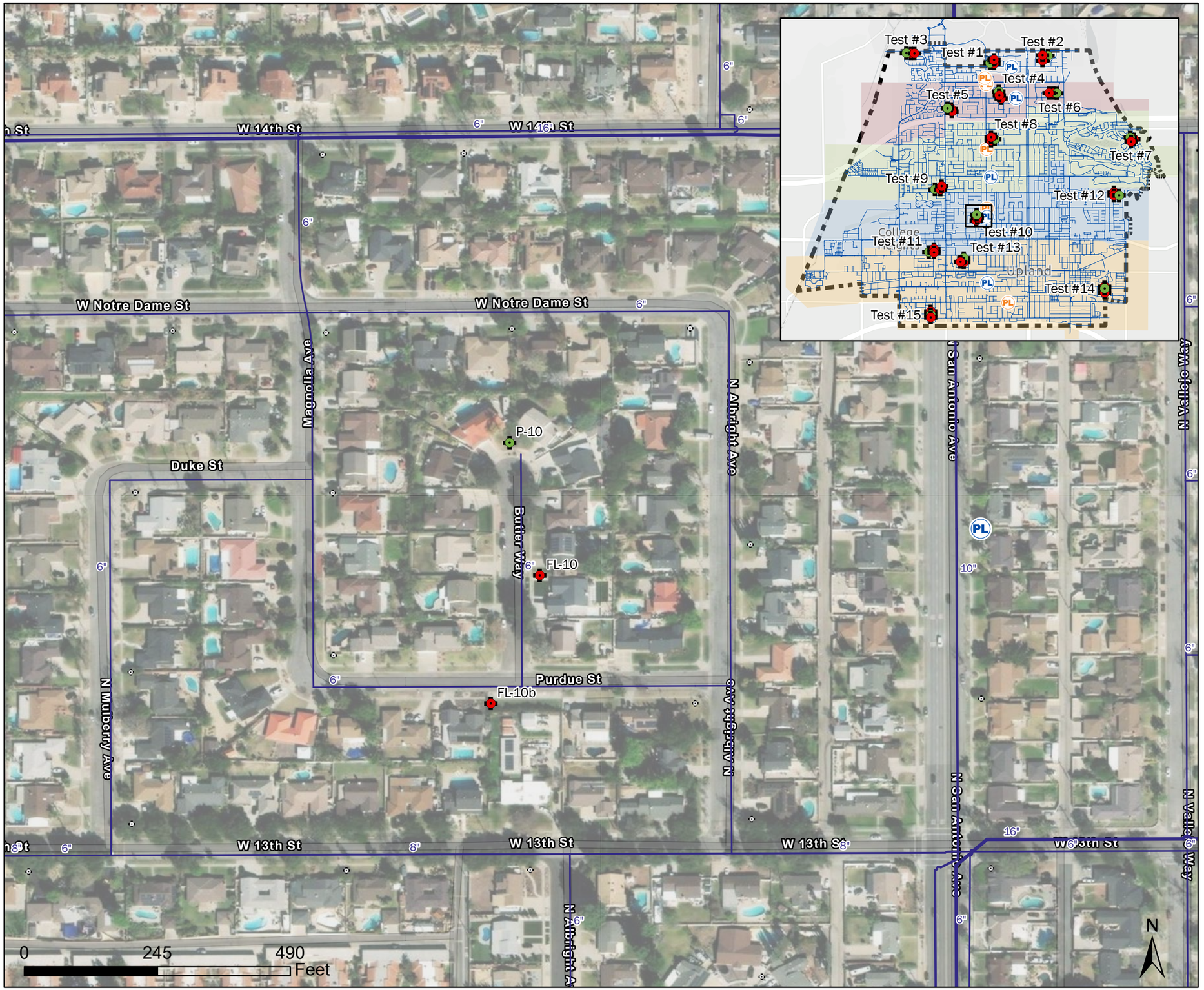
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Figure B-9. Test 9



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure B-10. Test 10

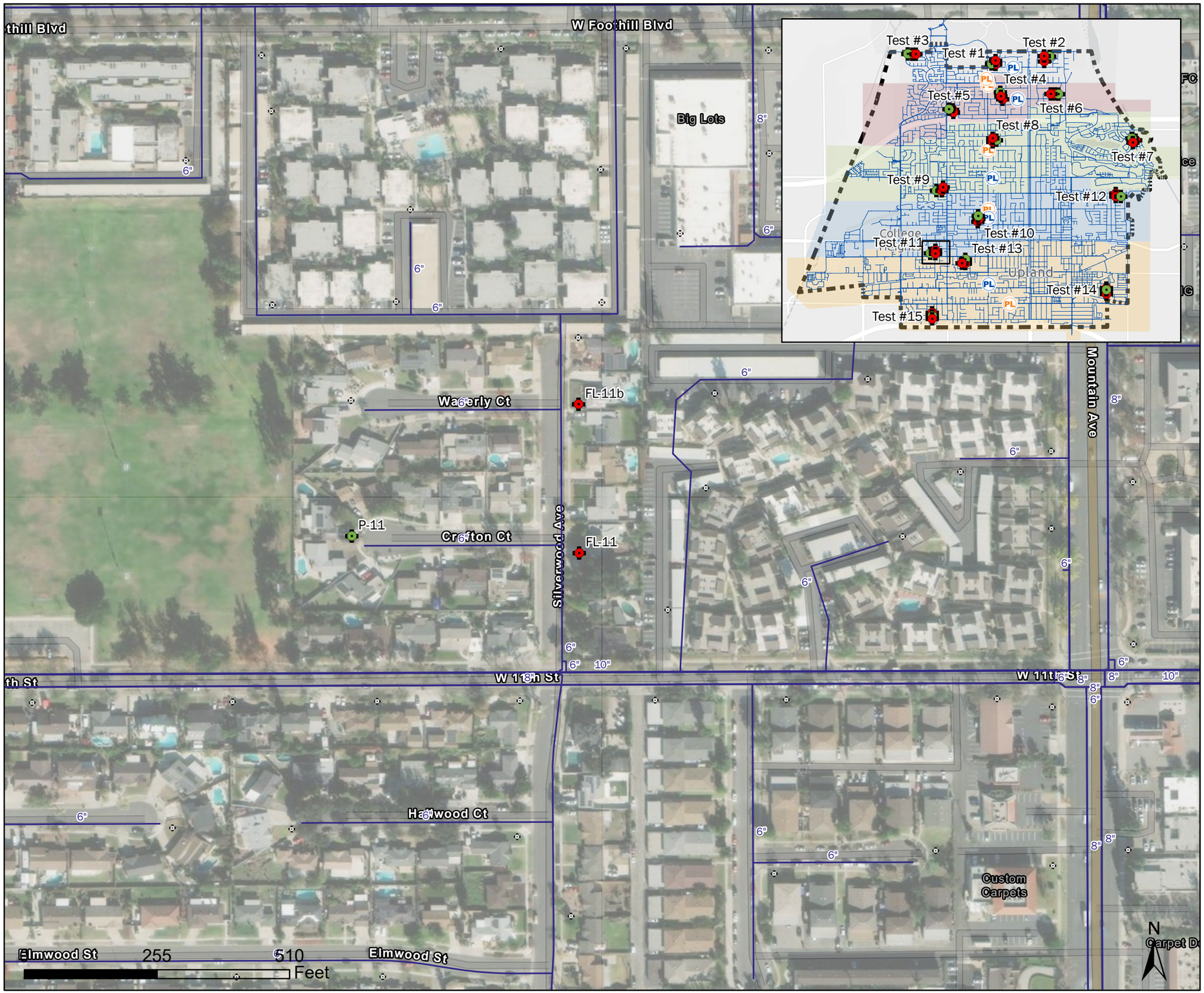


Figure B-11. Test 11

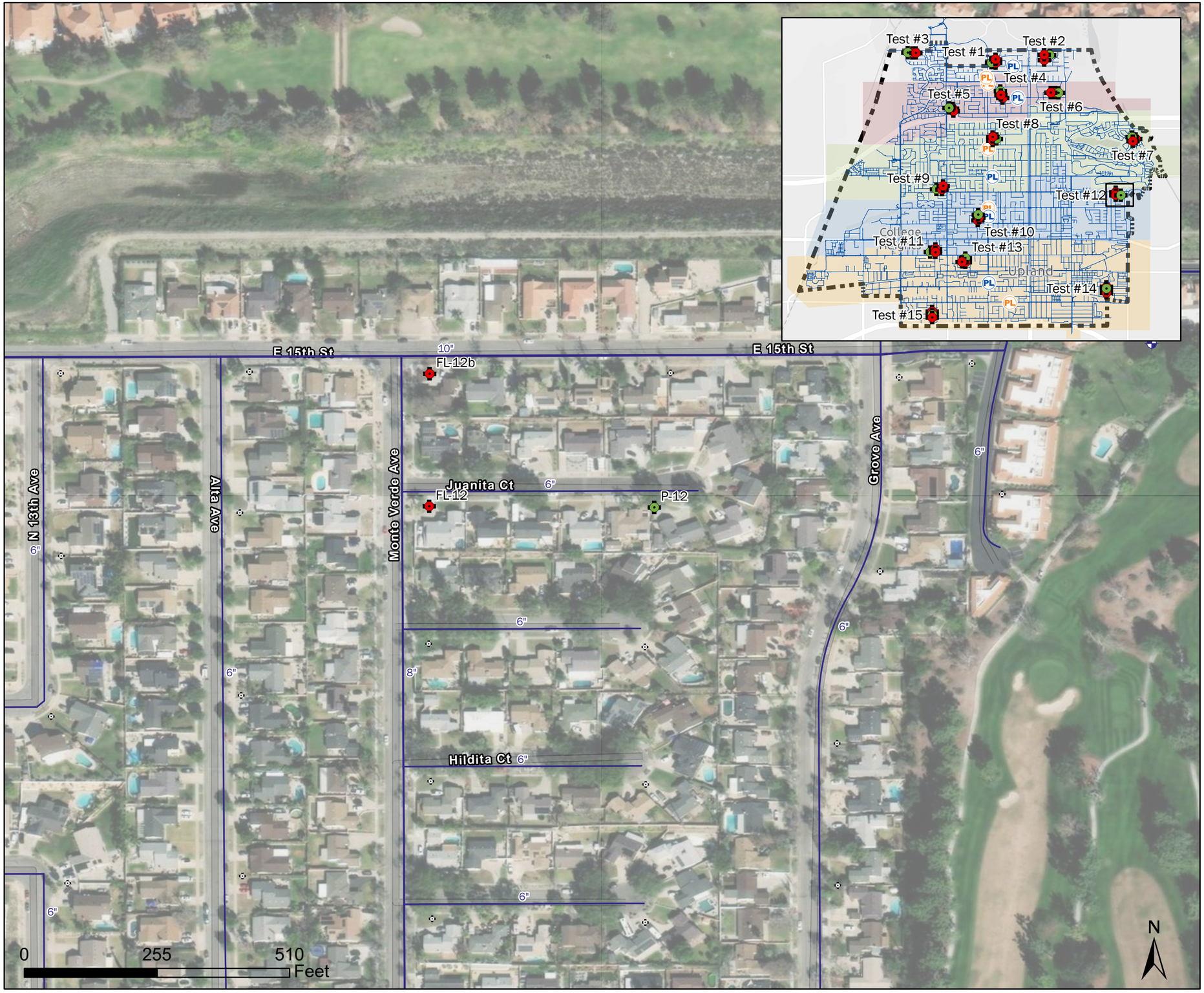
City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

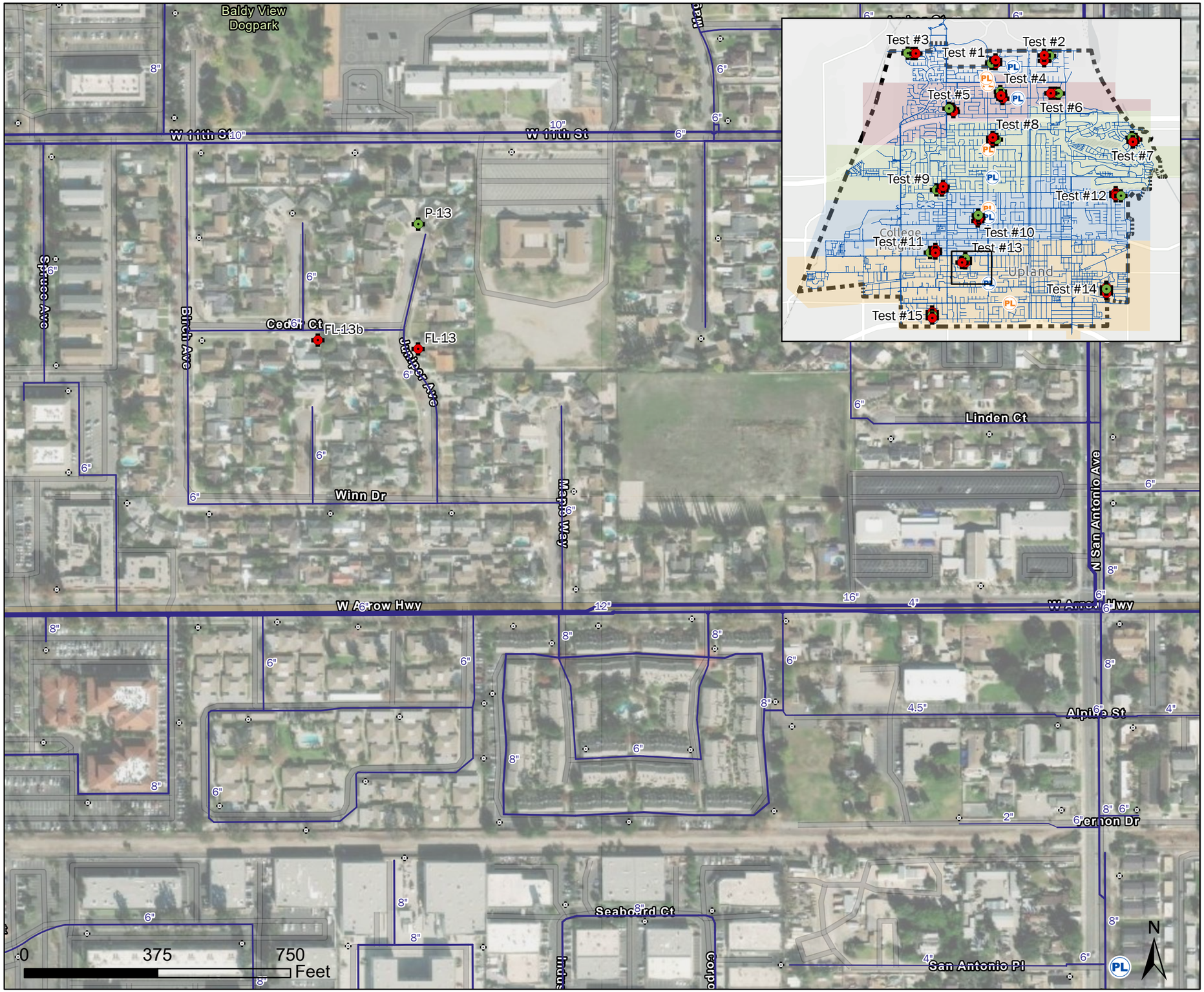
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Well/Supply
- Water Pipeline

Brown AND Caldwell

Figure B-12. Test 12



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

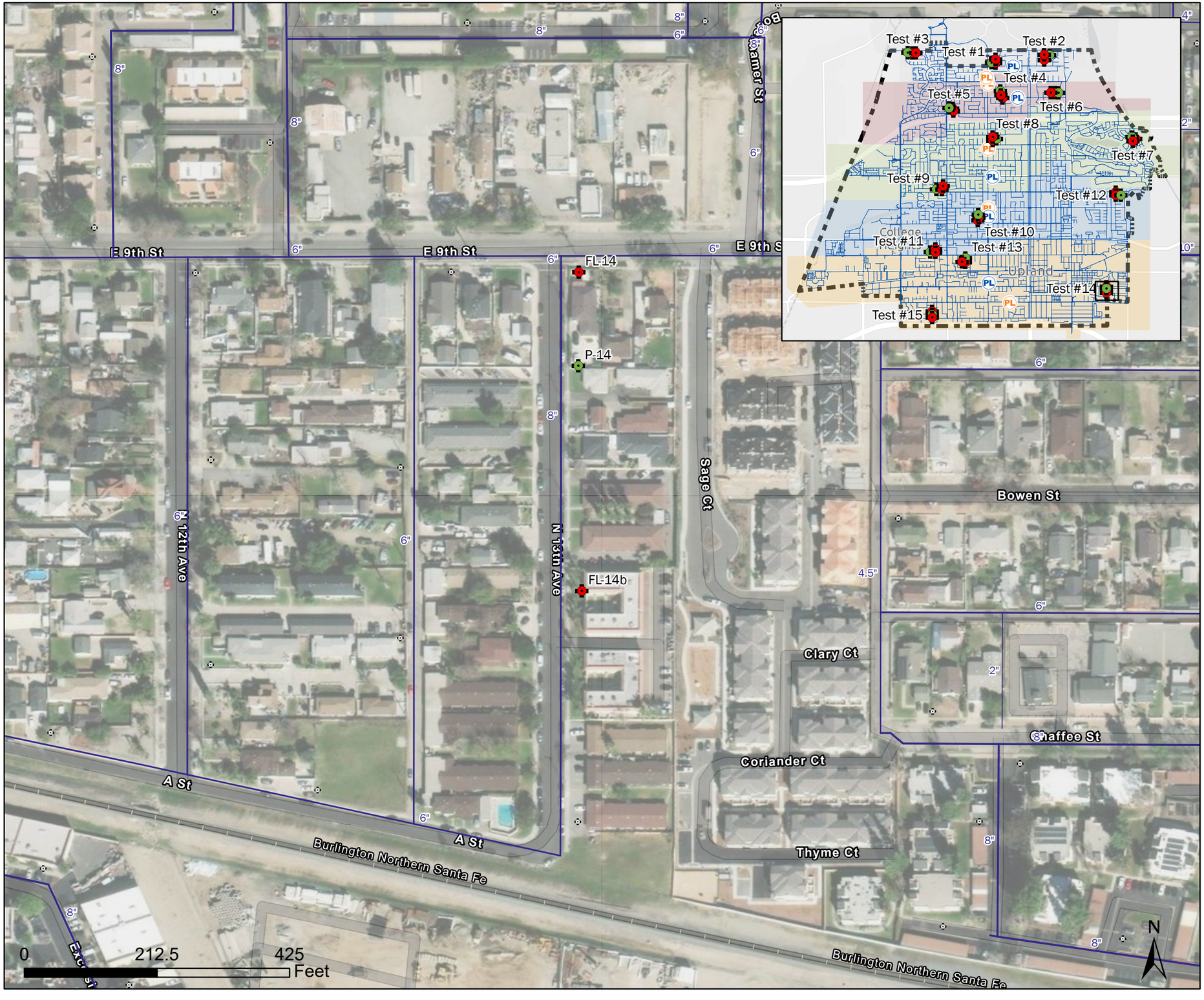
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Water Pipeline

Brown AND Caldwell

Figure B-13. Test 13



City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Figure B-14. Test 14

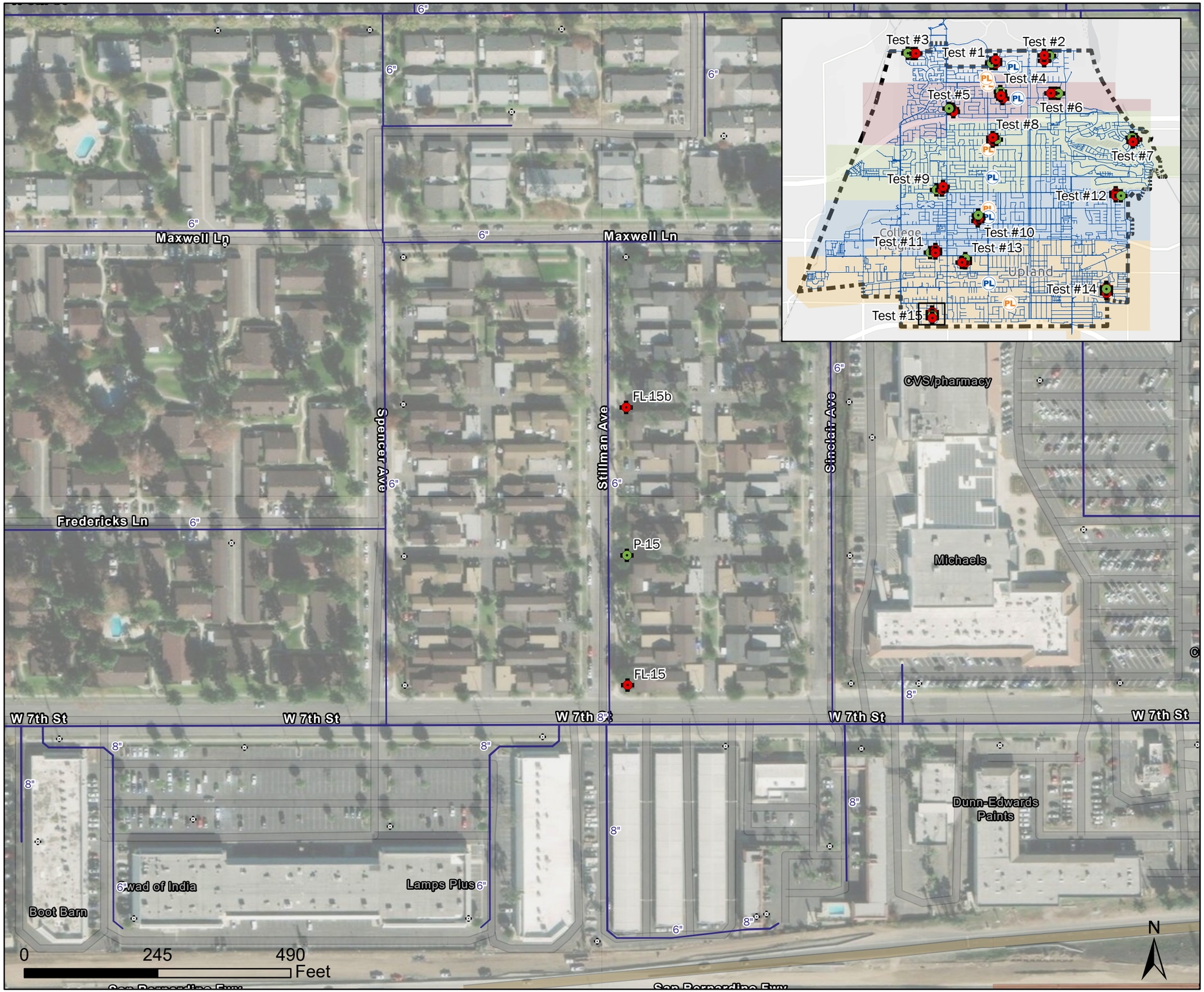


Figure B-15. Test 15

City of Upland
Field Calibration Plan
Appendix B Flow Test Locations

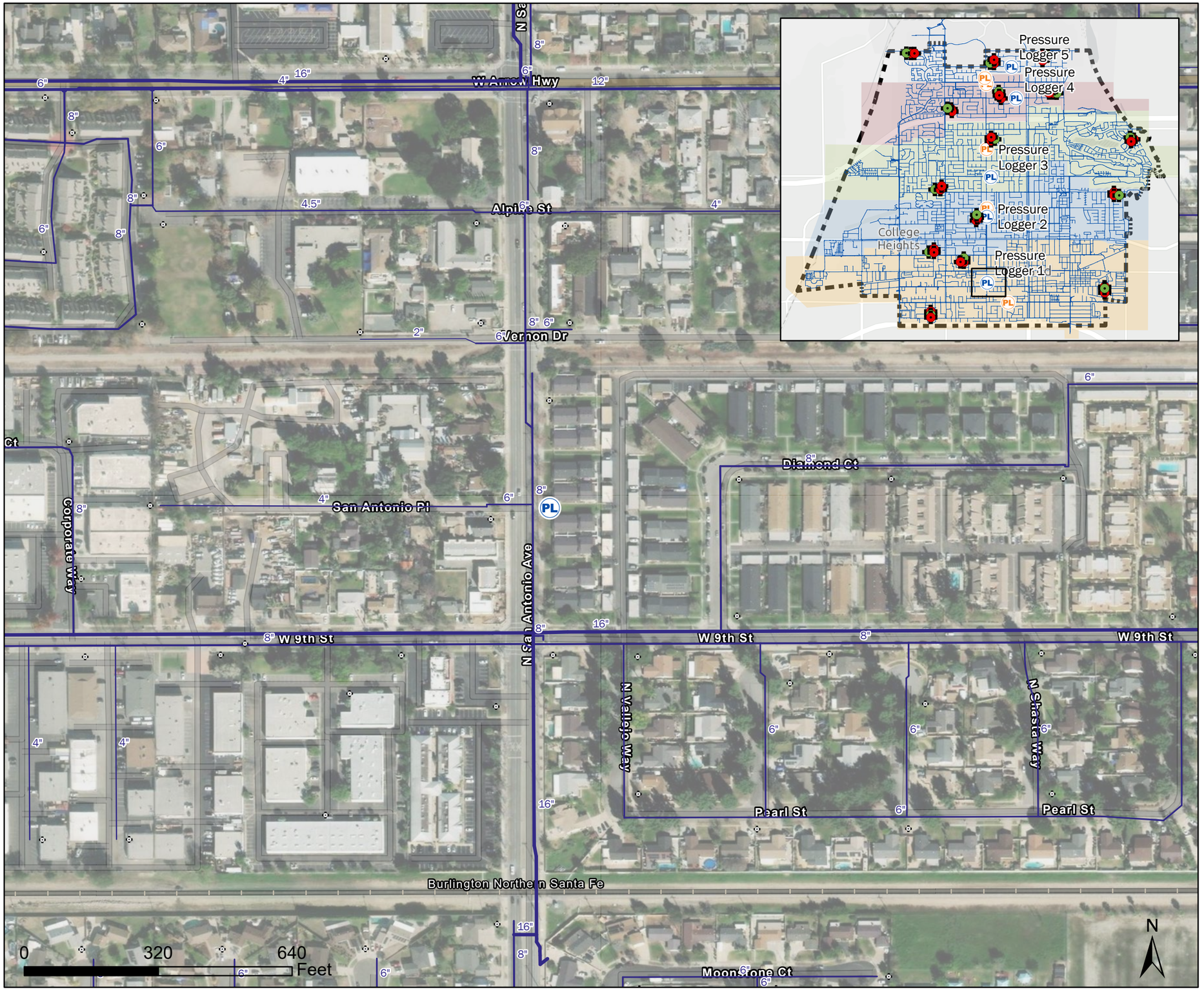
Hydrant Label Acronyms:

FL Flow Test
P Residual Test
PL Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Water Pipeline

Brown AND Caldwell

Attachment C: Pressure Logger Locations



City of Upland
Field Calibration Plan
Appendix C Pressure Logger Locations

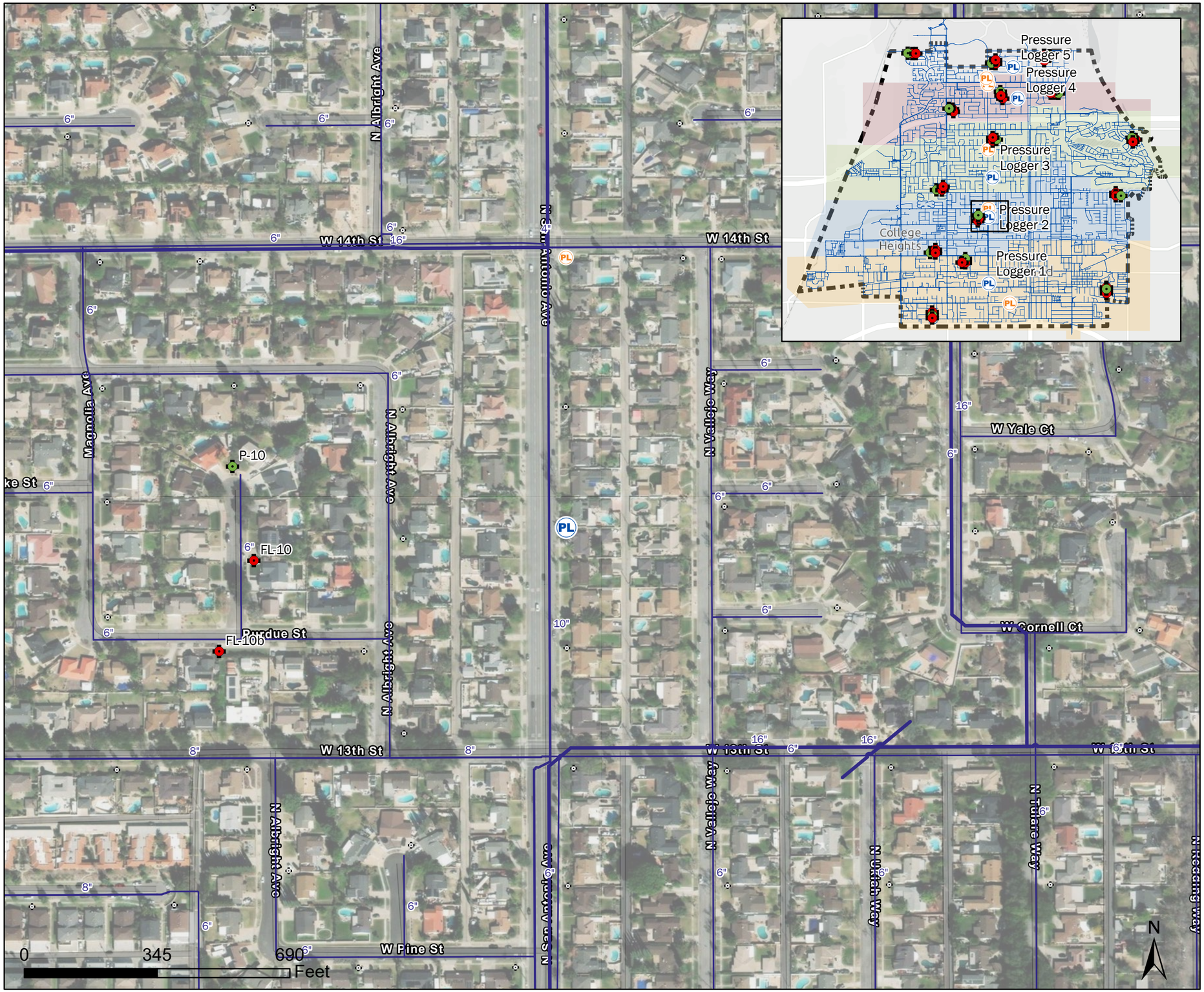
Hydrant Label Acronyms:

FL	Flow Test
RP	Residual Test
PL	Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure C-1. Pressure Logger 1



City of Upland
Field Calibration Plan
Appendix C Pressure Logger Locations

Hydrant Label Acronyms:

FL	Flow Test
RP	Residual Test
PL	Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure C-2. Pressure Logger 2

City of Upland
Field Calibration Plan

Appendix C Pressure Logger Locations

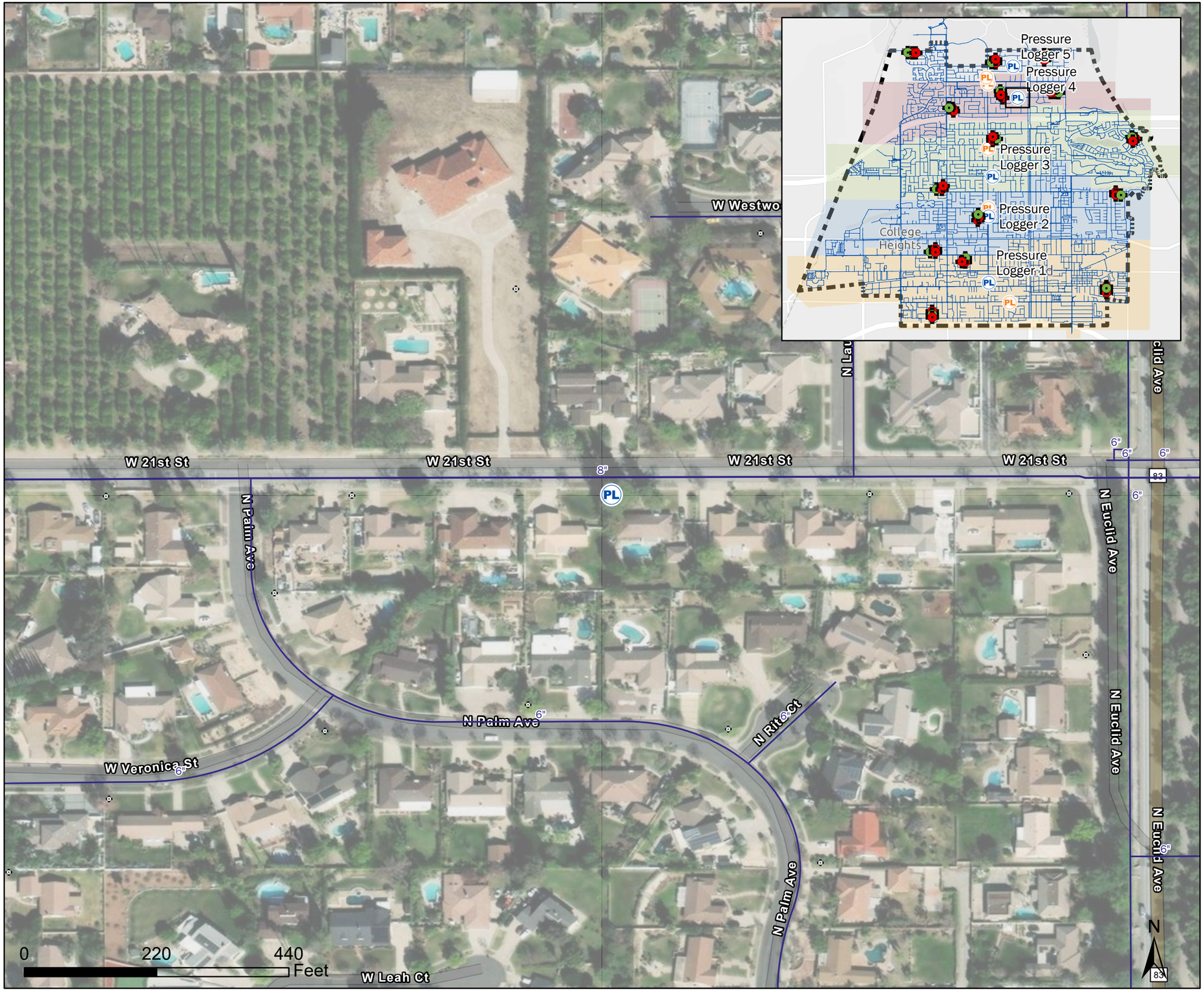
Hydrant Label Acronyms:

FL	Flow Test
RP	Residual Test
PL	Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure C-3. Pressure Logger 3



City of Upland
Field Calibration Plan
Appendix C Pressure Logger Locations

Hydrant Label Acronyms:

FL	Flow Test
RP	Residual Test
PL	Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Figure C-4. Pressure Logger 4

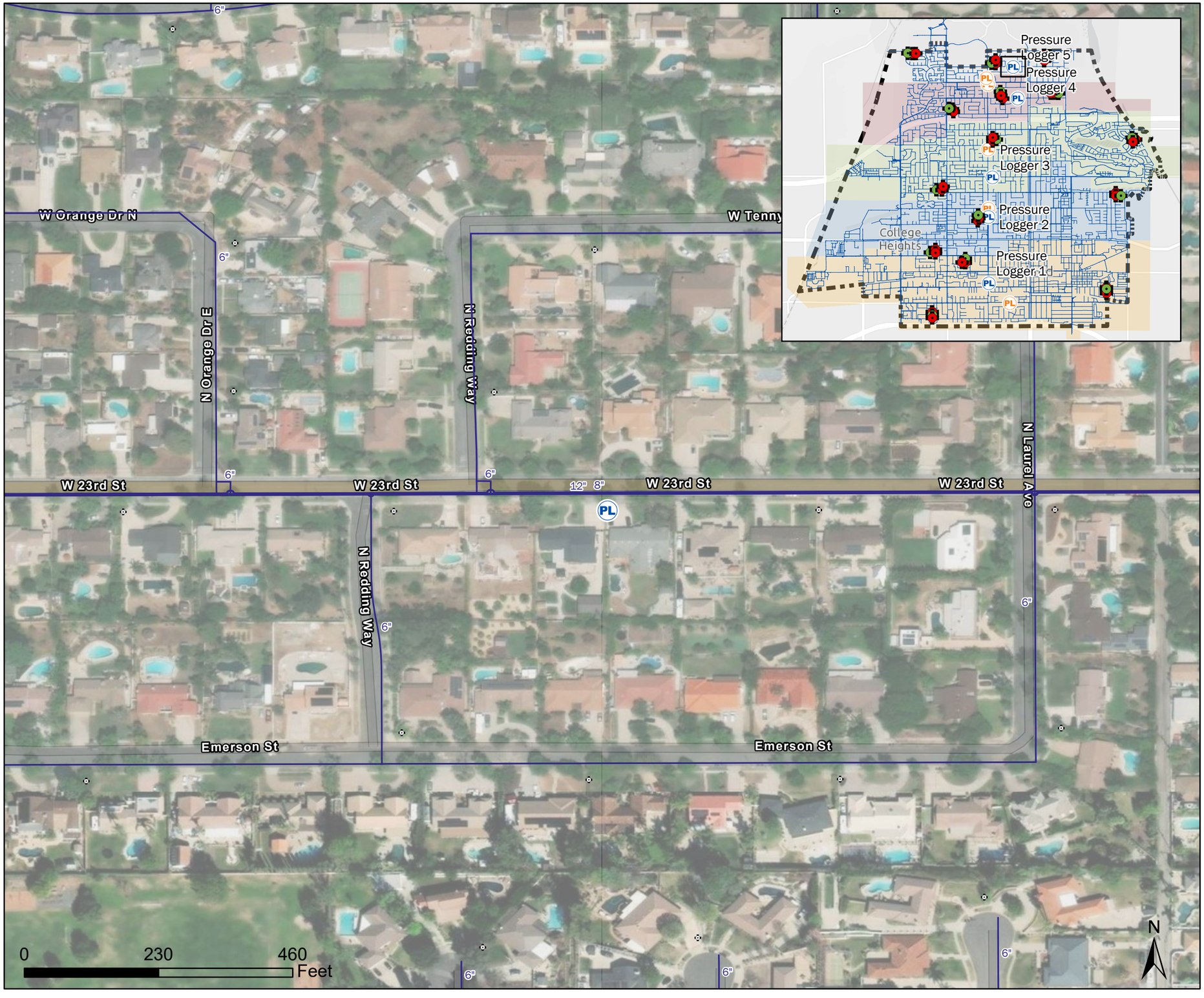


Figure C-5. Pressure Logger 5

City of Upland
Field Calibration Plan

Appendix C Pressure Logger Locations

Hydrant Label Acronyms:

FL	Flow Test
RP	Residual Test
PL	Pressure Logger

- Flow Hydrant
- Residual Hydrant
- Other Hydrants
- Pressure Logger
- Pressure Logger Alternate
- Water Pipeline

Brown AND Caldwell

Attachment B: Calibration Results

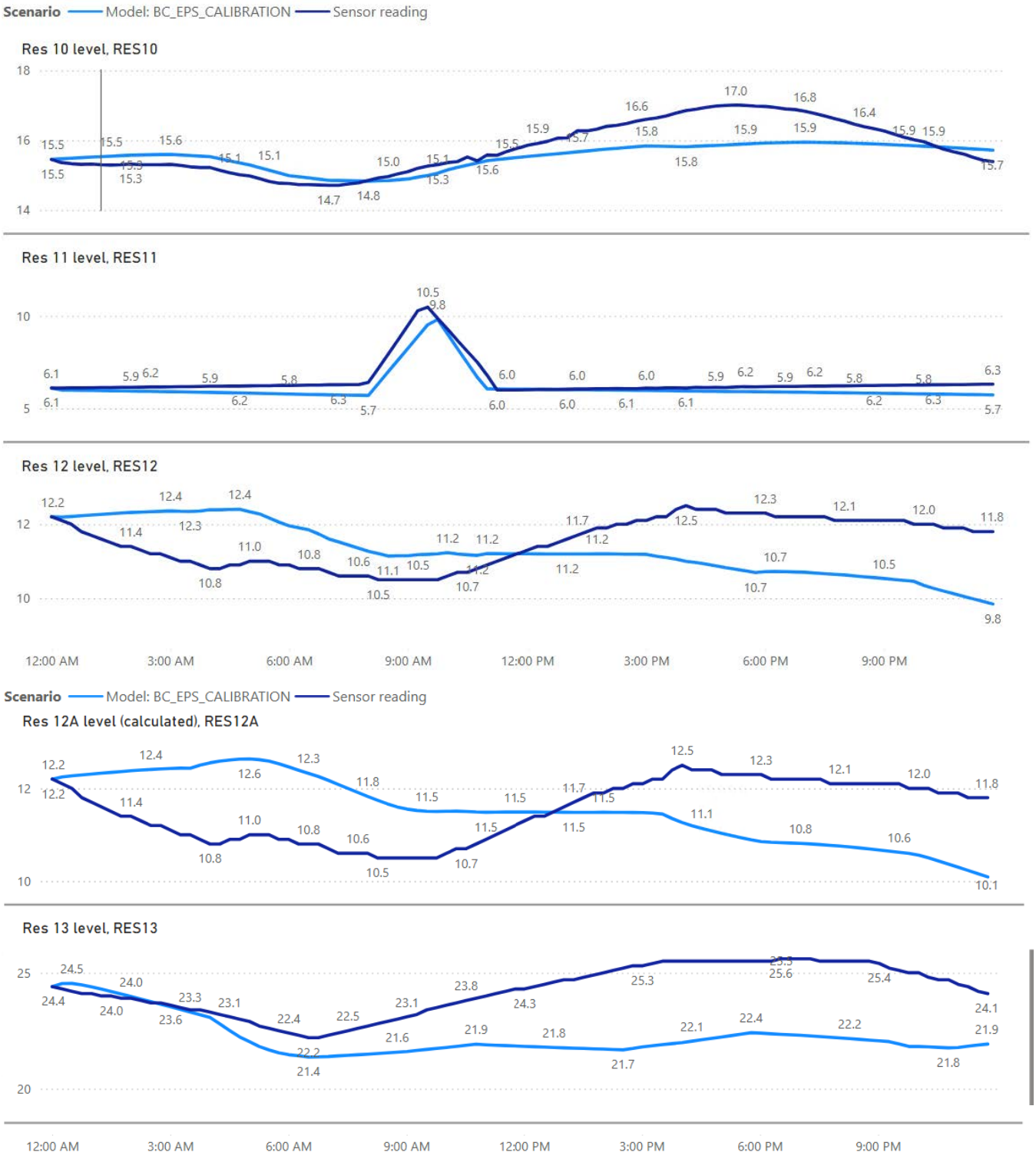
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CityofUpland_TM_WaterModelDevelopment_100125

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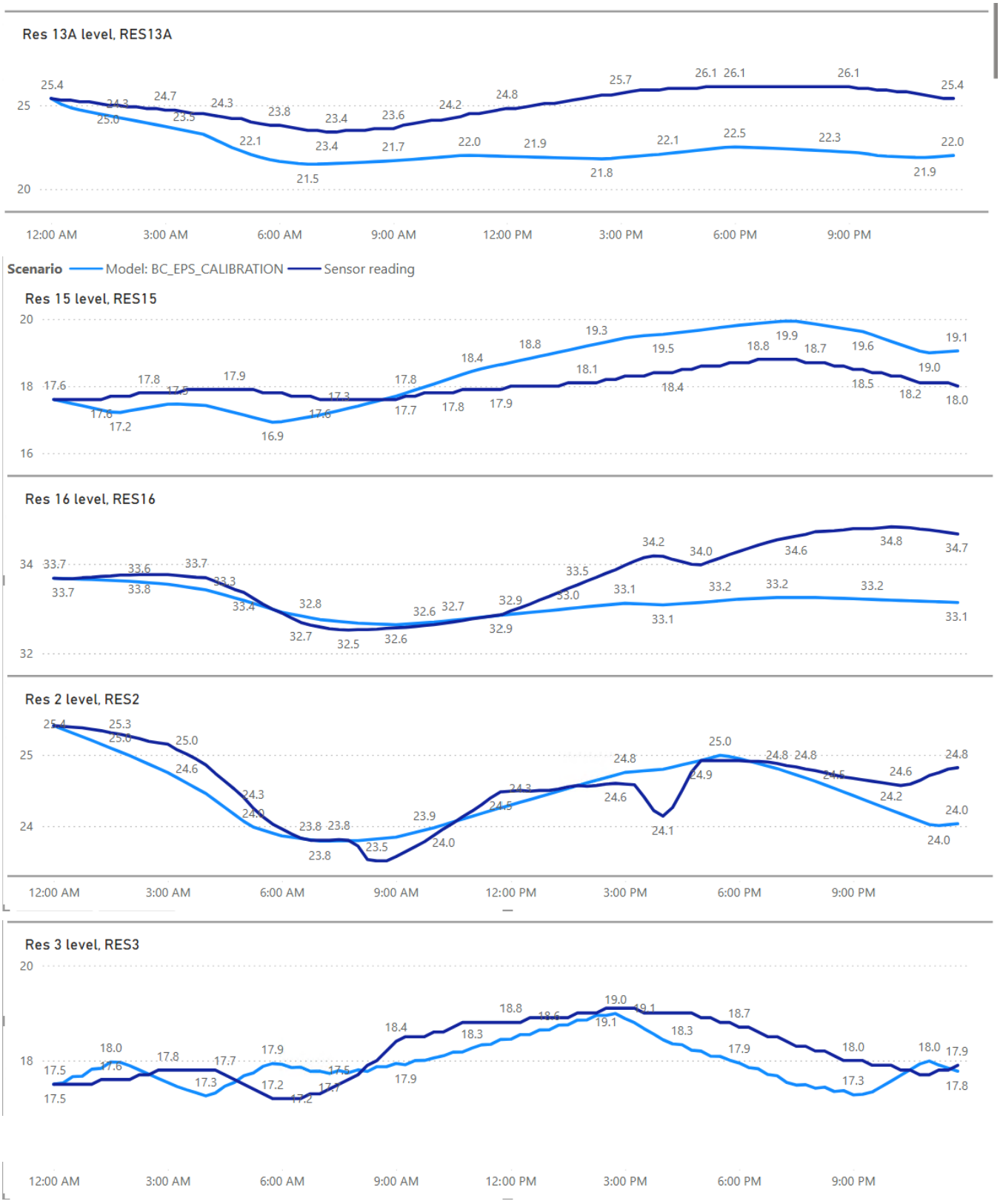
Use of contents on this sheet is subject to the limitations specified at the beginning of this document.
CityofUpland_TM_WaterModelDevelopment_100125

Calibration Results – Extended Period Simulation

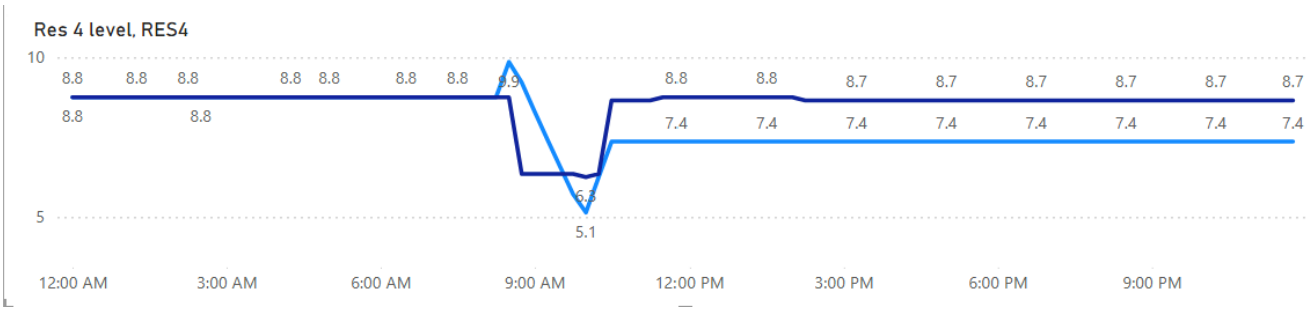
Reservoir Levels



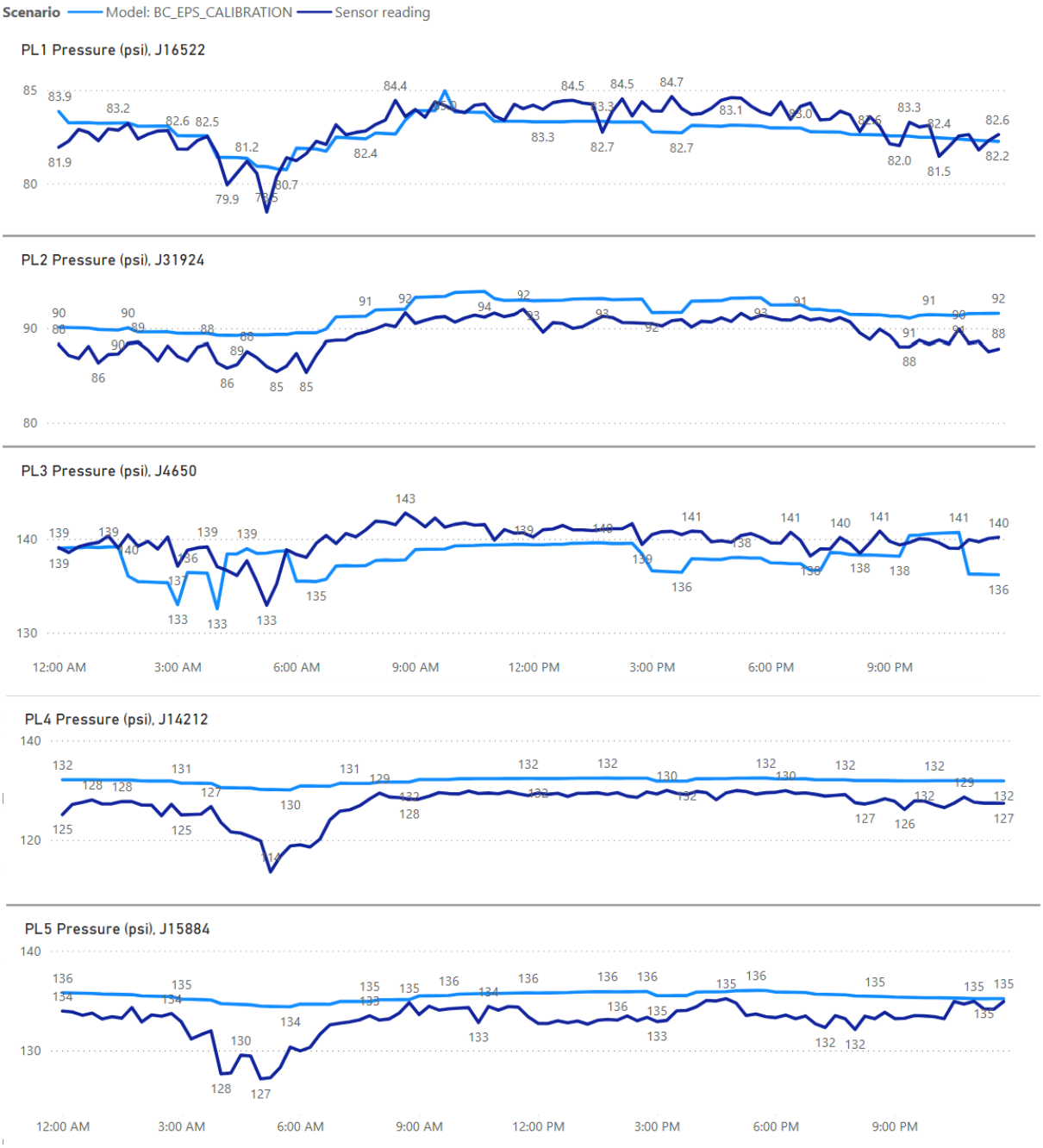
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Pressure Logger



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Attachment C: Model Controls

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Table C-3. Model Controls				
Facility	Facility Type	Wet Year Status	Dry Year Status	Controls
Pressure Zone 5				
San Antonio Canyon WTP	Supply	Active	Active	
Well 1A	Well	Inactive	Active	Open if Reservoir 2 level below 22 ft
Well 2	Well	Inactive	Inactive	
Reservoir 2	Tank	Active	Active	
SAWCO 24th & Campos Connection	Supply	Active	Active	
SAWCO Well 15	Well	Active	Active	
SAWCO Well 16	Well	Inactive	Inactive	
Pressure Zone 4				
Reservoir 16	Tank	Active	Active	
Plant 2 P1	Pump Station	Inactive	Active	Open if Reservoir 2 level below 21 ft
Plant 2 P2	Pump Station	Inactive	Active	Open if Reservoir 2 level below 21 ft
Plant 2 P3	Pump Station	Inactive	Active	Open if Reservoir 2 level below 21 ft
Pressure Zone 3				
Well 5	Well	Inactive	Active	Status dictated by treatment plant and 24th/Campos connection
Reservoir 3	Tank	Active	Active	
Reservoir 7	Tank	Active	Active	
Plant 3 P1	Pump Station	As needed basis	Active	Open if Reservoir 16 level below 32 ft
Plant 3 P2	Pump Station	As needed basis	Active	Open if Reservoir 16 level below 35 ft
Plant 3 P3	Pump Station	As needed basis	Active	Open if Reservoir 16 level below 34 ft
Plant 3 P4	Pump Station	As needed basis	Active	Open if Reservoir 16 level below 33 ft
Plant 3 P5	Pump Station	As needed basis	Active	
CVWD Interconnection	Supply	Active	Active	Emergency purposes only
Upland Foothill Well 3	Well	Active	Active	
San Antonio PRV	PRV	As needed basis	As needed basis	
Colony Booster Station	Booster Station	Inactive	As needed basis	
Plant 4 P1	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 18 ft
Plant 4 P2	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 17 ft
Plant 4 P3	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 18.3 ft
Plant 4 P4	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 17 ft
Plant 7 P1	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 14.5 ft
Plant 7 P2	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 17 ft

Use of contents on this sheet is subject to the limitations specified at the beginning of this document.
CityofUpland_TM_WaterModelDevelopment_100125

Table C-3. Model Controls				
Facility	Facility Type	Wet Year Status	Dry Year Status	Controls
Plant 7 P3	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 17.5 ft
Plant 7 P4	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 15 ft
Plant 7 P5	Pump Station	As needed basis	Active	Open if Reservoir 3 level below 15.5 ft
Pressure Zone 2				
LH4	Well	Inactive	Active	Open if Reservoir 15 level below 16.5 ft
WECWC04 (Well 4)	Well	Active	Active	Open if Reservoir 15 level below 16.5 ft
WECWC03	Well	Active	Active	
Well 17	Well	Inactive	Inactive	
WFA/JPA #1	Supply	Active	Active	
SAWCO 26	Well	Active	Active	
SAWCO 27A	Well	Active	Active	
SAWCO 25A	Well	Inactive	Inactive	
Reservoir 15	Tank	Active	Active	
GSWC Interconnection	Supply	Active	Active	
MVWD Interconnection	Supply	Active	Active	
Well 15	Well	Active	Active	Open if Reservoir 13A level below 28.5 ft
Well 20	Well	Active	Active	Open if Reservoir 13A level below 28 ft
Reservoir 13A	Tank	Active	Active	
Reservoir 13	Tank	Active	Active	
Plant 6 P1	Pump Station	Active	Active	Open if Reservoir 13A level below 25 ft
Plant 6 P2	Pump Station	Active	Active	Open if Reservoir 13A level below 27 ft
Plant 6 P3	Pump Station	Active	Active	Open if Reservoir 13A level below 26 ft
Plant 6 P4	Pump Station	Active	Active	Open if Reservoir 13A level below 24 ft
Pressure Zone 1				
Well 13	Well	Inactive	Inactive	
Well 3	Well	Inactive	Inactive	
Well 8	Well	Active	Active	Open if Reservoir 12 level below 13.5 ft
Well 21A	Well	Inactive	Inactive	
Reservoir 10	Tank	Active	Active	
Reservoir 11	Tank	Active	Active	
Plant 12 P1	Pump Station	As needed basis	Active	Open if Reservoir 11 level above 10 ft
Plant 12 P2	Pump Station	As needed basis	Active	Open if Reservoir 11 level above 13 ft
Plant 12 P3	Pump Station	As needed basis	Active	Open if Reservoir 11 level above 11 ft

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CityofUpland_TM_WaterModelDevelopment_100125

Table C-3. Model Controls				
Facility	Facility Type	Wet Year Status	Dry Year Status	Controls
SAWCO Well 9	Well	Inactive	Inactive	
SAWCO Well 2	Well	Active	Active	Used as blending source at Plant 6
SAWCO Well 22	Well	Inactive	Active	
SAWCO Well 3	Well	Inactive	Active	Open if Reservoir 12A level below 9 ft
SAWCO Well 24	Well	Inactive	Active	Open if Reservoir 12A level below 10.5 ft
SAWCO Well 31	Well	Inactive	Inactive	
Well 7A	Well	Active	Active	Open if Reservoir 12A level below 13 ft
Reservoir 4	Tank	Active	Active	
Reservoir 4 Booster	Pump Station	Active	Active	Open if Reservoir 4 level above 9 ft
Reservoir 12	Tank	Active	Active	
Reservoir 12A	Tank	Active	Active	
Reservoir 14	Tank	Inactive	Inactive	
Plant 5 P1	Pump Station	Inactive	Inactive	
Plant 5 P2	Pump Station	Inactive	Inactive	
Plant 5 P3	Pump Station	Inactive	Inactive	

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CityofUpland_TM_WaterModelDevelopment_100125

Appendix E: Pump Efficiency Tests

Southern California Edison (2023)

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SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

Confidential / Proprietary

October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT2 B1

Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14102

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 12, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 40

Pump: VERTI No: V75-72977
Motor: GE No: B065036

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	57.4	54.0	52.2
Discharge Head, Feet	132.6	124.7	120.6
Suction Head, Feet	7.2	6.5	6.7
Total Head, Feet	125.4	118.3	113.9
Capacity, GPM	809	854	887
Acre Feet Pumped in 24 Hours	3.576	3.775	3.921
kW Input to Motor	30.8	31.4	31.7
HP Input to Motor	41.3	42.1	42.5
Motor Load (%)	93.1	95.0	95.9
Measured Speed of Pump, RPM	1,185		
Customer Meter, GPM			
kWH per Acre Foot	**207**	**200**	**194**
Overall Plant Efficiency (%)	**62.0**	**60.6**	**60.0**

Test #1 with pumps 1,2,3 running. Test #2 with pumps 1,3 running. Test #3 with pump running by itself.

RON FORD
Manager
HYDRAULIC SERVICES

SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

Confidential / Proprietary

October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: PLT2 B1
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14102

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 12, 2022, billing history for the past 12 months, and your current rate of TP2D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 62.0% to 67%.
2) This can save you up to 5,514 kWh and $1,048 annually.
3) These kWh savings translate to a 2.93-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 140.

Annual	Existing	Improved	Savings
Total kWh	**74,520**	**69,006**	**5,514**
kW Input	**30.80**	**28.52**	**2.28**
kWh per Acre-Foot	**207**	**191**	**15**
Acre-Feet per Year	**360.4**		
Average Cost per kWH	**$0.19000**		
Average Cost per Acre-Foot	**$39.28**	**$36.38**	**$2.91**
Overall Plant Efficiency (%)	**62.04**	**67.00**	
Total Annual Cost	**$14,159**	**$13,111**	**$1,048**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

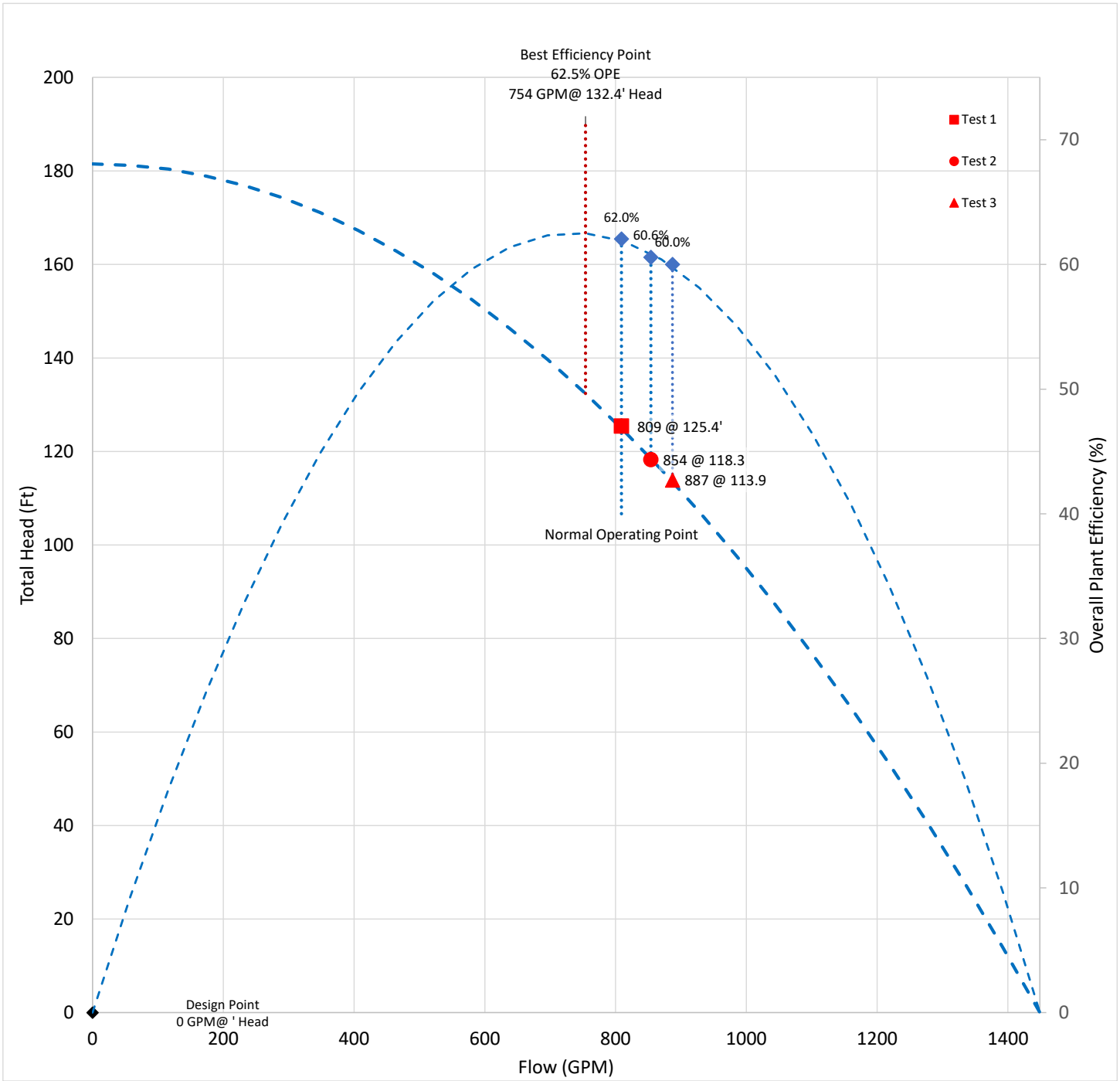
SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT2 B1
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14102



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	754	132.4	62.50%
Normal	809	125.4	62.04%
Second	854	118.3	60.57%
Third	887	113.9	60.01%

300 NORTH PEPPER AVE
RIALTO, CA 92376

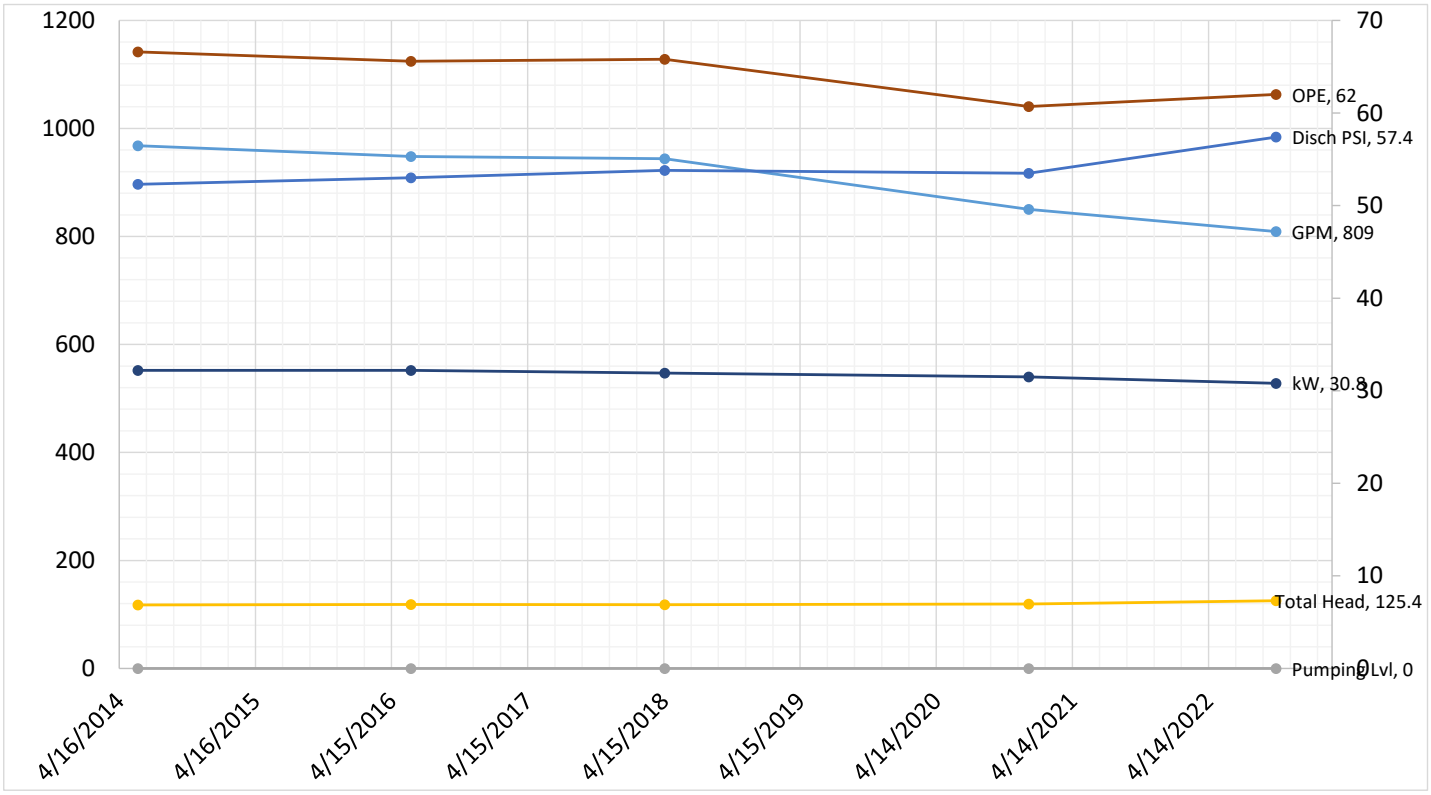
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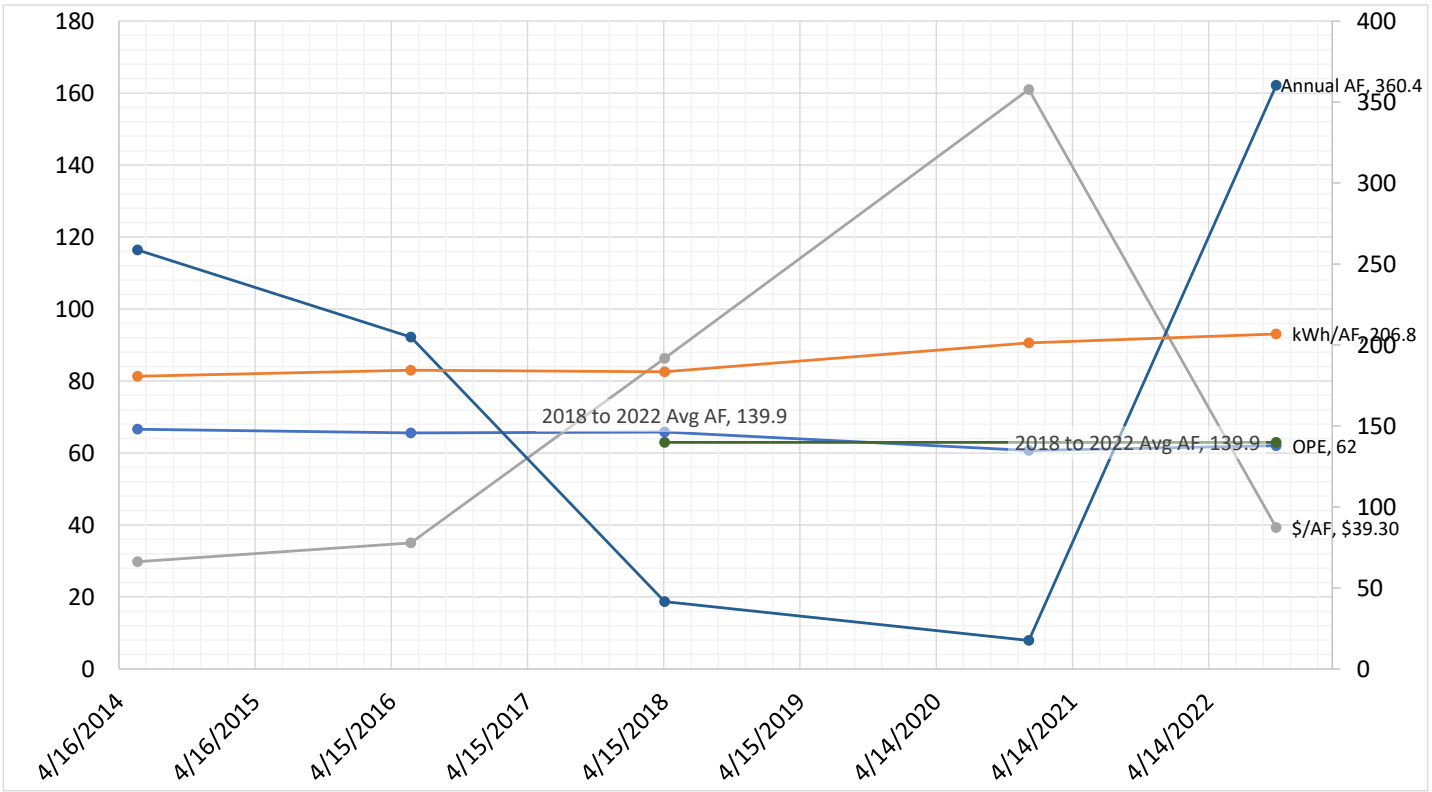
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT2 B1
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14102





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HYDRAULIC TEST RESULTS: PLT2 B2

Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14103

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 12, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 40

Pump: AUROR No: V7572976
Motor: GE No: CLFT070U011

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	51.9	54.0	57.3
Discharge Head, Feet	119.9	124.7	132.4
Suction Head, Feet	7.6	7.6	7.4
Total Head, Feet	112.3	117.1	125.0
Capacity, GPM	970	920	871
Acre Feet Pumped in 24 Hours	4.287	4.066	3.850
kW Input to Motor	30.7	30.6	30.1
HP Input to Motor	41.2	41.0	40.4
Motor Load (%)	96.8	96.5	95.0
Measured Speed of Pump, RPM	1,189		
Customer Meter, GPM			
kWH per Acre Foot	**172**	**181**	**188**
Overall Plant Efficiency (%)	**66.8**	**66.3**	**68.1**

Test #1 with pump running by itself. Test #2 with pumps 2,3 running. Test #3 with pumps 2,3,1 running.

RON FORD
Manager
HYDRAULIC SERVICES

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PUMPING COST ANALYSIS: PLT2 B2
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14103

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 12, 2022, billing history for the past 12 months, and your current rate of TP2D49.

1) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 155.

Annual	
Total kWh	**61,920**
kW Input	**30.70**
kWh per Acre-Foot	**172**
Acre-Feet per Year	**360.2**
Average Cost per kWH	**$0.19000**
Average Cost per Acre-Foot	**$32.66**
Overall Plant Efficiency (%)	**66.80**
Total Annual Cost	**$11,765**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

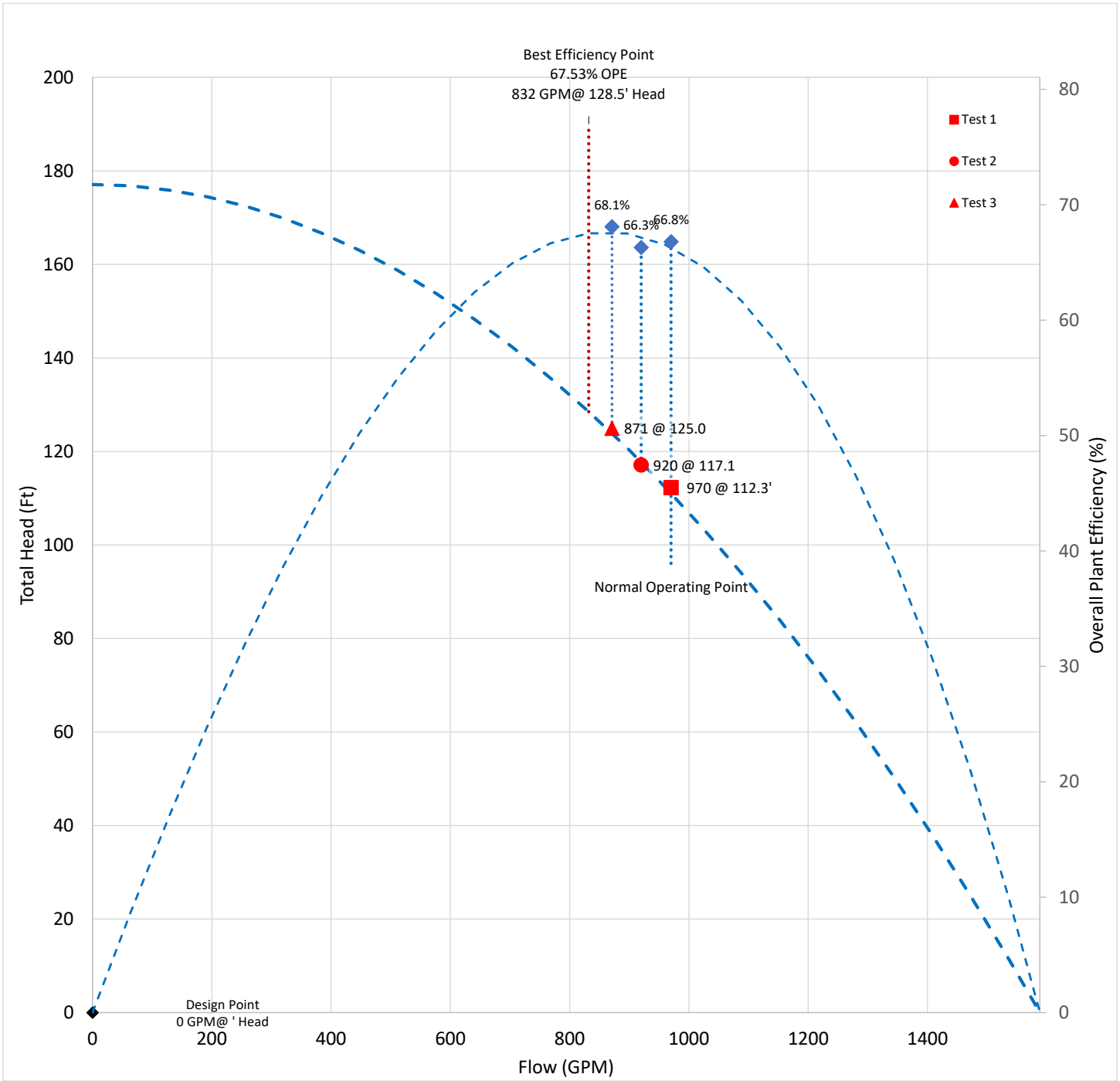
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Pump Name: PLT2 B2
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14103



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	832	128.5	67.53%
Normal	970	112.3	66.80%
Second	920	117.1	66.31%
Third	871	125.0	68.10%

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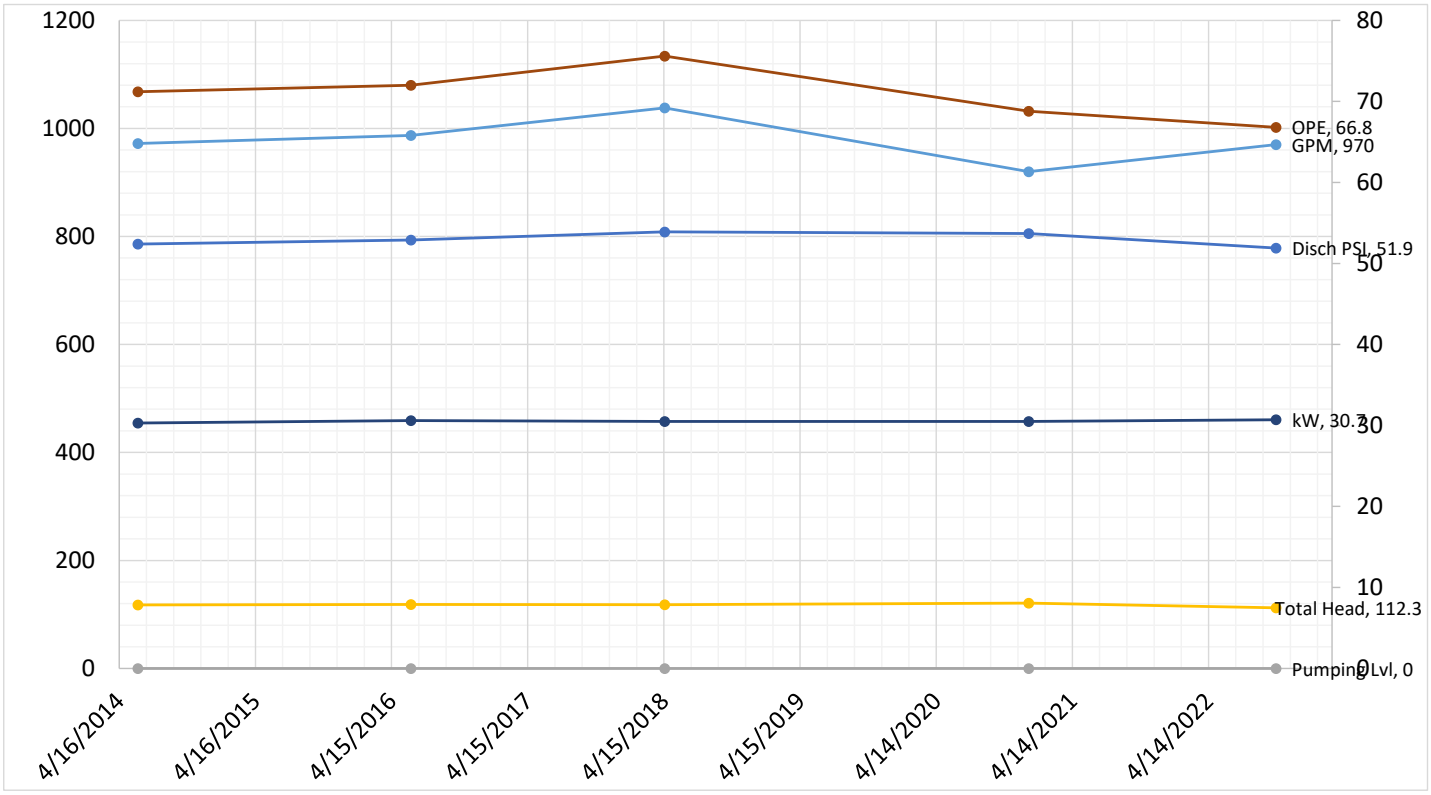
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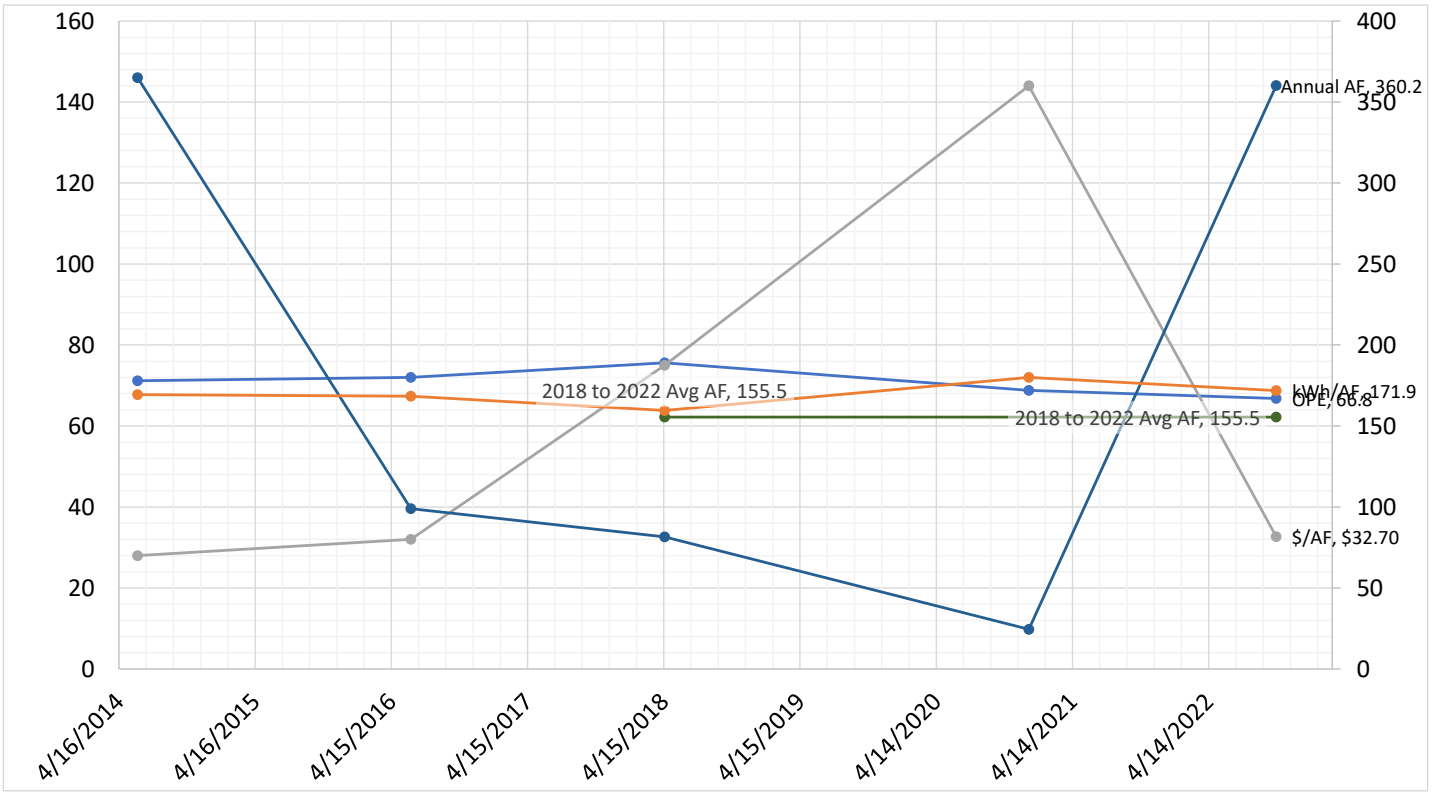
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UPLAND, CITY OF
460 N EUCLID AVE
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Pump Name: PLT2 B2
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14103





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT2 B3
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14104

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 12, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 50
Pump: VERTI No: V8572541
Motor: GE No: 5K326FP6005

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	51.0	53.2	56.5
Discharge Head, Feet	117.8	122.9	130.5
Suction Head, Feet	7.4	7.4	7.4
Total Head, Feet	110.4	115.5	123.1
Capacity, GPM	742	711	667
Acre Feet Pumped in 24 Hours	3.280	3.143	2.948
kW Input to Motor	27.0	27.0	27.2
HP Input to Motor	36.2	36.2	36.5
Motor Load (%)	66.1	66.1	66.6
Measured Speed of Pump, RPM	1,785		
Customer Meter, GPM			
kWH per Acre Foot	**198**	**206**	**221**
Overall Plant Efficiency (%)	**57.1**	**57.3**	**56.9**

This pump is operating inefficiently. The inefficiency is most likely caused by pump wear, the failure of the pump design to meet existing conditions, or a combination of both. Test #1 with pump running by itself. Test #2 with pumps 3,1 running. Test #3 with pumps 3,1,2 running.

RON FORD
Manager
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PUMPING COST ANALYSIS: PLT2 B3
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14104

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 12, 2022, billing history for the past 12 months, and your current rate of TP2D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 57.1% to 67%.
2) This can save you up to 9,280 kWh and $1,763 annually.
3) These kWh savings translate to a 4.94-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 124.

Annual	**Existing**	**Improved**	**Savings**
Total kWh	**63,072**	**53,792**	**9,280**
kW Input	**27.00**	**23.03**	**3.97**
kWh per Acre-Foot	**198**	**169**	**29**
Acre-Feet per Year	**319.2**		
Average Cost per kWH	**$0.19000**		
Average Cost per Acre-Foot	**$37.55**	**$32.02**	**$5.52**
Overall Plant Efficiency (%)	**57.14**	**67.00**	
Total Annual Cost	**$11,984**	**$10,220**	**$1,763**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

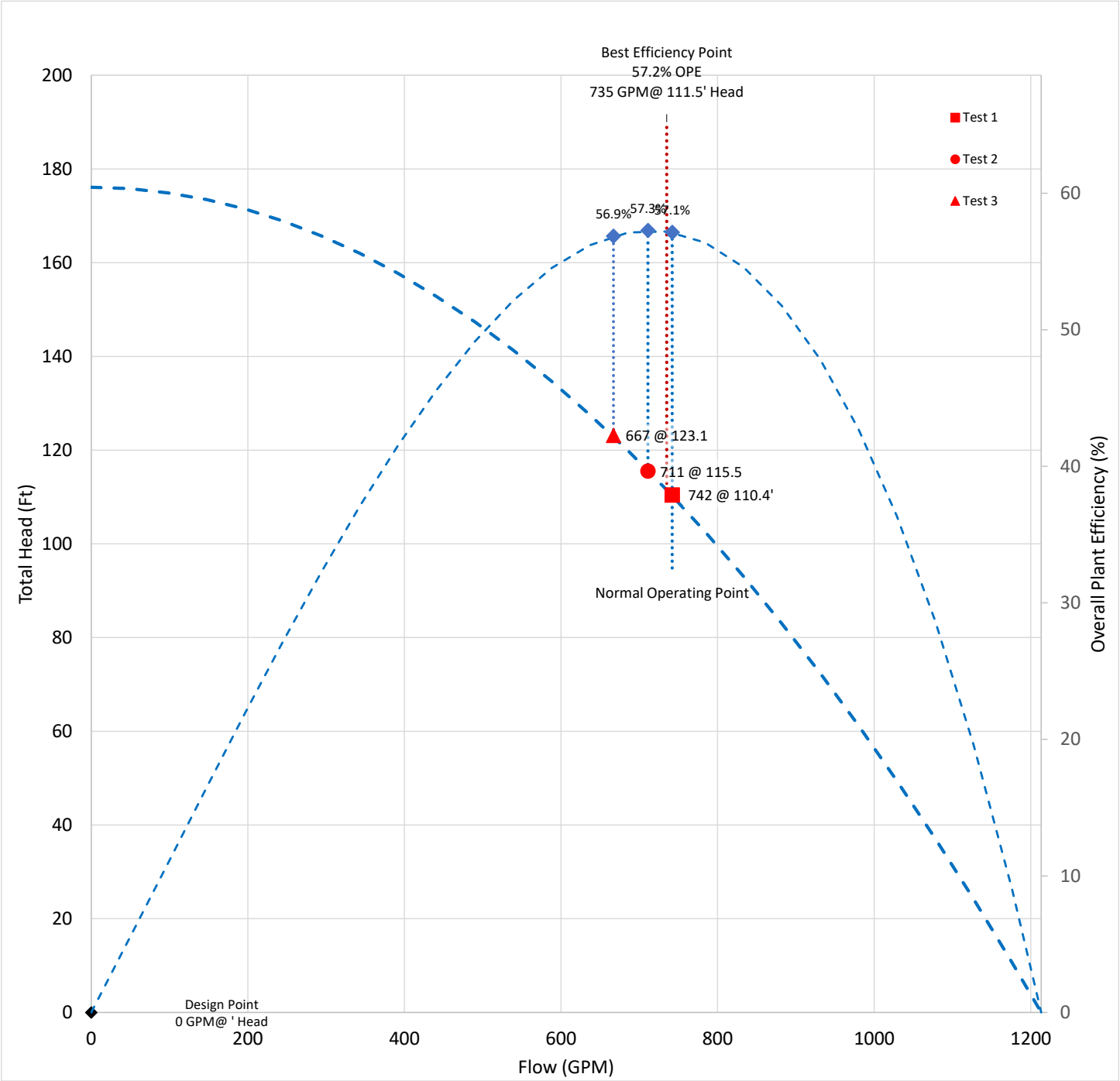
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Pump Name: PLT2 B3
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14104



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	735	111.5	57.20%
Normal	742	110.4	57.14%
Second	711	115.5	57.27%
Third	667	123.1	56.86%

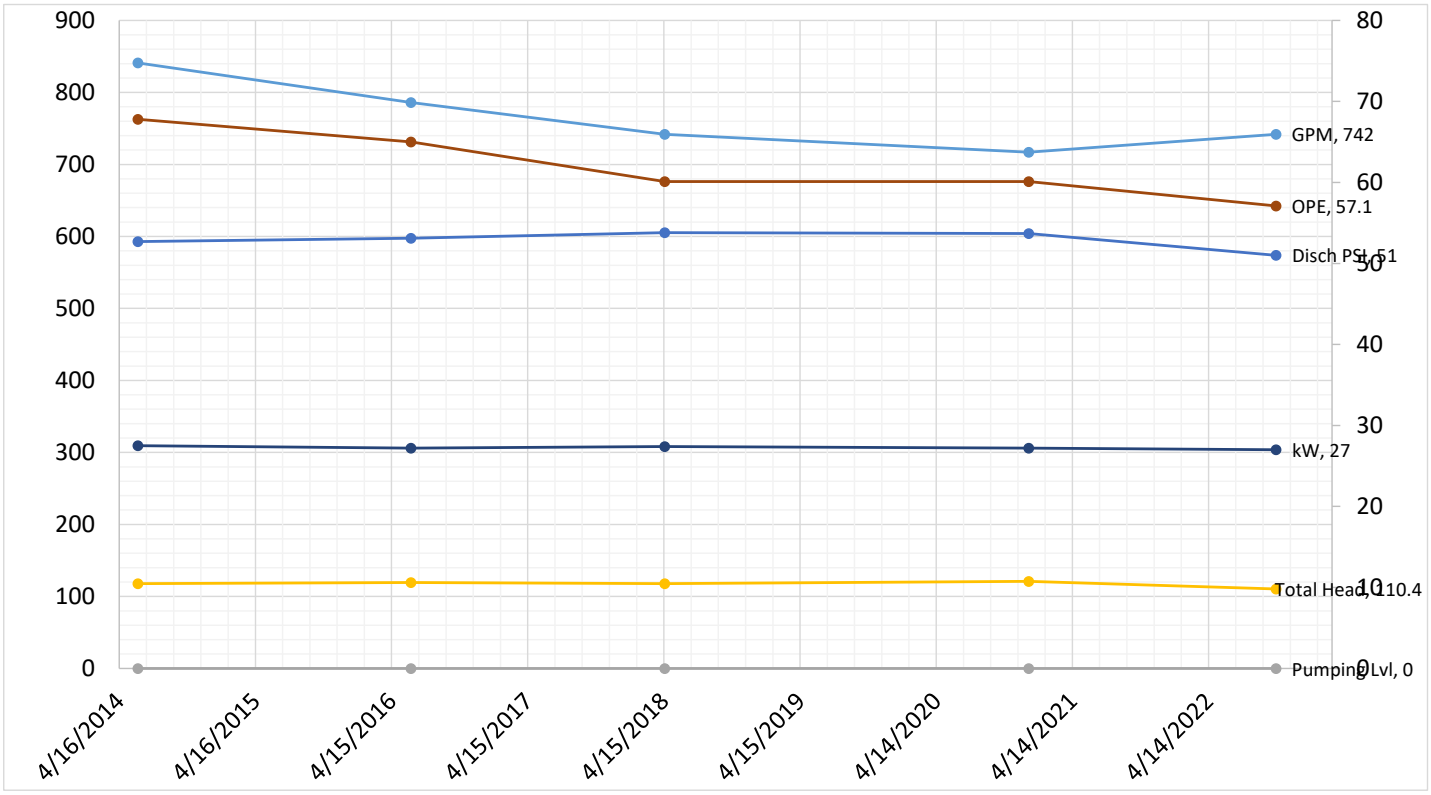
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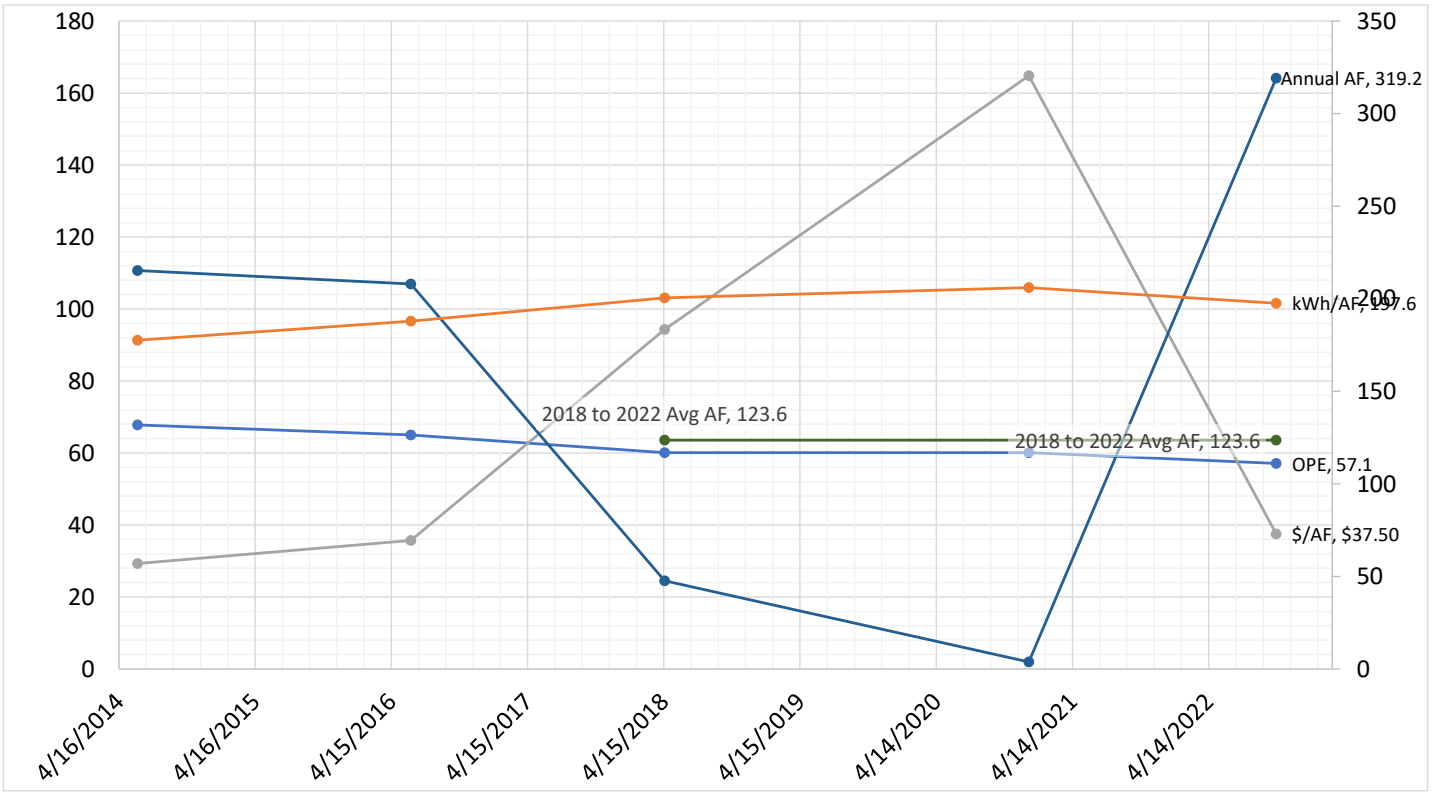
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Pump Name: PLT2 B3
Location: 1285 W 24TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8003516482
Meter: 259000-004043 Pump Ref. #: 14104





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 3 B1
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14089

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 20, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 125
Pump: JOHNS No: JU-6178
Motor: US No: 1326250

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	82.6	92.7	102.9
Discharge Head, Feet	190.8	214.1	237.7
Suction Head, Feet	1.4	1.4	1.4
Total Head, Feet	192.2	215.5	239.1
Capacity, GPM	873	715	582
Acre Feet Pumped in 24 Hours	3.859	3.160	2.572
kW Input to Motor	65.8	63.7	60.4
HP Input to Motor	88.2	85.4	81.0
Motor Load (%)	65.2	63.1	59.8
Measured Speed of Pump, RPM	1,784		
Customer Meter, GPM			
kWH per Acre Foot	**409**	**484**	**564**
Overall Plant Efficiency (%)	**48.0**	**45.6**	**43.4**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. This pump is operating inefficiently. The inefficiency is most likely caused by pump wear, the failure of the pump design to meet existing conditions, or a combination of both.

RON FORD
Manager
HYDRAULIC SERVICES

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October 28, 2022

JOHN ROBLES
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460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: PLT 3 B1
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14089

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 20, 2022, billing history for the past 12 months, and your current rate of TP3D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 48.0% to 70%.
2) This can save you up to 27,087 kWh and $4,876 annually.
3) These kWh savings translate to a 14.41-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 210.

Annual	Existing	Improved	Savings
Total kWh	**86,268**	**59,181**	**27,087**
kW Input	**65.80**	**45.14**	**20.66**
kWh per Acre-Foot	**409**	**281**	**129**
Acre-Feet per Year	**210.8**		
Average Cost per kWH	**$0.18000**		
Average Cost per Acre-Foot	**$73.68**	**$50.55**	**$23.13**
Overall Plant Efficiency (%)	**48.02**	**70.00**	
Total Annual Cost	**$15,528**	**$10,653**	**$4,876**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

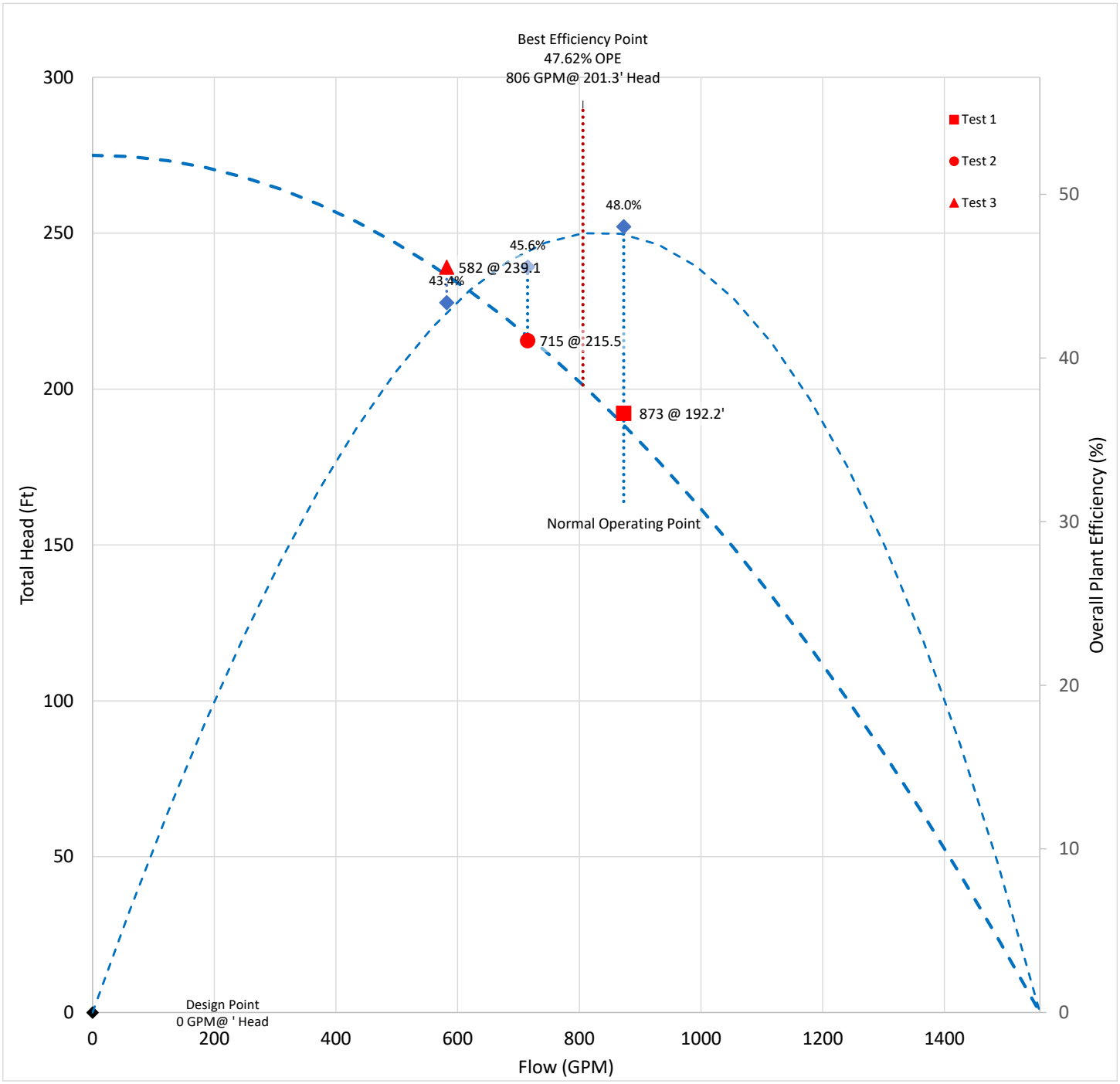
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UPLAND, CA 91786-4732

Pump Name: PLT 3 B1
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14089



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	806	201.3	47.62%
Normal	873	192.2	48.02%
Second	715	215.5	45.56%
Third	582	239.1	43.39%

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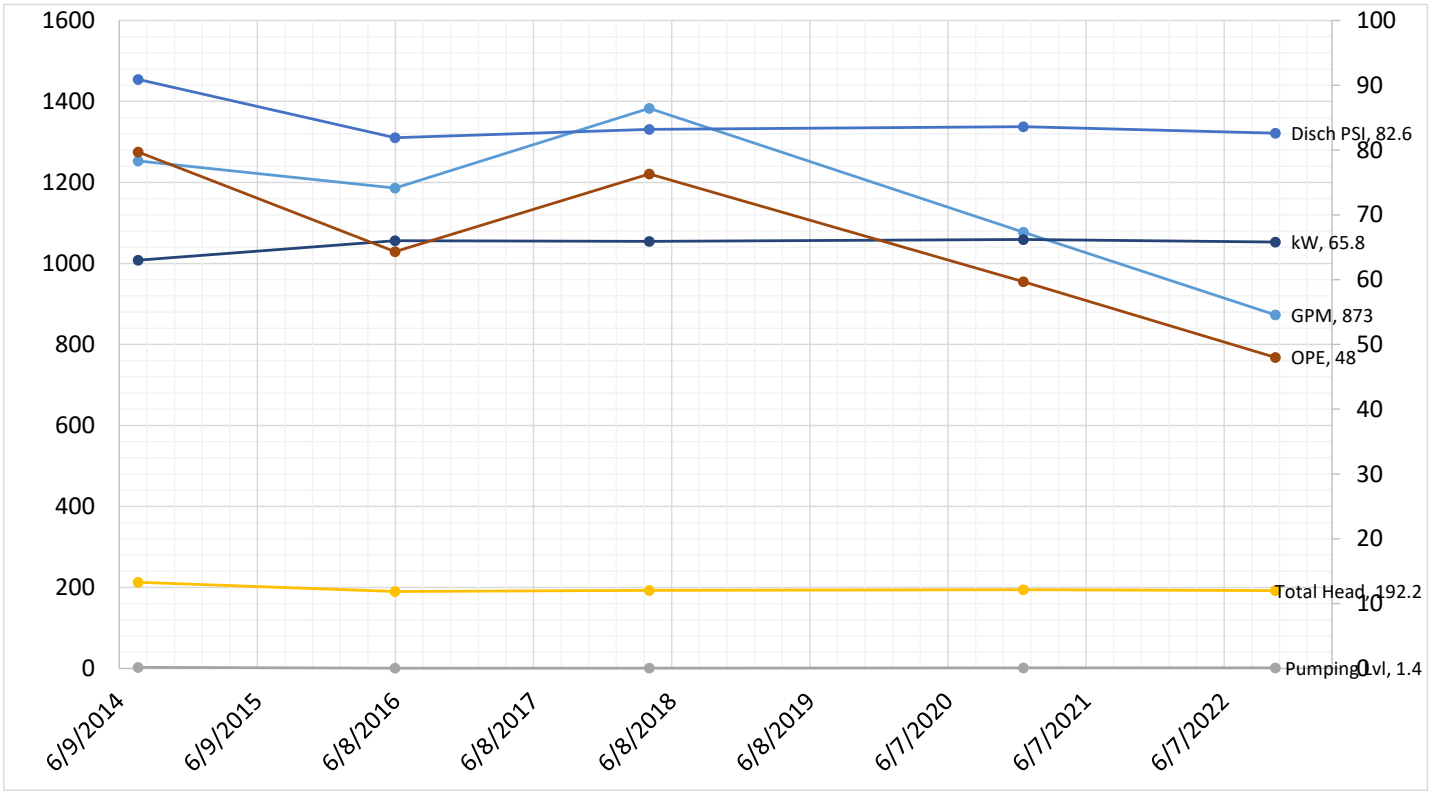
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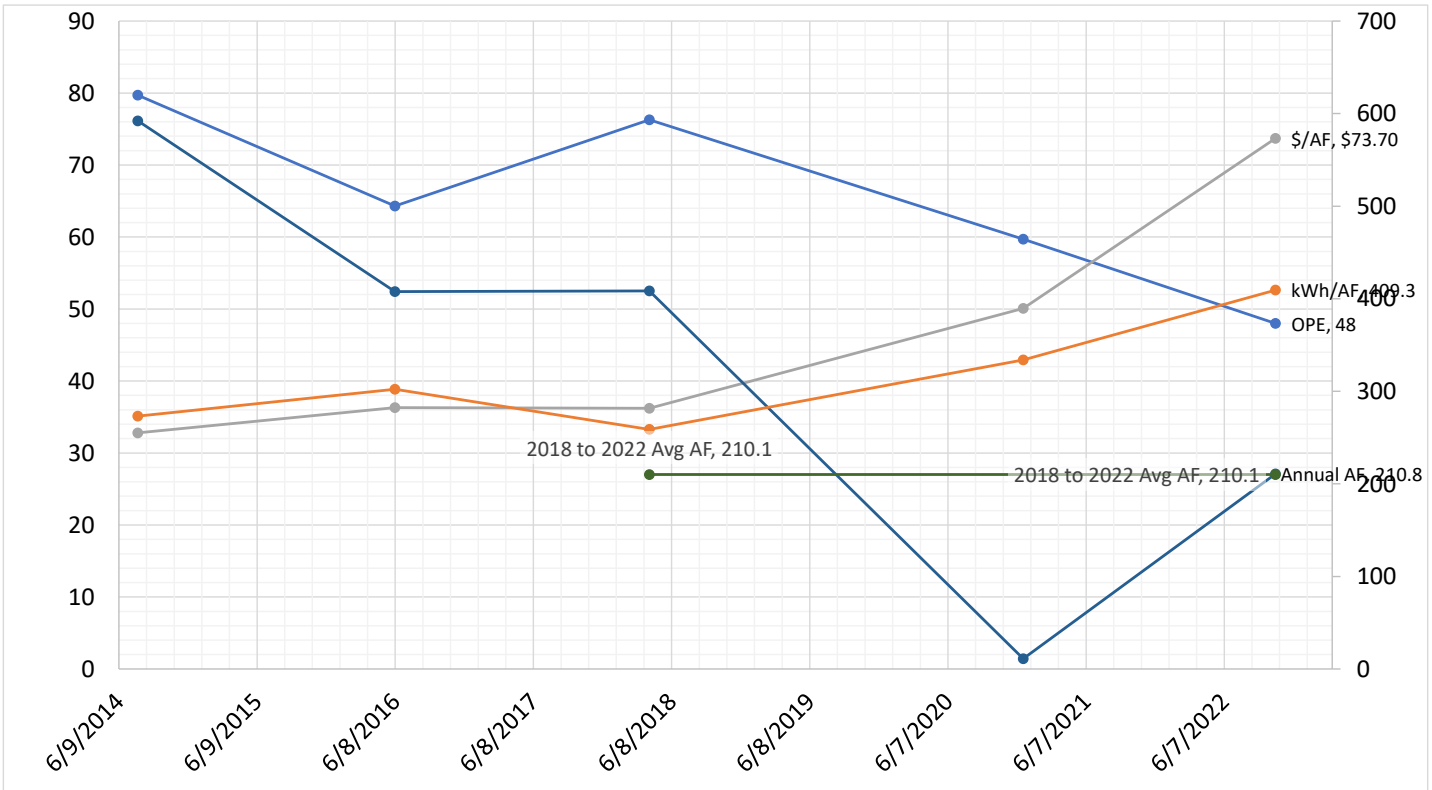
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Pump Name: PLT 3 B1
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14089





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HYDRAULIC TEST RESULTS: PLT 3 B2
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14090

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 20, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump: JOHNS No: JU-6177
Motor: US No: 1326246

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	81.4	92.4	102.2
Discharge Head, Feet	188.0	213.4	236.1
Suction Head, Feet	1.4	1.4	1.5
Total Head, Feet	189.4	214.8	237.6
Capacity, GPM	927	842	676
Acre Feet Pumped in 24 Hours	4.097	3.722	2.988
kW Input to Motor	66.7	66.3	62.9
HP Input to Motor	89.4	88.9	84.3
Motor Load (%)	66.0	65.6	62.3
Measured Speed of Pump, RPM	1,787		
Customer Meter, GPM			
kWH per Acre Foot	**391**	**428**	**505**
Overall Plant Efficiency (%)	**49.6**	**51.4**	**48.1**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. This pump is operating inefficiently. The inefficiency is most likely caused by pump wear, the failure of the pump design to meet existing conditions, or a combination of both.

RON FORD
Manager
HYDRAULIC SERVICES

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PUMPING COST ANALYSIS: PLT 3 B2
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14090

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 20, 2022, billing history for the past 12 months, and your current rate of TP3D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 49.6% to 70%.
2) This can save you up to 27,338 kWh and $4,921 annually.
3) These kWh savings translate to a 14.54-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 158.

Annual	Existing	Improved	Savings
Total kWh	**93,708**	**66,370**	**27,338**
kW Input	**66.70**	**47.24**	**19.46**
kWh per Acre-Foot	**391**	**277**	**114**
Acre-Feet per Year	**239.8**		
Average Cost per kWH	**$0.18000**		
Average Cost per Acre-Foot	**$70.34**	**$49.82**	**$20.52**
Overall Plant Efficiency (%)	**49.58**	**70.00**	
Total Annual Cost	**$16,867**	**$11,946**	**$4,921**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

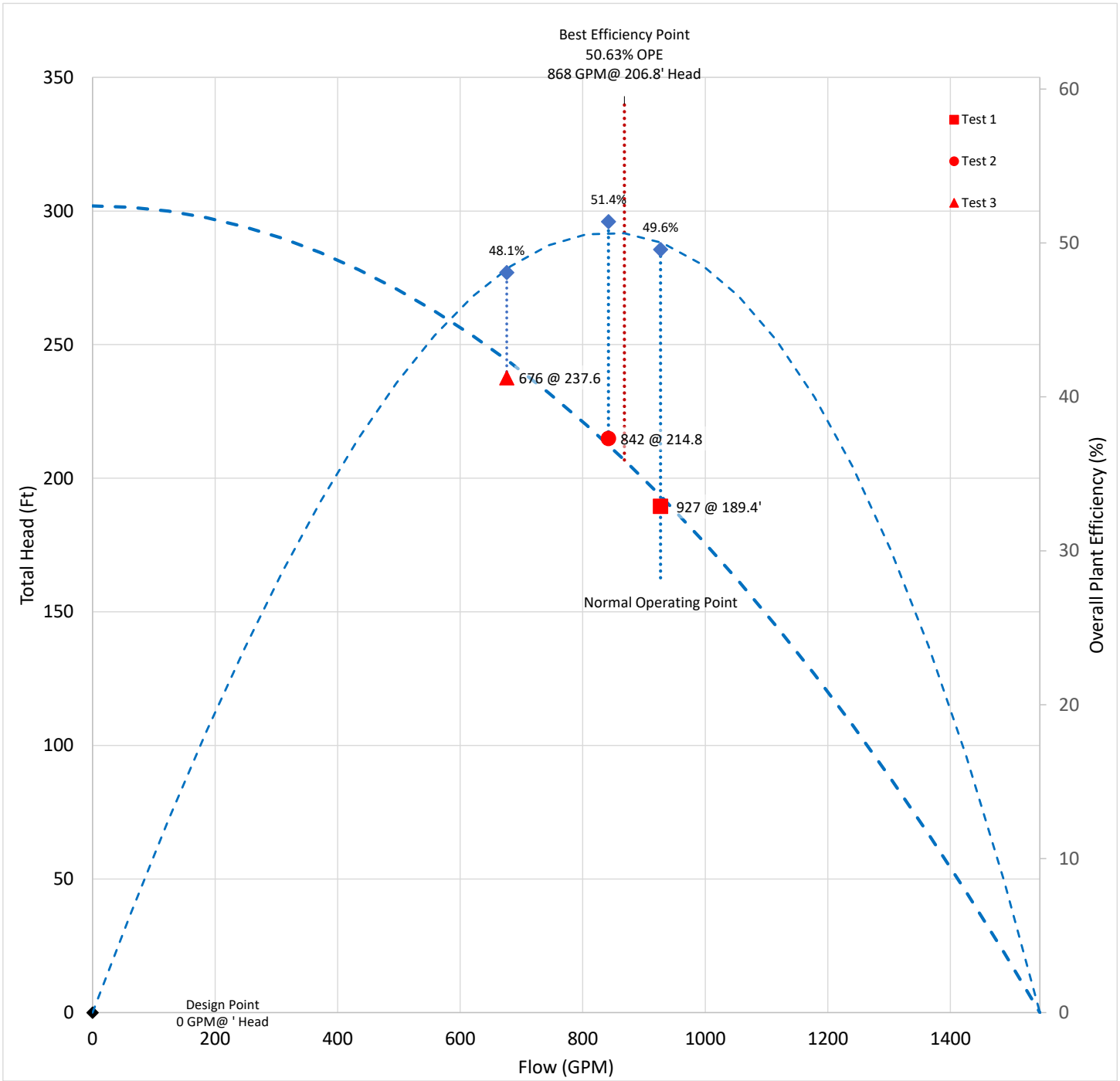
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UPLAND, CA 91786-4732

Pump Name: PLT 3 B2
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14090



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	868	206.8	50.63%
Normal	927	189.4	49.58%
Second	842	214.8	51.38%
Third	676	237.6	48.08%

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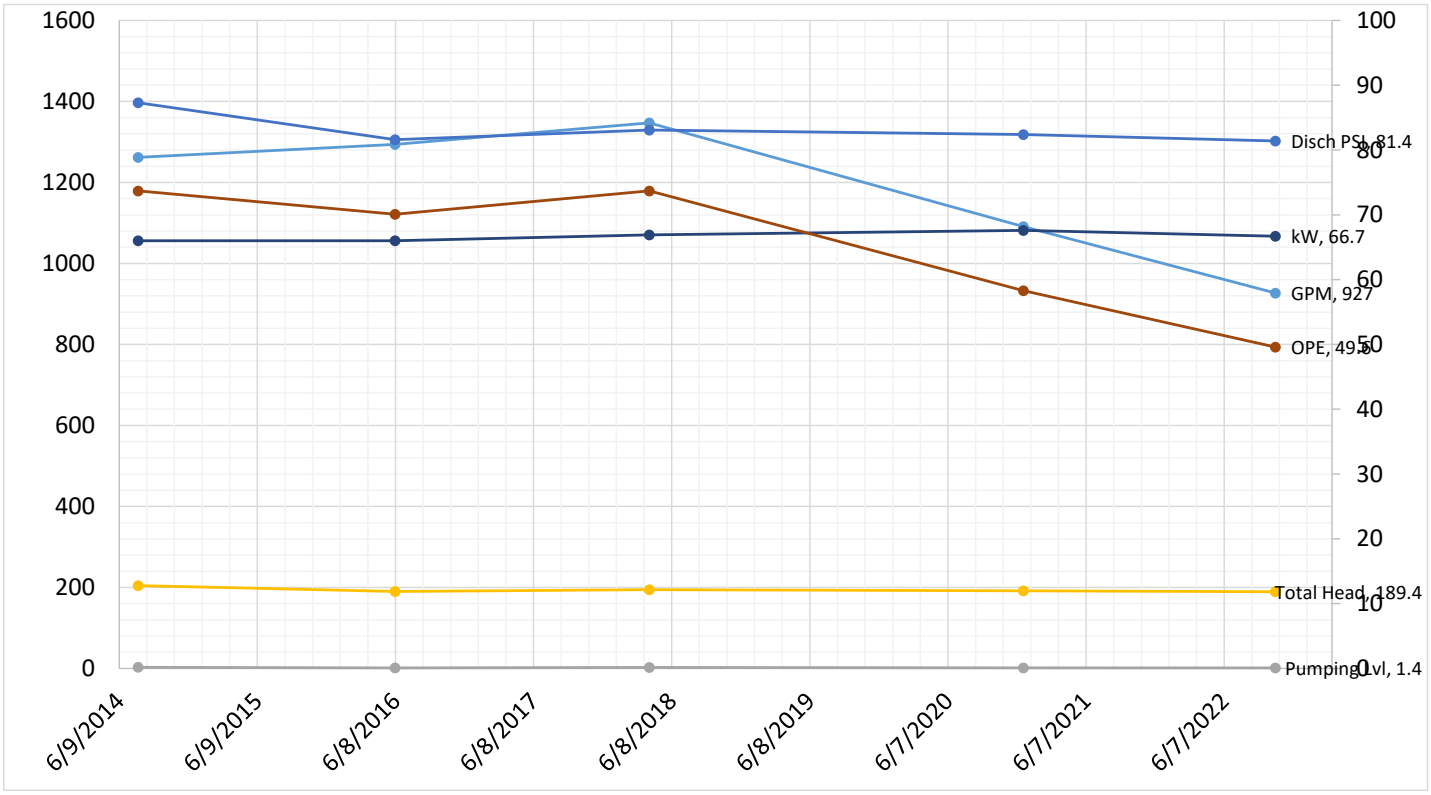
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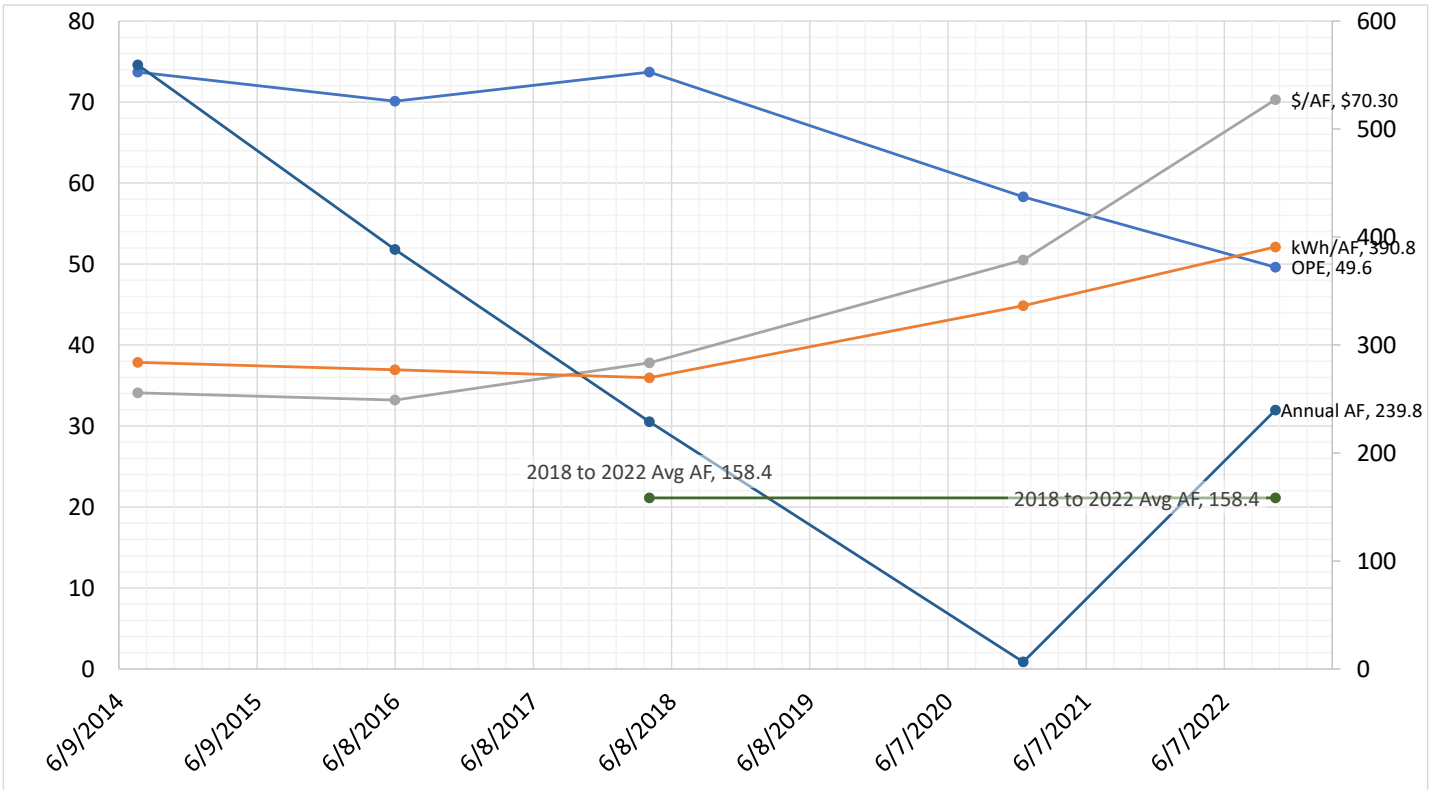
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460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 3 B2
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14090





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460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 3 B4

Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14711

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 20, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump: No:
Motor: GE No: B353037

Results	Test 1	Test 2
Discharge Pressure, PSI	83.3	86.4
Discharge Head, Feet	192.4	199.6
Suction Head, Feet	1.5	1.5
Total Head, Feet	193.9	201.1
Capacity, GPM	1,782	1,744
Acre Feet Pumped in 24 Hours	7.876	7.708
kW Input to Motor	99.1	99.0
HP Input to Motor	132.9	132.8
Motor Load (%)	100.5	100.4
Measured Speed of Pump, RPM	1,790	
Customer Meter, GPM		
kWH per Acre Foot	**302**	**308**
Overall Plant Efficiency (%)	**65.7**	**66.7**

Test #1 with pump running by itself. Test #2 with pumps 4,2 running.

RON FORD
Manager
HYDRAULIC SERVICES

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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: PLT 3 B4
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14711

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 20, 2022, billing history for the past 12 months, and your current rate of TP3D49.

1) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 157.

Annual	
Total kWh	**110,400**
kW Input	**99.10**
kWh per Acre-Foot	**302**
Acre-Feet per Year	**365.5**
Average Cost per kWH	**$0.18000**
Average Cost per Acre-Foot	**$54.36**
Overall Plant Efficiency (%)	**65.67**
Total Annual Cost	**$19,872**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

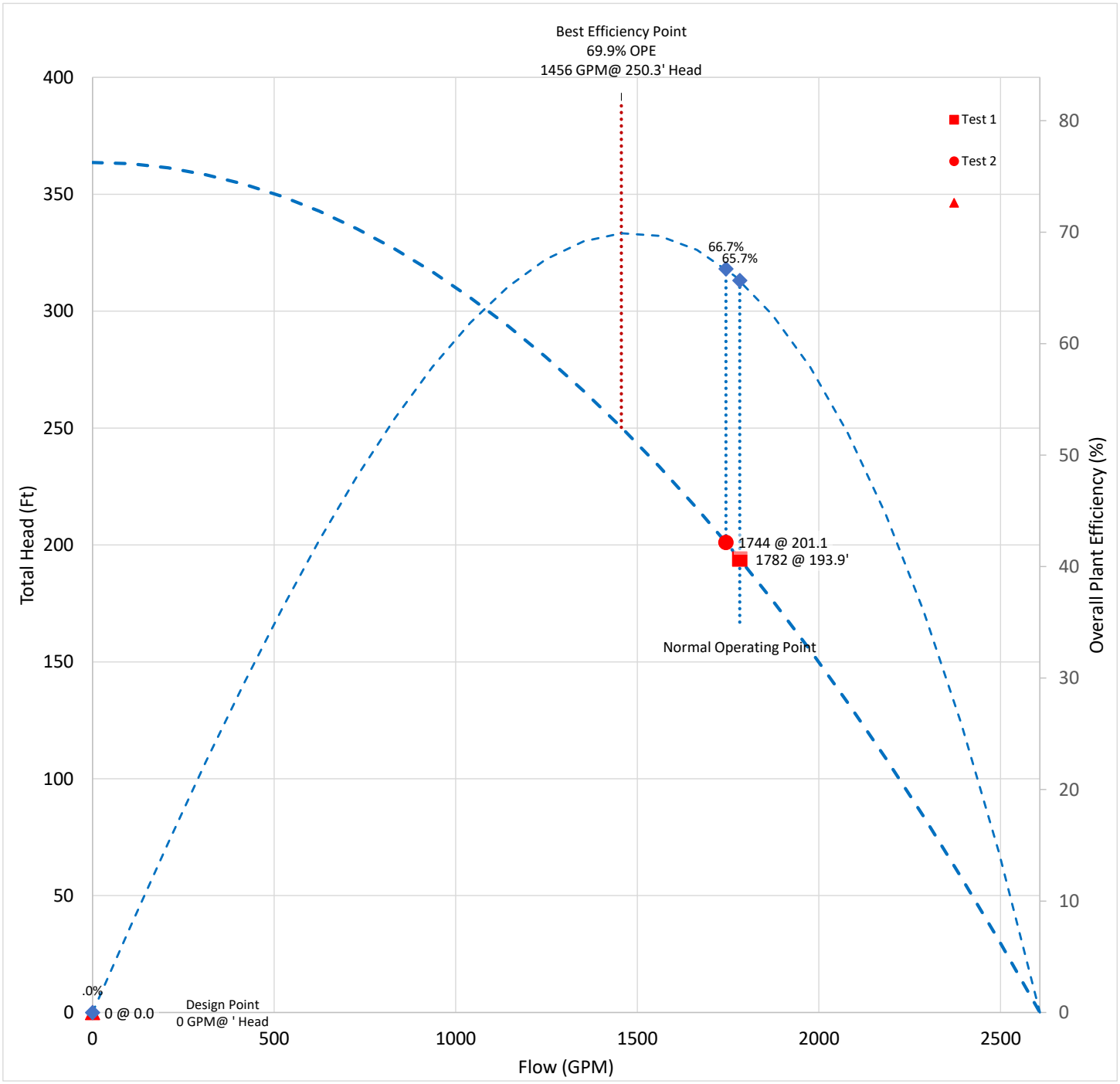
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UPLAND, CITY OF
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UPLAND, CA 91786-4732

Pump Name: PLT 3 B4
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14711



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	1456	250.3	69.90%
Normal	1782	193.9	65.67%
Second	1744	201.1	66.71%
Third	0	0.0	0.00%

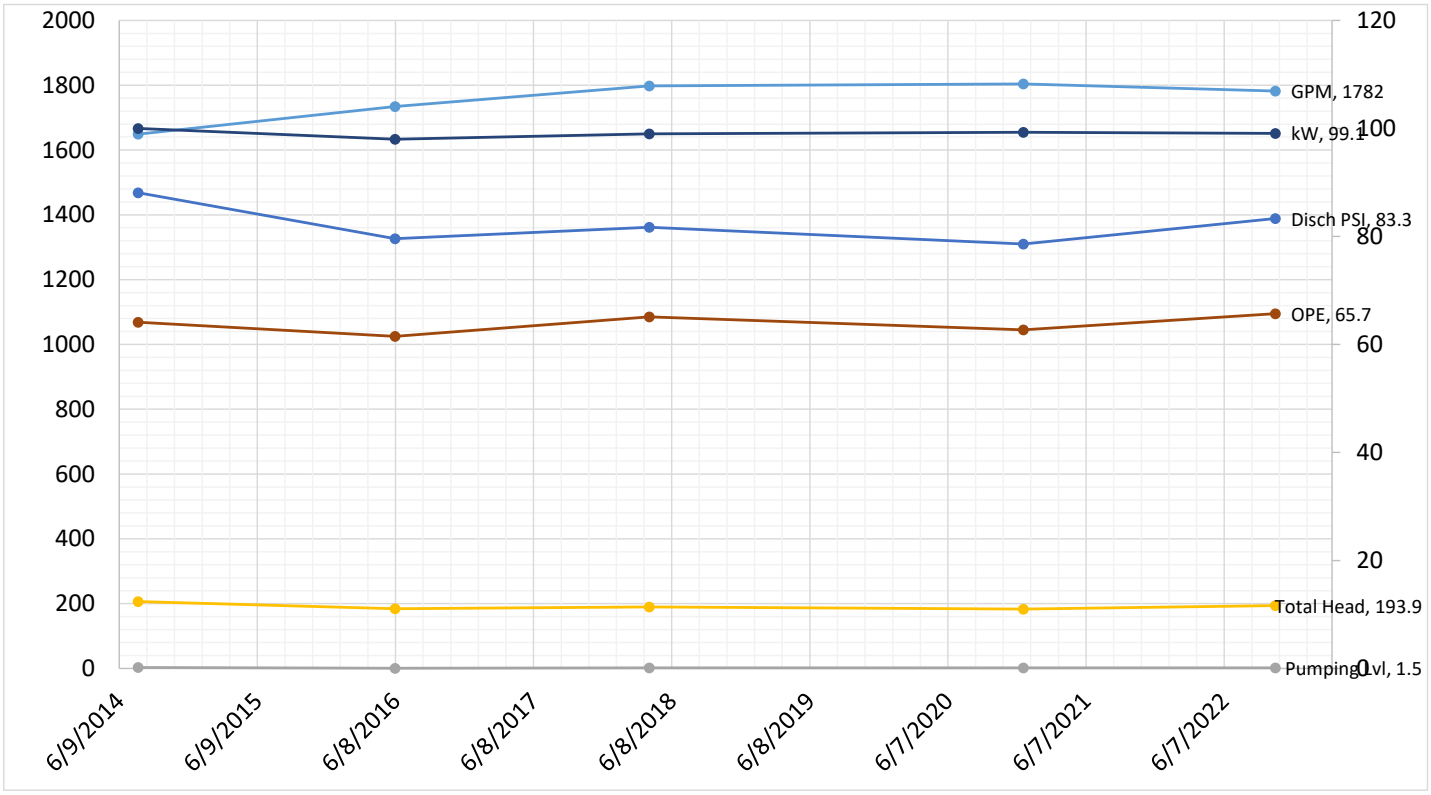
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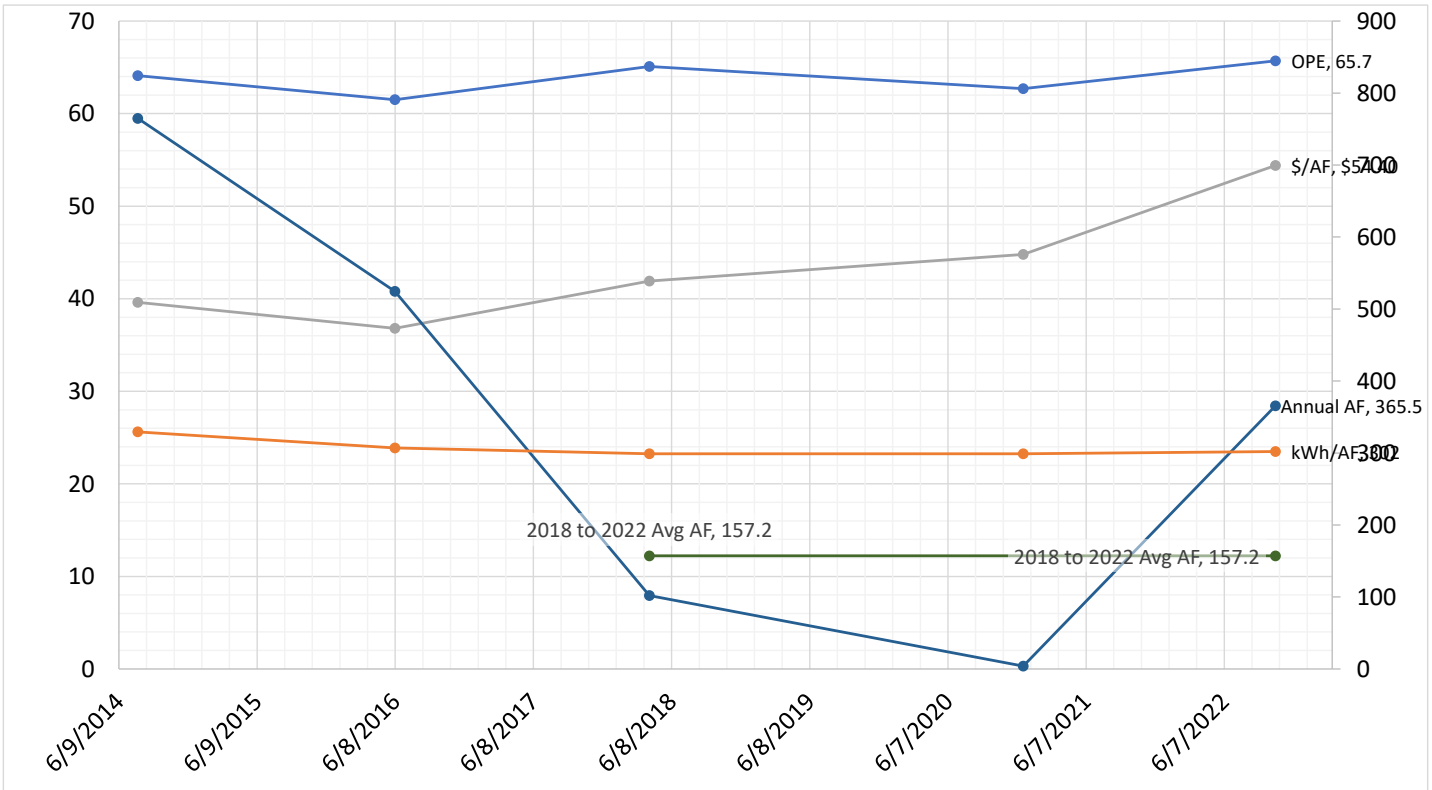
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JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 3 B4
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14711





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JOHN ROBLES
UPLAND, CITY OF
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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 3 B5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14712

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on October 20, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 100
Pump: INGER No: 9512N58416
Motor: GE No: GMJ721103

Results	Test 1	Test 2
Discharge Pressure, PSI	80.4	83.8
Discharge Head, Feet	185.7	193.6
Suction Head, Feet	1.5	1.6
Total Head, Feet	187.2	195.2
Capacity, GPM	1,224	1,185
Acre Feet Pumped in 24 Hours	5.410	5.238
kW Input to Motor	65.7	65.5
HP Input to Motor	88.1	87.8
Motor Load (%)	81.2	81.0
Measured Speed of Pump, RPM	1,790	
Customer Meter, GPM	1,141	1,107
kWH per Acre Foot	**292**	**300**
Overall Plant Efficiency (%)	**65.7**	**66.5**

Test #1 with pump running by itself. Test #2 with pumps 5,4 running. Recommend having water meter calibrated, or replaced.

RON FORD
Manager
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PUMPING COST ANALYSIS: PLT 3 B5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14712

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 20, 2022, billing history for the past 12 months, and your current rate of TP3D49.

1) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 190.

Annual	
Total kWh	**92,568**
kW Input	**65.70**
kWh per Acre-Foot	**292**
Acre-Feet per Year	**317.5**
Average Cost per kWH	**$0.18000**
Average Cost per Acre-Foot	**$52.47**
Overall Plant Efficiency (%)	**65.68**
Total Annual Cost	**$16,662**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

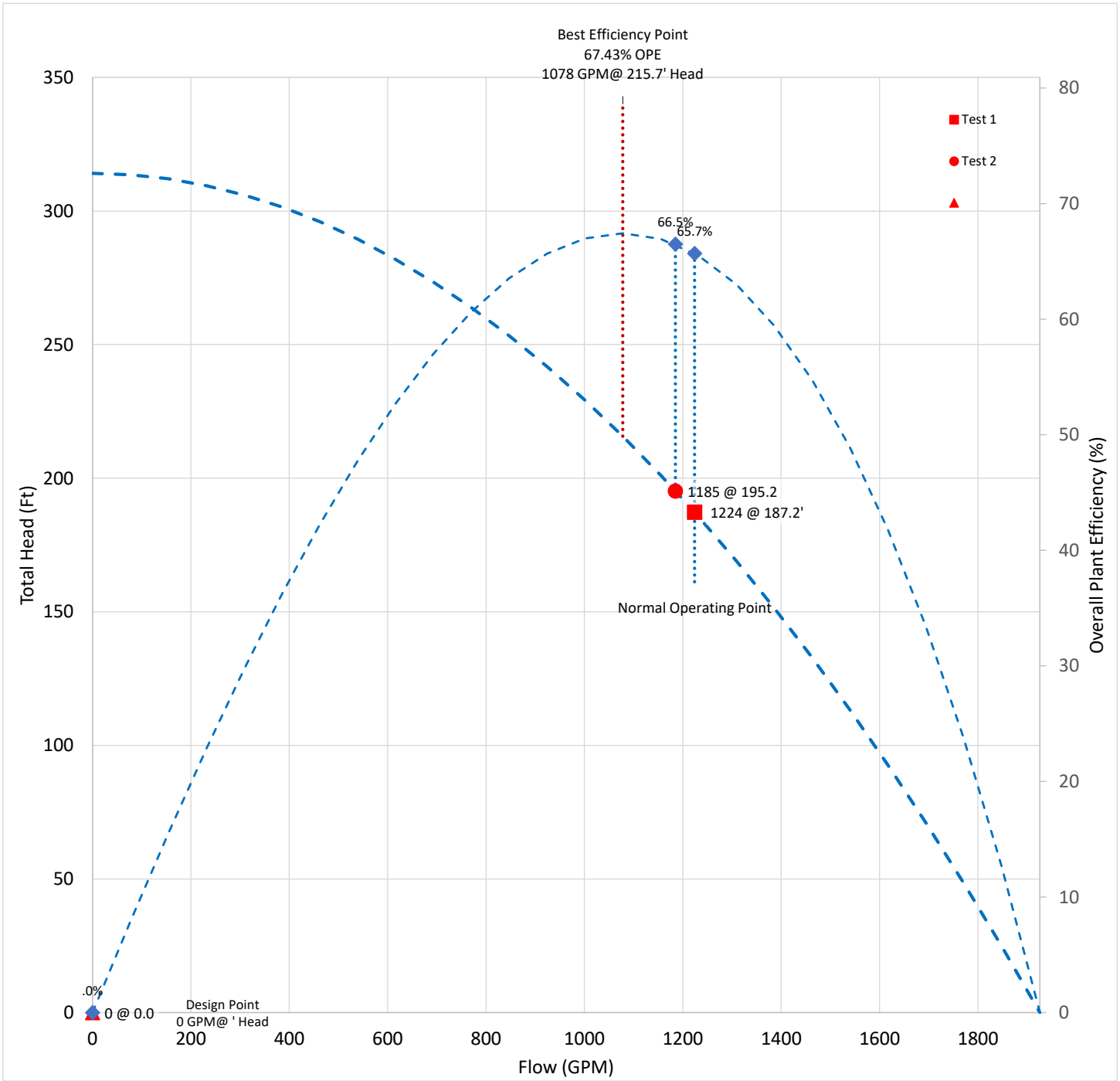
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Pump Name: PLT 3 B5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14712



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	1078	215.7	67.43%
Normal	1224	187.2	65.68%
Second	1185	195.2	66.49%
Third	0	0.0	0.00%

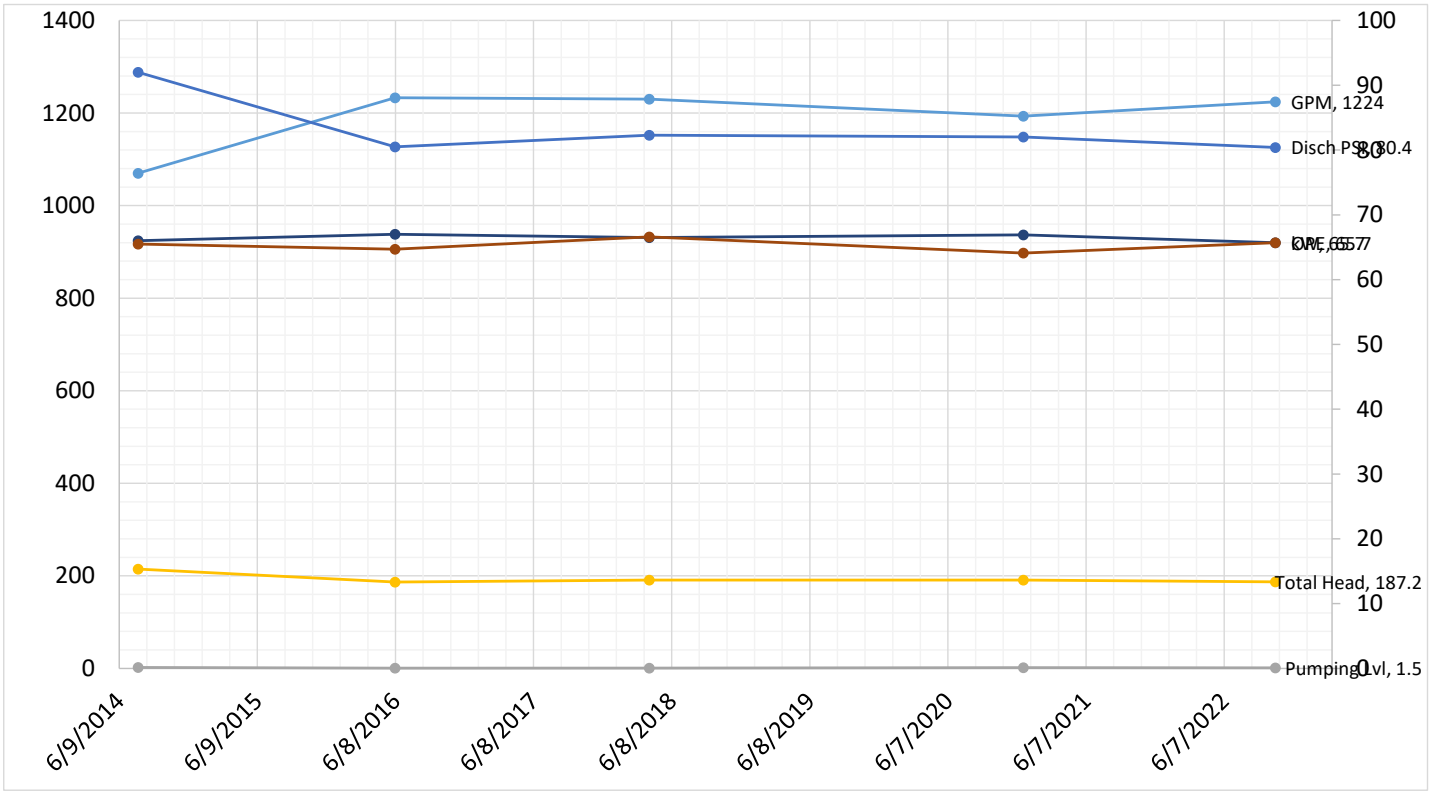
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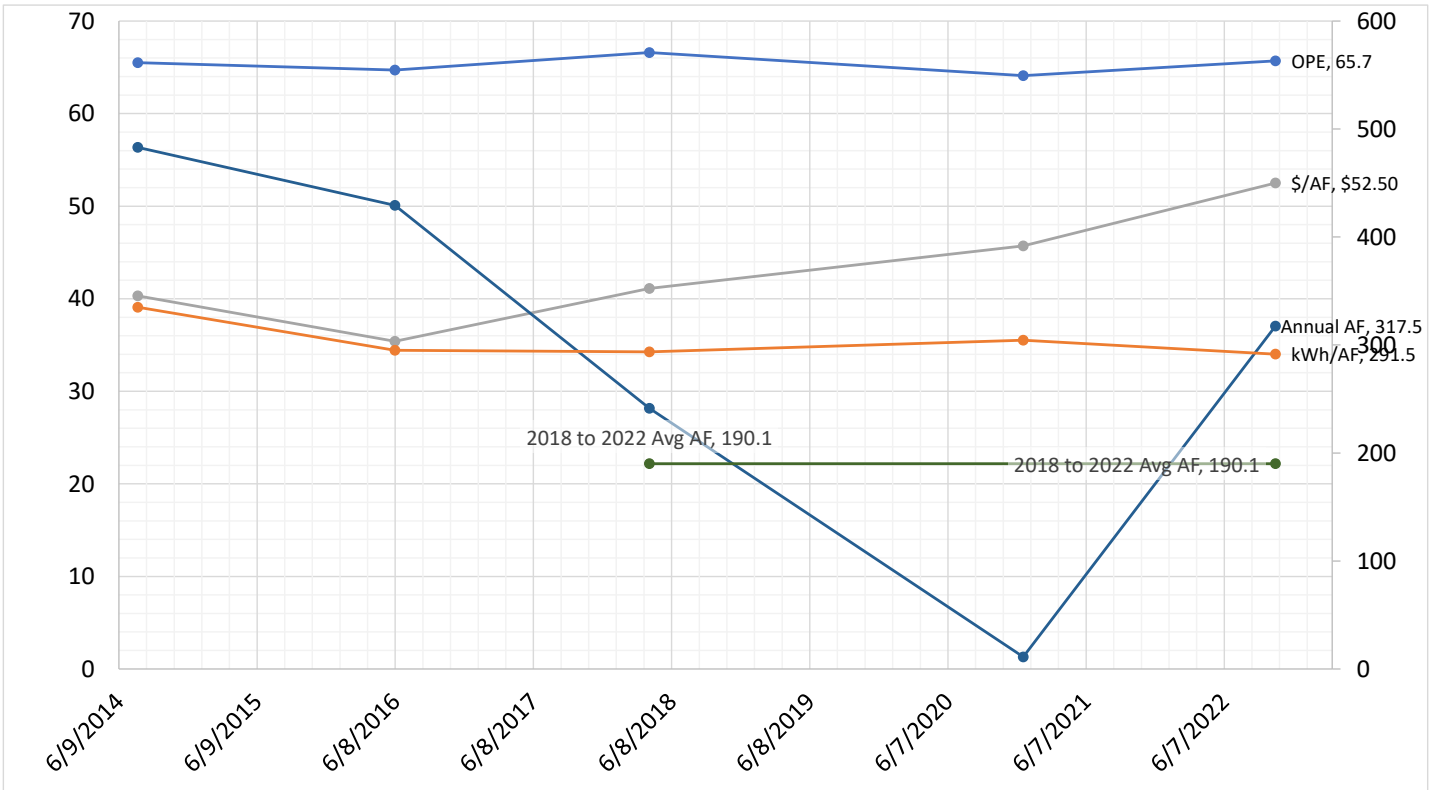
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Pump Name: PLT 3 B5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14712





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 4 B1

Location:	421 E 19TH ST UPLAND CA US 91784		
Bus.Part.ID:	1003638587	Contract ID:	8000983823
Meter:	V349N-011466	Pump Ref. #:	14033

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 30, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump:	JOHNS	No:	JU-6175
Motor:	US	No:	4326249

Results	Test 1
Discharge Pressure, PSI	103.1
Discharge Head, Feet	238.2
Suction Head, Feet	24.5
Total Head, Feet	213.7
Capacity, GPM	1,622
Acre Feet Pumped in 24 Hours	7.169
kW Input to Motor	100.5
HP Input to Motor	134.8
Motor Load (%)	99.5
Measured Speed of Pump, RPM	1,778
Customer Meter, GPM	
kWH per Acre Foot	**336**
Overall Plant Efficiency (%)	**64.9**

The test location does not meet industry standards.We recommend 8-10 diameters of uninterrupted pipe lengths for the ideal test location. Tested with pump running by itself. Discharge valve does not turn, unable to perform throttle points.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

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PUMPING COST ANALYSIS: PLT 4 B1
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14033

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on March 30, 2023, billing history for the past 12 months, and your current rate of TP3D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 64.9% to 70%.
2) This can save you up to 30,741 kWh and $4,919 annually.
3) These kWh savings translate to a 16.35-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2019 and 2023, the average annual acre-feet is 1,142.

Annual	Existing	Improved	Savings
Total kWh	**425,304**	**394,563**	**30,741**
kW Input	**100.50**	**93.24**	**7.26**
kWh per Acre-Foot	**336**	**312**	**24**
Acre-Feet per Year	**1,263.9**		
Average Cost per kWH	**$0.16000**		
Average Cost per Acre-Foot	**$53.84**	**$49.95**	**$3.89**
Overall Plant Efficiency (%)	**64.94**	**70.00**	
Total Annual Cost	**$68,049**	**$63,130**	**$4,919**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

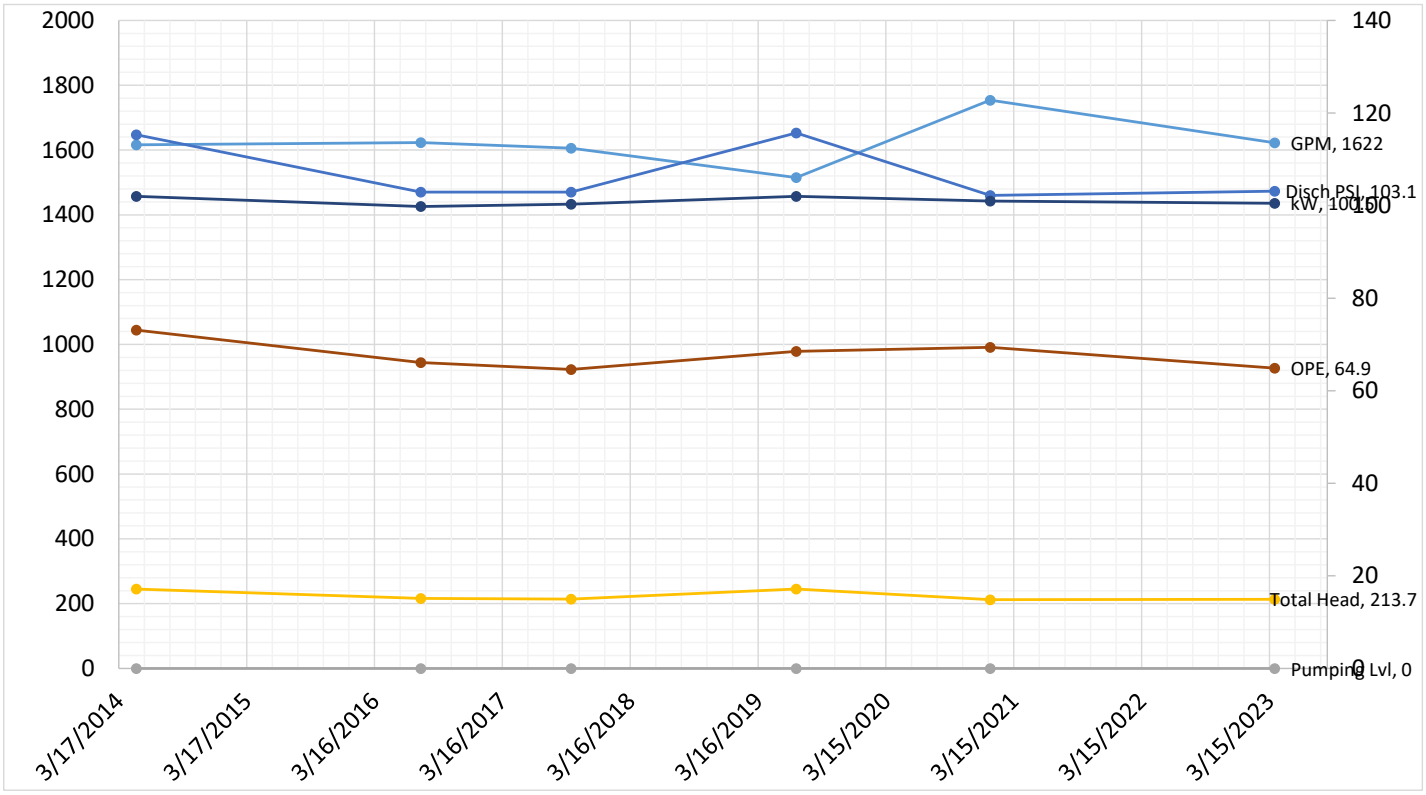
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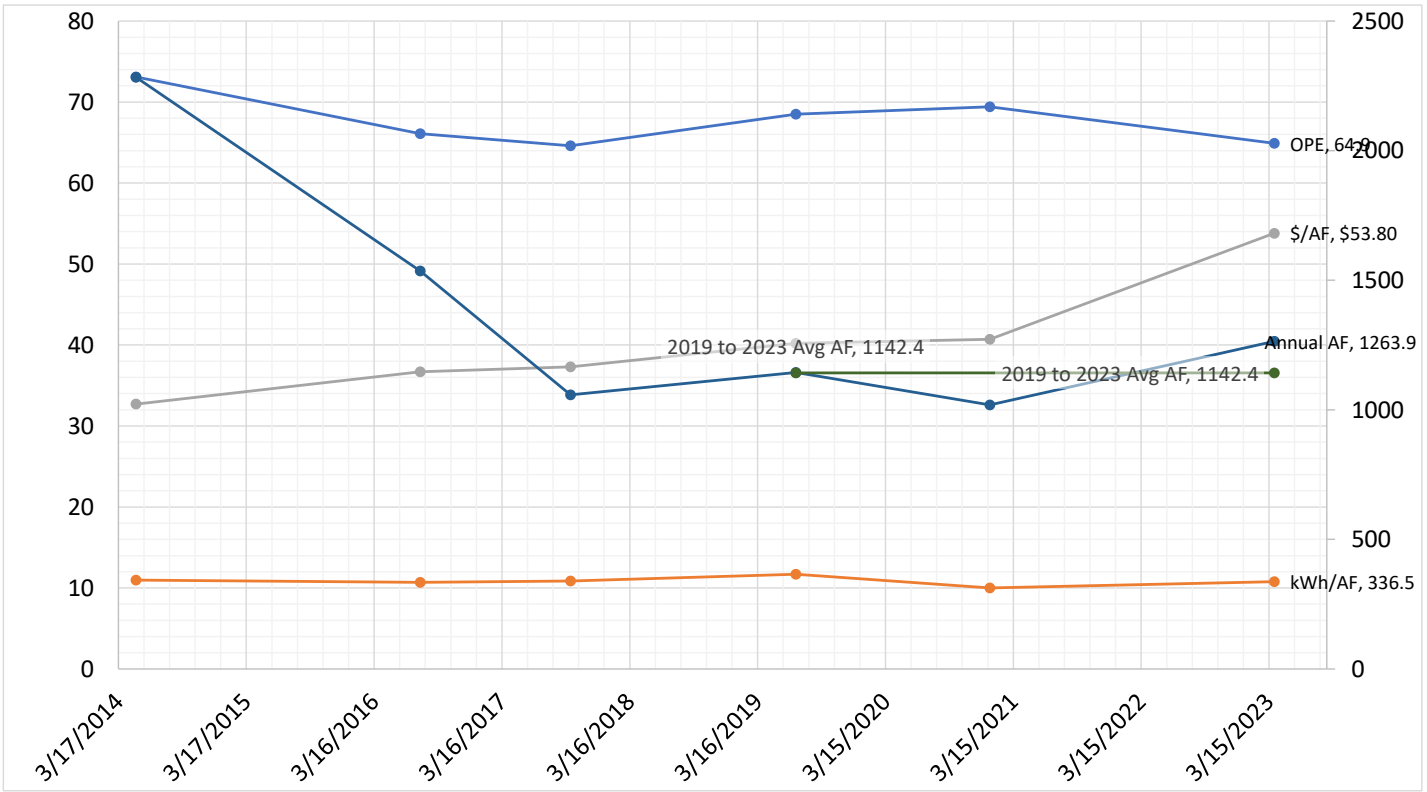
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Pump Name: PLT 4 B1
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14033





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 4 B2
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14034

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 30, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 125
Pump: JOHNS No: JU-6176
Motor: US No: 1326247

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	100.1	111.3	121.6
Discharge Head, Feet	231.2	257.1	280.9
Suction Head, Feet	24.5	24.5	24.5
Total Head, Feet	206.7	232.6	256.4
Capacity, GPM	1,316	1,192	1,060
Acre Feet Pumped in 24 Hours	5.817	5.269	4.685
kW Input to Motor	74.5	74.2	73.4
HP Input to Motor	99.9	99.5	98.4
Motor Load (%)	73.8	73.5	72.7
Measured Speed of Pump, RPM	1,780		
Customer Meter, GPM			
kWH per Acre Foot	**307**	**338**	**376**
Overall Plant Efficiency (%)	**68.8**	**70.4**	**69.7**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. The test location does not meet industry standards.We recommend 8-10 diameters of uninterrupted pipe lengths for the ideal test location. Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

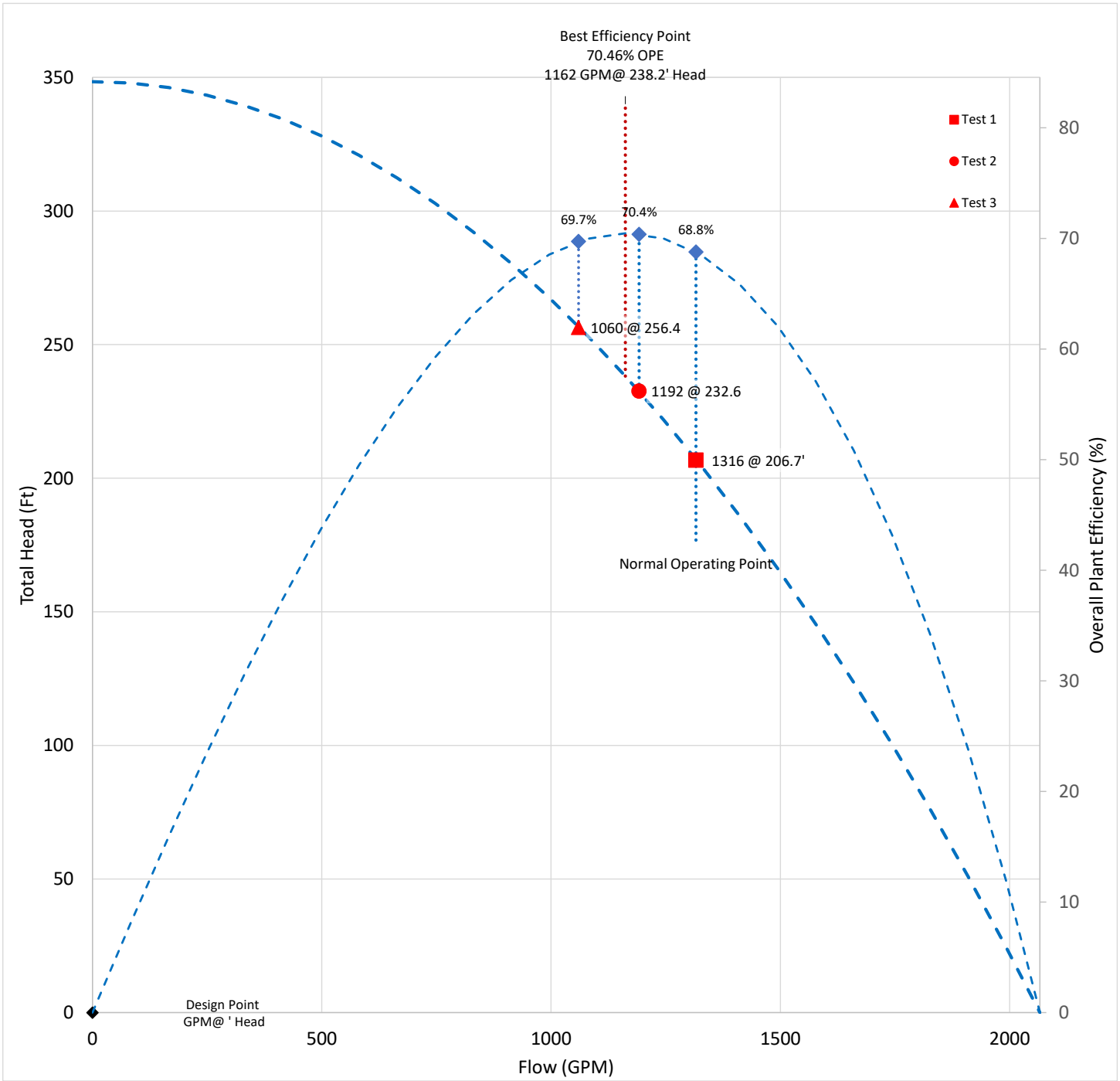
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Pump Name: PLT 4 B2
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14034



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1162	238.2	70.46%
Normal	1316	206.7	68.77%
Second	1192	232.6	70.37%
Third	1060	256.4	69.73%

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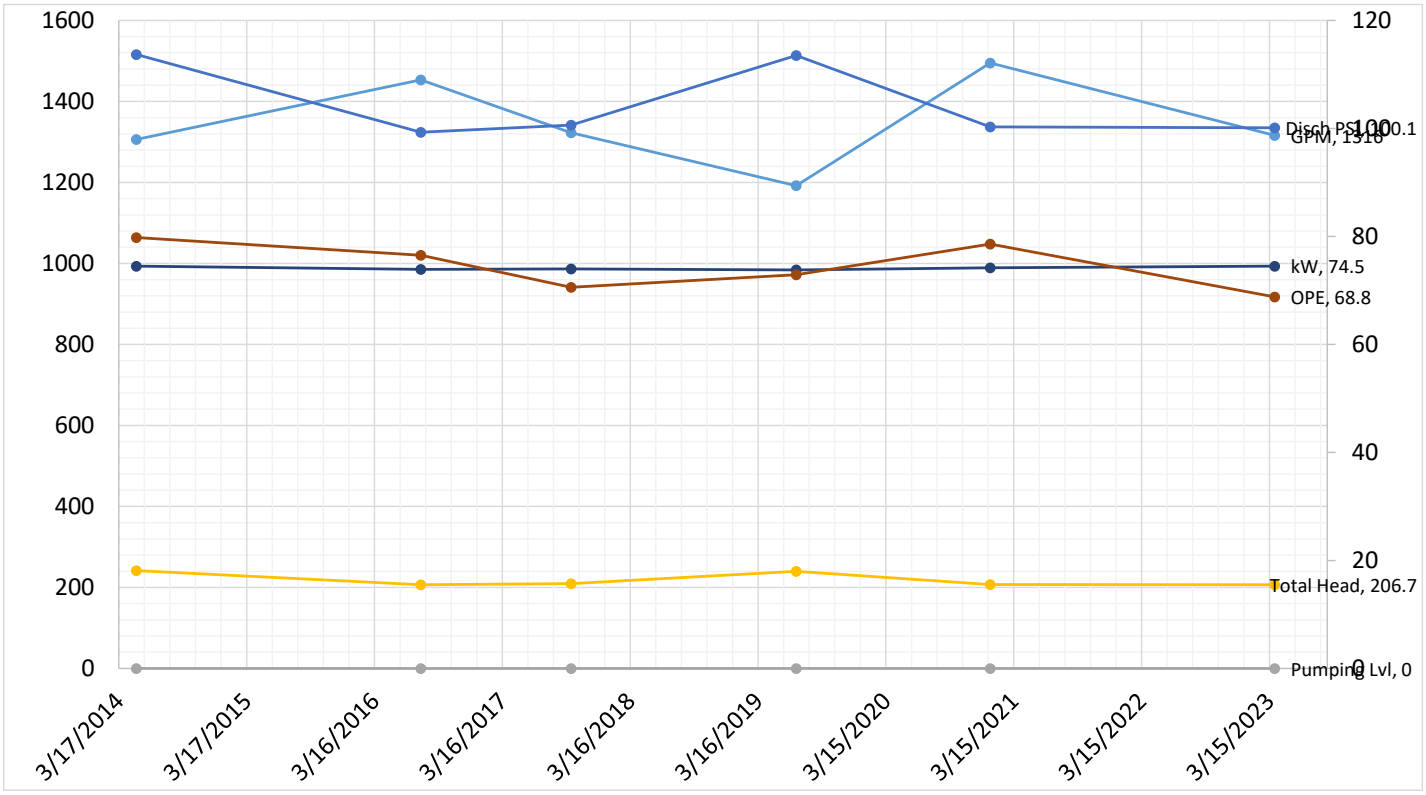
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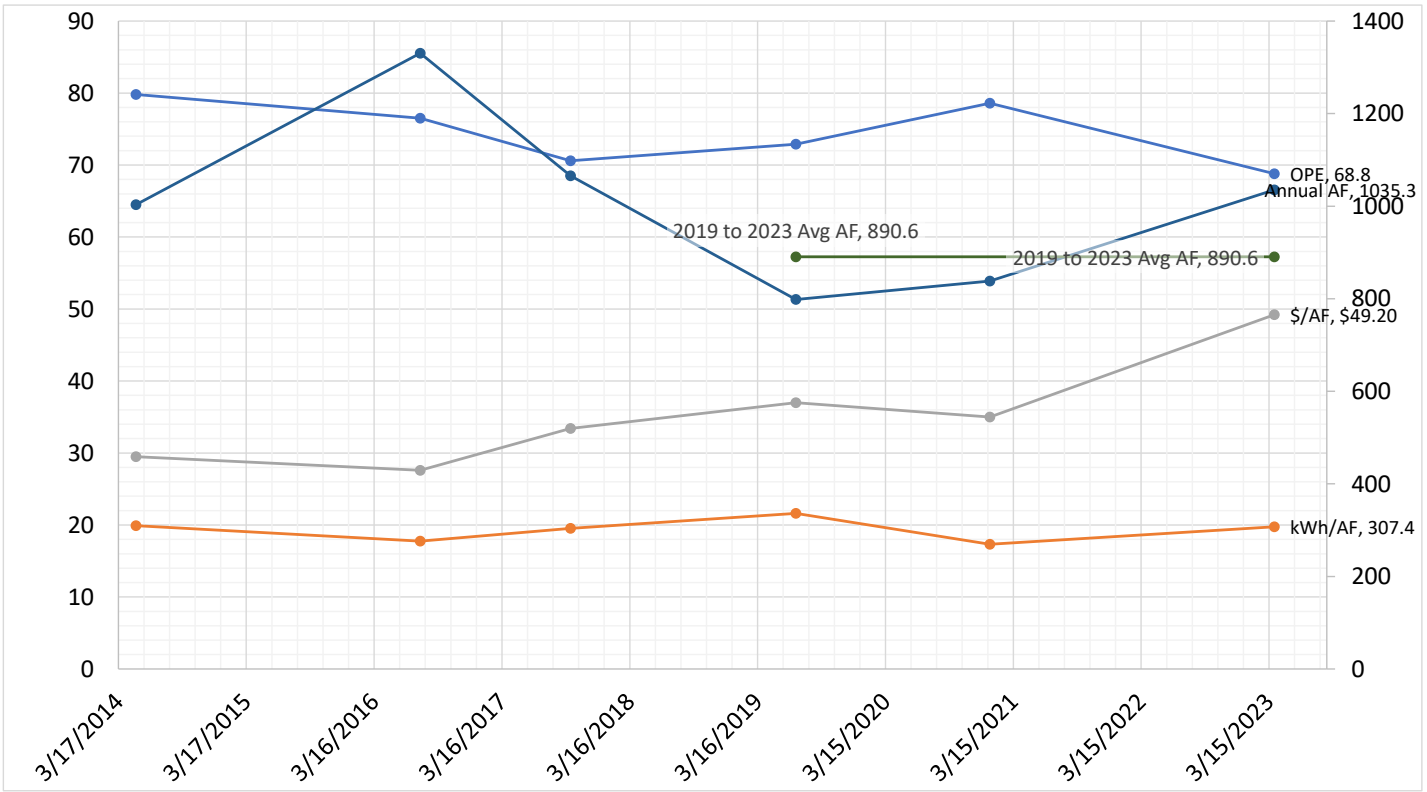
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UPLAND, CITY OF
460 N EUCLID AVE
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Pump Name: PLT 4 B2
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14034





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HYDRAULIC TEST RESULTS: PLT 4 B3
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14035

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 30, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 125
Pump: VERTI No: 7672887
Motor: US No: 3550219

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	100.0	110.3	119.3
Discharge Head, Feet	231.0	254.8	275.6
Suction Head, Feet	24.3	24.3	24.3
Total Head, Feet	206.7	230.5	251.3
Capacity, GPM	1,780	1,715	1,650
Acre Feet Pumped in 24 Hours	7.868	7.580	7.293
kW Input to Motor	100.8	102.2	103.0
HP Input to Motor	135.2	137.1	138.1
Motor Load (%)	99.8	101.2	102.0
Measured Speed of Pump, RPM	1,783		
Customer Meter, GPM			
kWH per Acre Foot	**308**	**324**	**339**
Overall Plant Efficiency (%)	**68.7**	**72.9**	**75.8**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. The test location does not meet industry standards.We recommend 8-10 diameters of uninterrupted pipe lengths for the ideal test location. Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

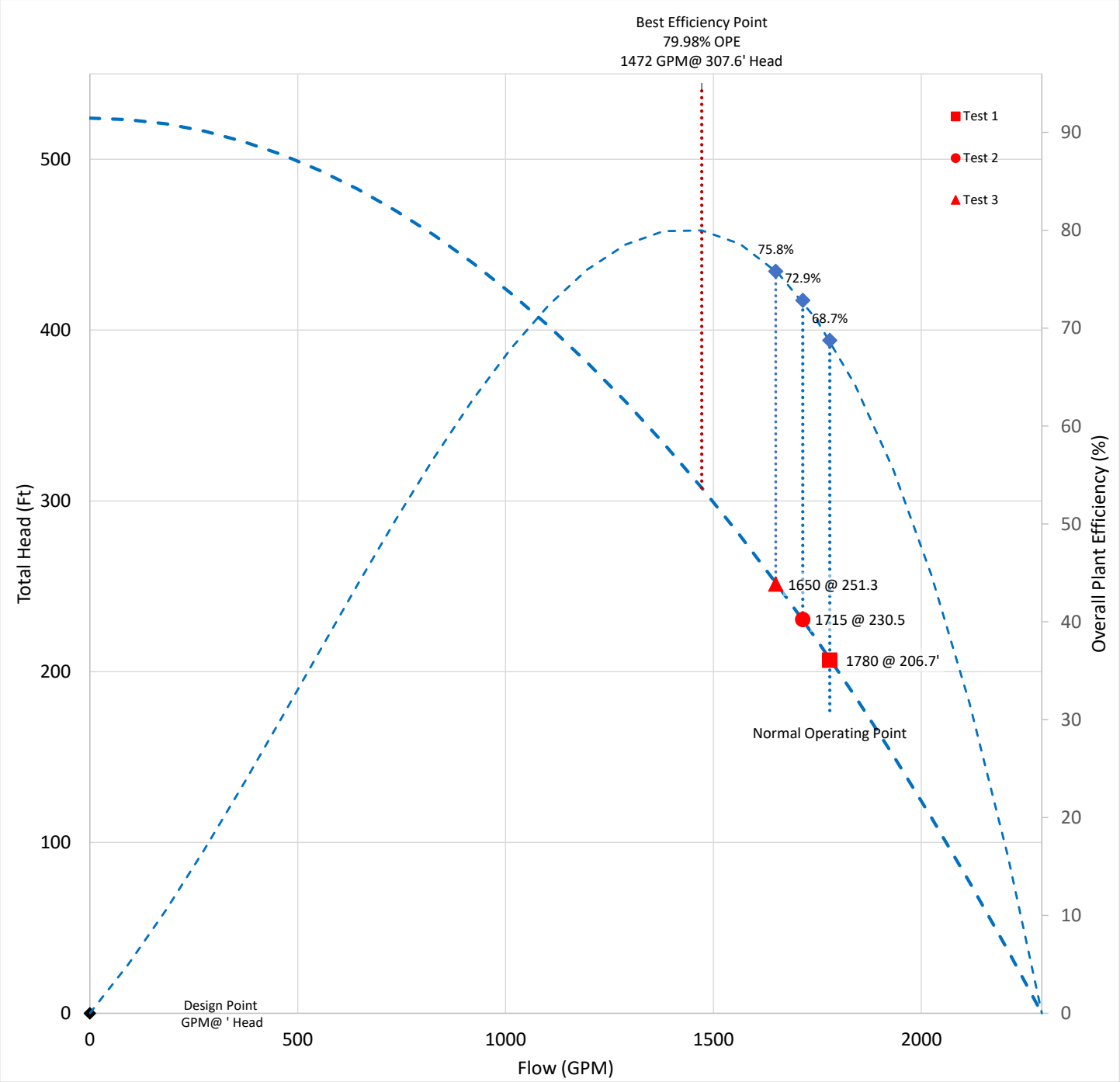
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UPLAND, CITY OF
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UPLAND, CA 91786-4732

Pump Name: PLT 4 B3
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14035



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1472	307.6	79.98%
Normal	1780	206.7	68.75%
Second	1715	230.5	72.85%
Third	1650	251.3	75.82%

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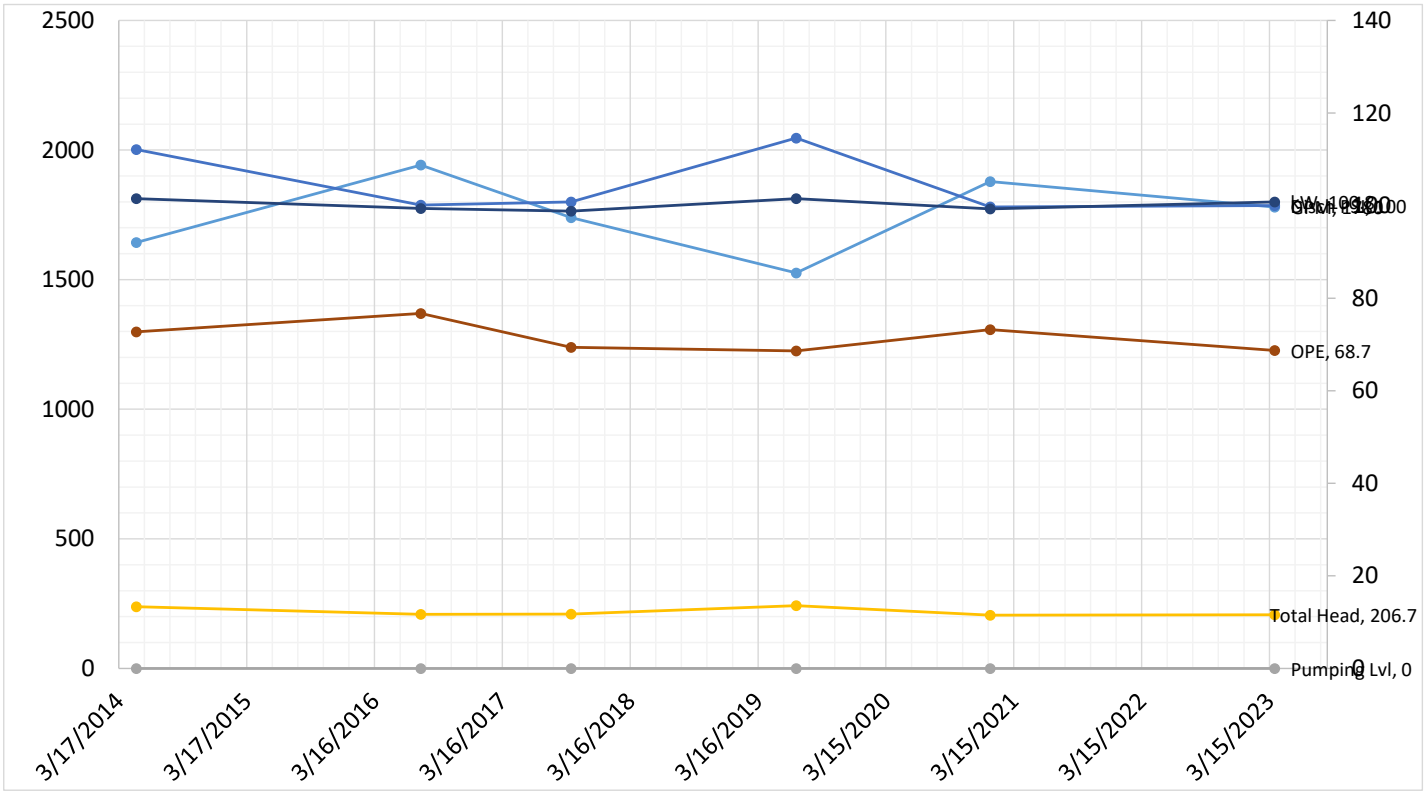
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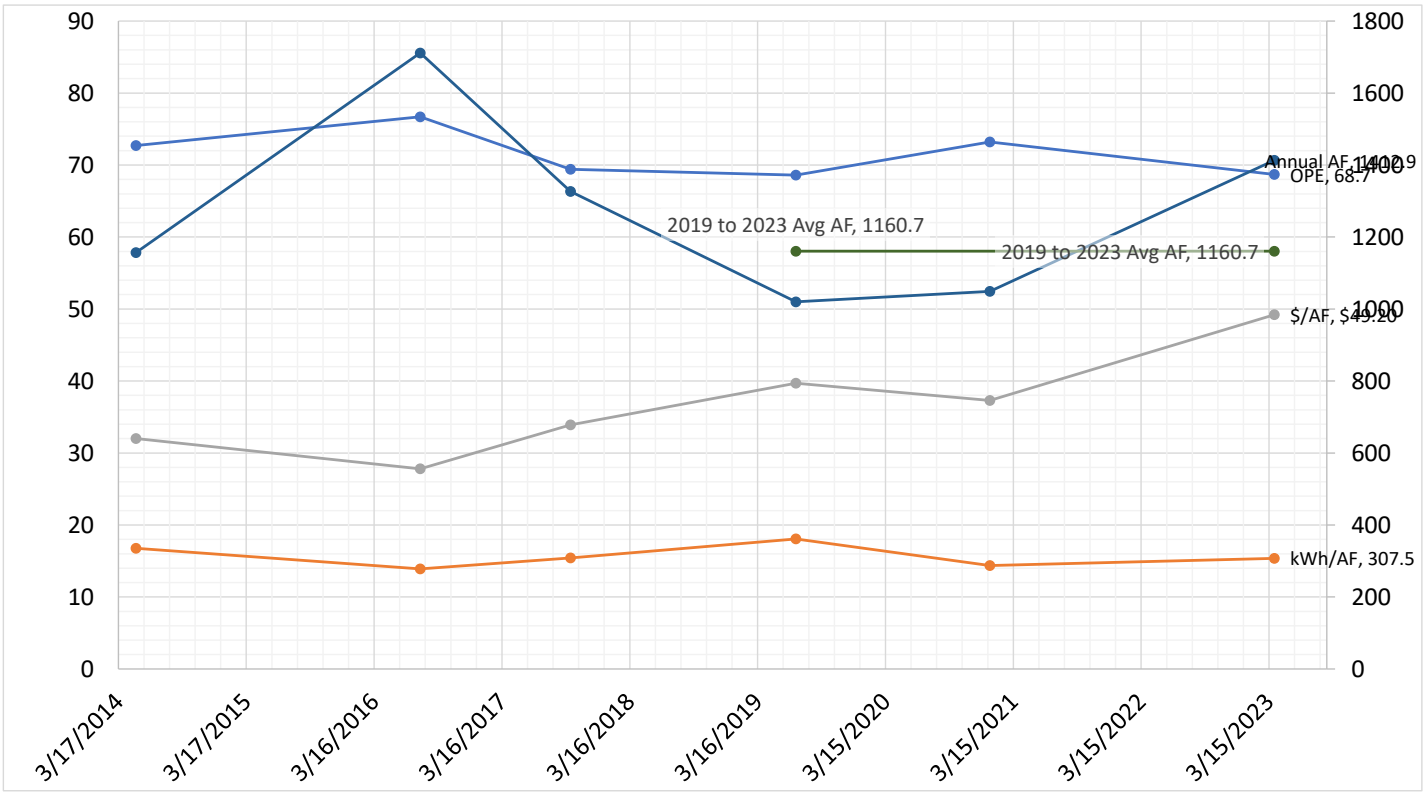
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JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 4 B3
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14035





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HYDRAULIC TEST RESULTS: PLT 4 B4
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14036

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 30, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 125
Pump: VERT No: V76-72884
Motor: US No: B355236138

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	100.3	110.3	120.6
Discharge Head, Feet	231.7	254.8	278.6
Suction Head, Feet	23.6	23.6	23.6
Total Head, Feet	208.1	231.2	255.0
Capacity, GPM	1,750	1,670	1,560
Acre Feet Pumped in 24 Hours	7.735	7.381	6.895
kW Input to Motor	100.6	101.6	102.6
HP Input to Motor	134.9	136.2	137.6
Motor Load (%)	99.6	100.6	101.6
Measured Speed of Pump, RPM	1,780		
Customer Meter, GPM			
kWH per Acre Foot	**312**	**330**	**357**
Overall Plant Efficiency (%)	**68.2**	**71.6**	**73.0**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. The test location does not meet industry standards.We recommend 8-10 diameters of uninterrupted pipe lengths for the ideal test location. Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

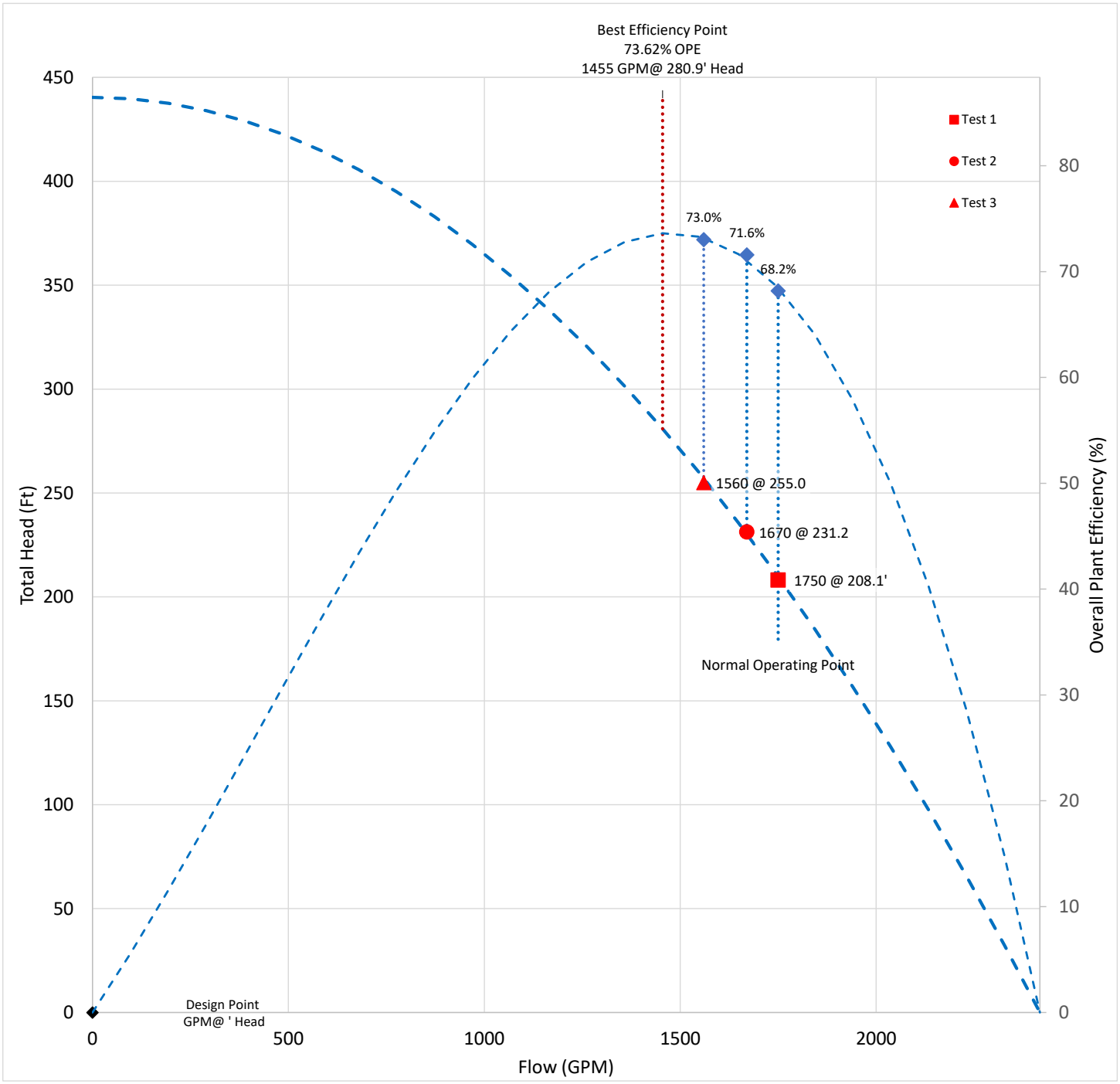
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April 27, 2023

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 4 B4
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14036



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1455	280.9	73.62%
Normal	1750	208.1	68.18%
Second	1670	231.2	71.57%
Third	1560	255.0	73.02%

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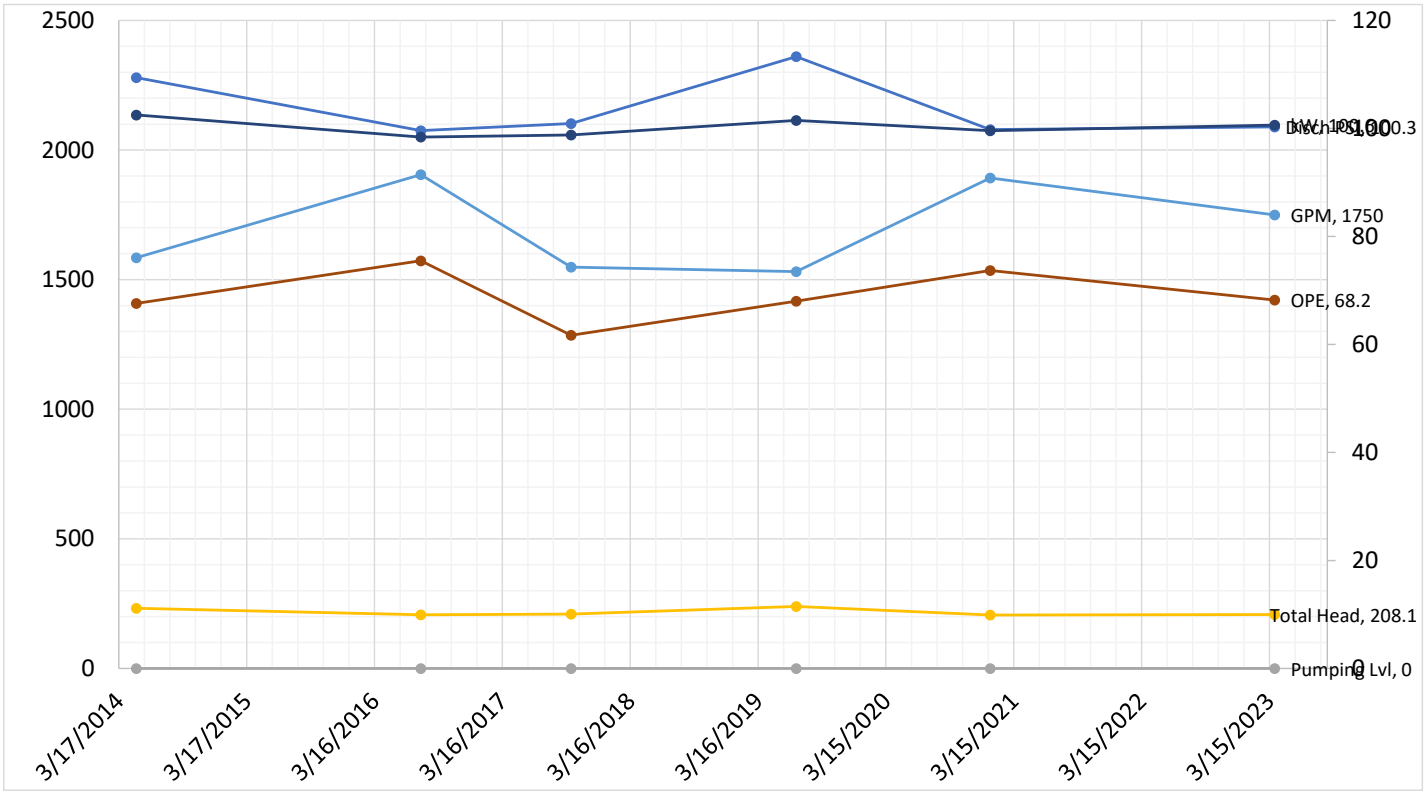
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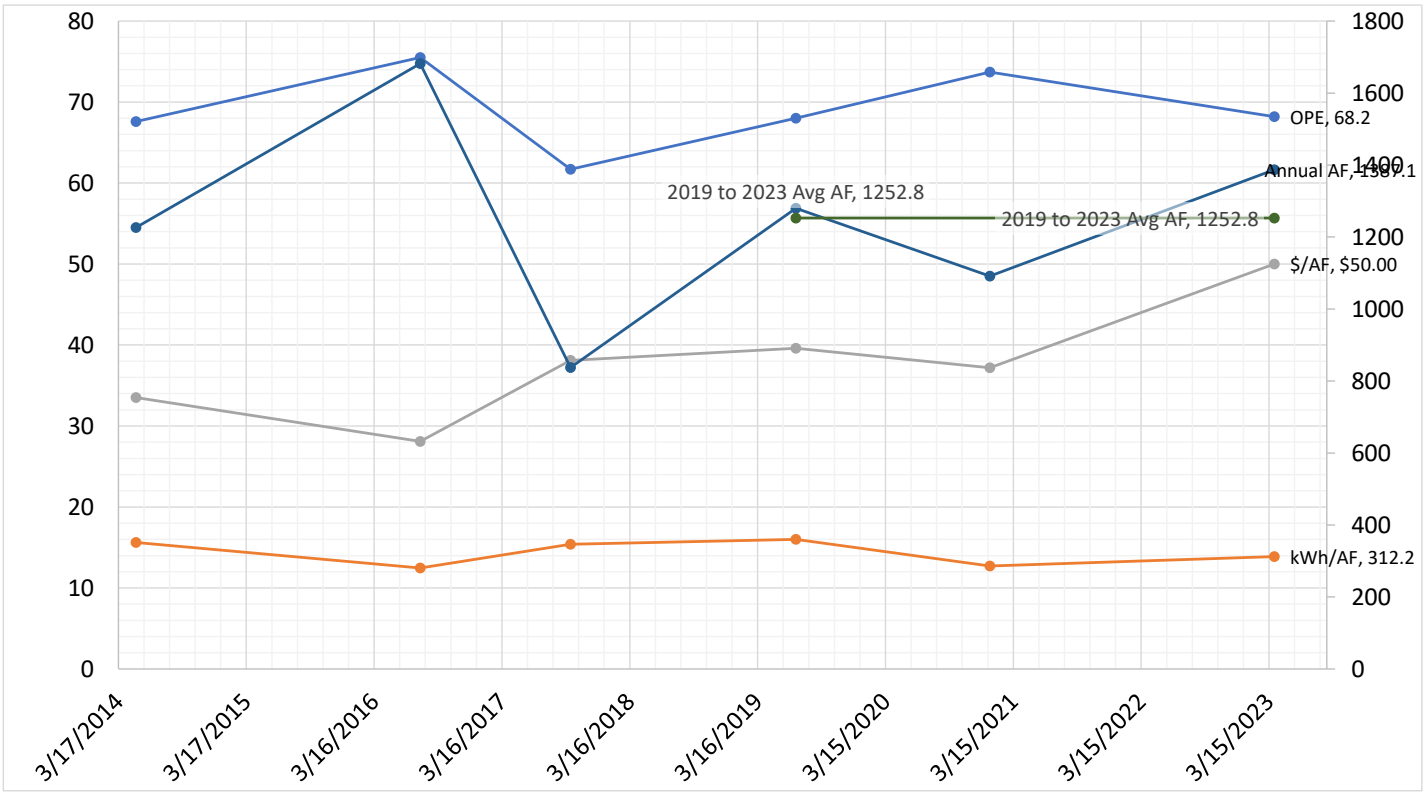
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April 27, 2023

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 4 B4
Location: 421 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000983823
Meter: V349N-011466 Pump Ref. #: 14036





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JOHN ROBLES
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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 6 B1

Location:	34 CAMPUS-15TH UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8001061873
Meter:	V349N-004361	Pump Ref. #:	14063

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 22, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump:	Goulds	No:	
Motor:	US	No:	1282203

Results	Test 1
Discharge Pressure, PSI	95.7
Discharge Head, Feet	221.1
Suction Head, Feet	4.7
Total Head, Feet	225.8
Capacity, GPM	1,712
Acre Feet Pumped in 24 Hours	7.567
kW Input to Motor	93.4
HP Input to Motor	125.2
Motor Load (%)	92.5
Measured Speed of Pump, RPM	1,785
Customer Meter, GPM	
kWH per Acre Foot	**296**
Overall Plant Efficiency (%)	**77.9**

Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

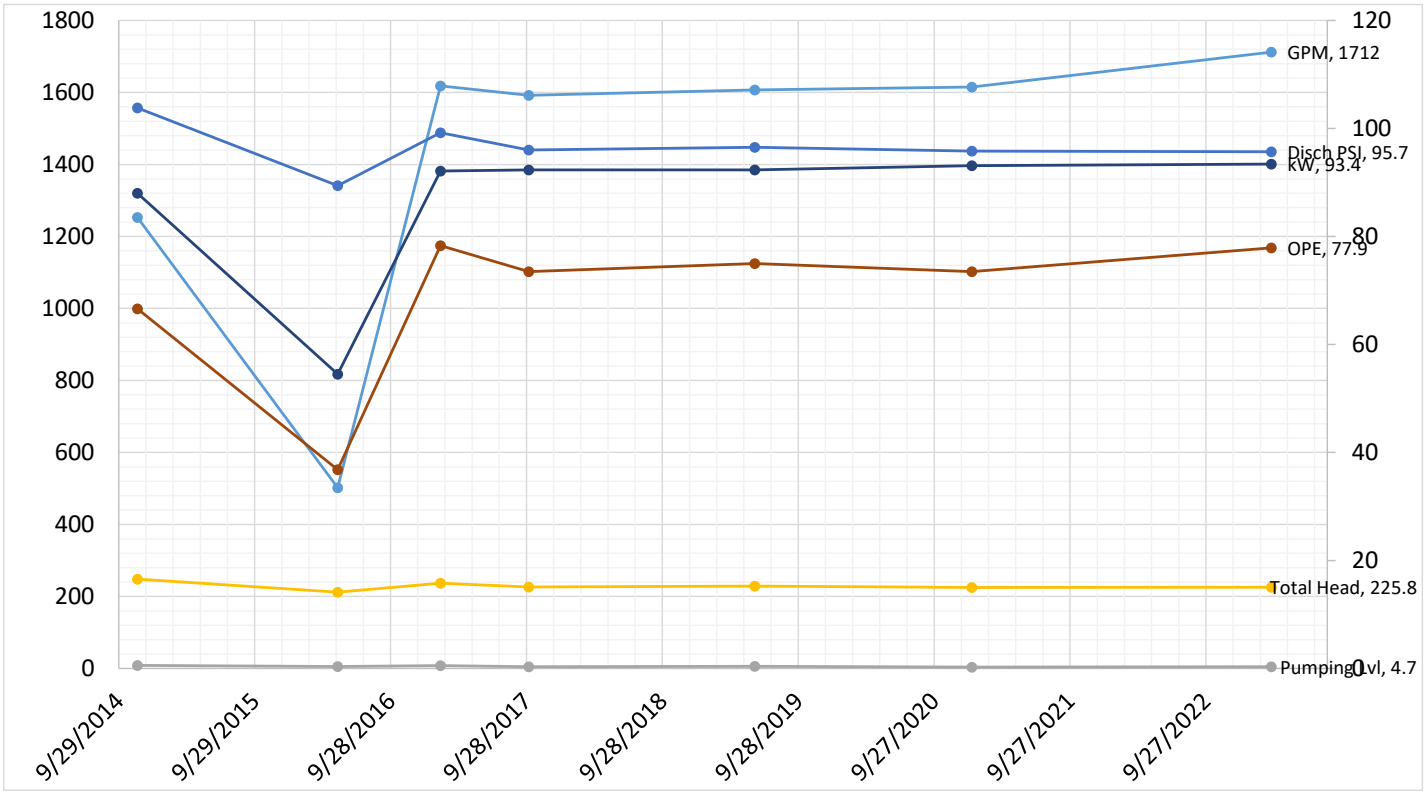
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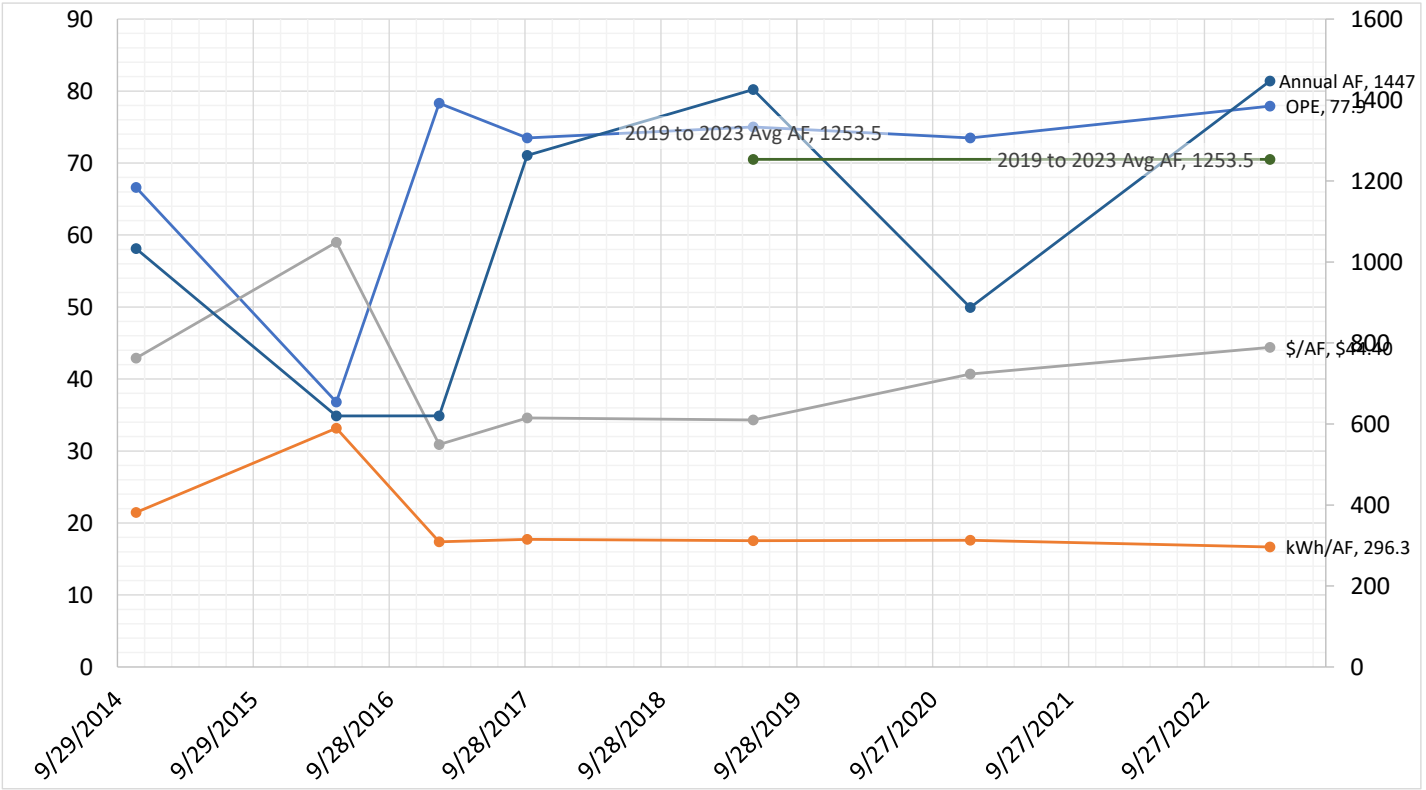
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April 27, 2023

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UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 6 B1
Location: 34 CAMPUS-15TH UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8001061873
Meter: V349N-004361 Pump Ref. #: 14063





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 6 B2

Location:	34 CAMPUS-15TH UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8001061873
Meter:	V349N-004361	Pump Ref. #:	14064

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 22, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump:	JOHNS	No:	JU-6180
Motor:	US	No:	1243997

Results	Test 1
Discharge Pressure, PSI	96.7
Discharge Head, Feet	223.4
Suction Head, Feet	4.1
Total Head, Feet	227.5
Capacity, GPM	1,606
Acre Feet Pumped in 24 Hours	7.099
kW Input to Motor	98.5
HP Input to Motor	132.1
Motor Load (%)	97.5
Measured Speed of Pump, RPM	1,784
Customer Meter, GPM	
kWH per Acre Foot	**333**
Overall Plant Efficiency (%)	**69.8**

Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

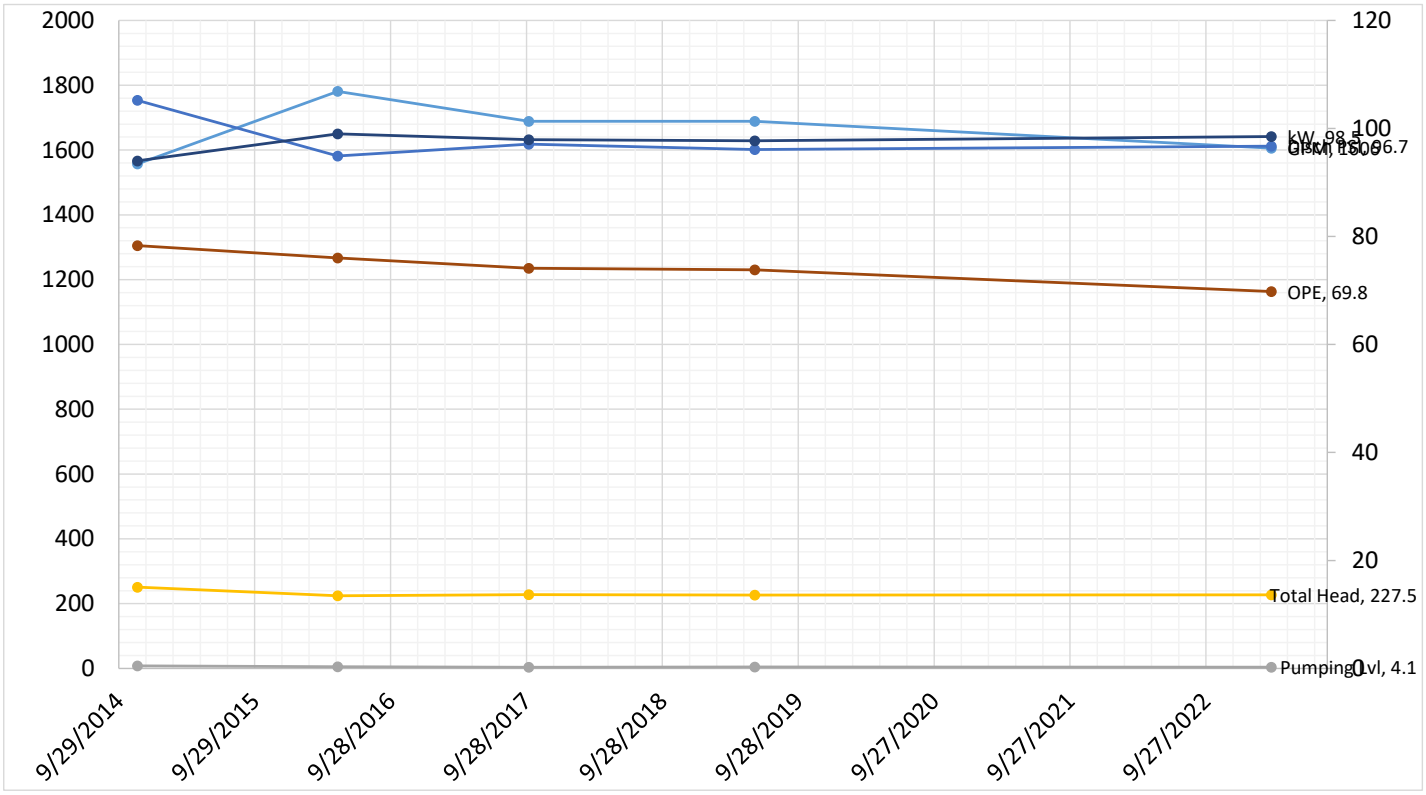
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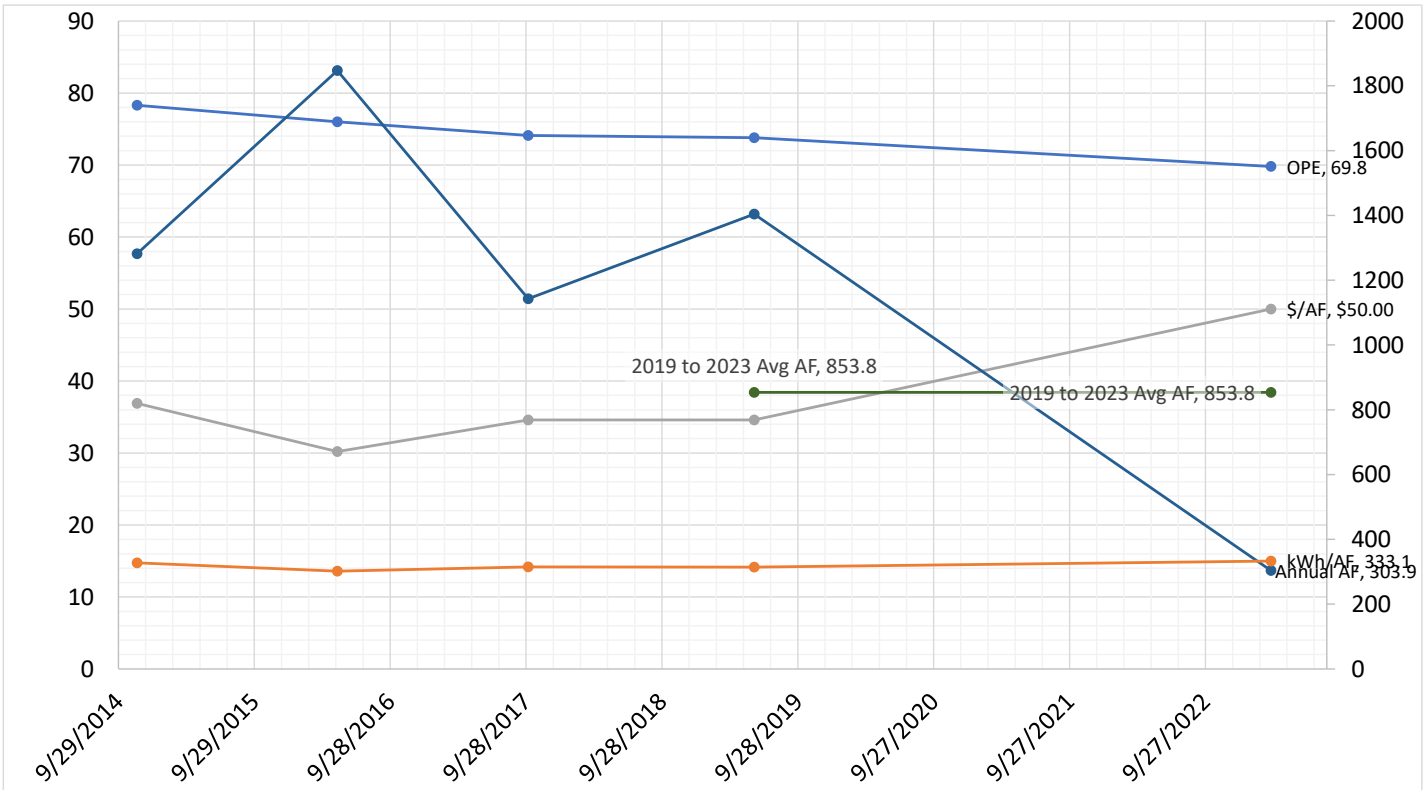
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UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 6 B2
Location: 34 CAMPUS-15TH UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8001061873
Meter: V349N-004361 Pump Ref. #: 14064





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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 6 B3

Location:	34 CAMPUS-15TH UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8001061873
Meter:	V349N-004361	Pump Ref. #:	14065

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 22, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump:	JOHNS	No:	JU-6174
Motor:	US	No:	091760004M0006

Results	Test 1
Discharge Pressure, PSI	95.5
Discharge Head, Feet	220.6
Suction Head, Feet	4.2
Total Head, Feet	224.8
Capacity, GPM	1,652
Acre Feet Pumped in 24 Hours	7.302
kW Input to Motor	97.6
HP Input to Motor	130.9
Motor Load (%)	99.9
Measured Speed of Pump, RPM	1,783
Customer Meter, GPM	
kWH per Acre Foot	**321**
Overall Plant Efficiency (%)	**71.7**

Tested with pump running by itself.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

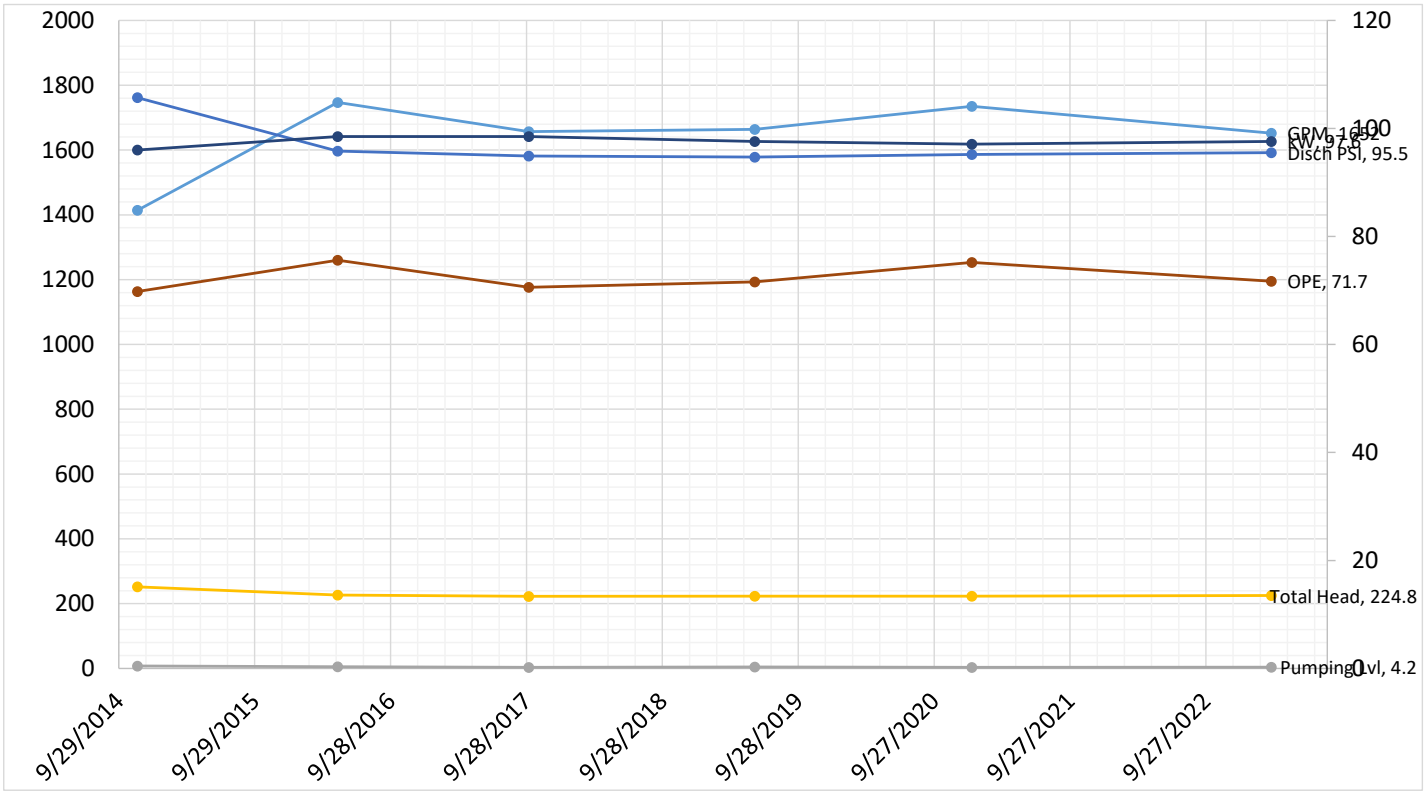
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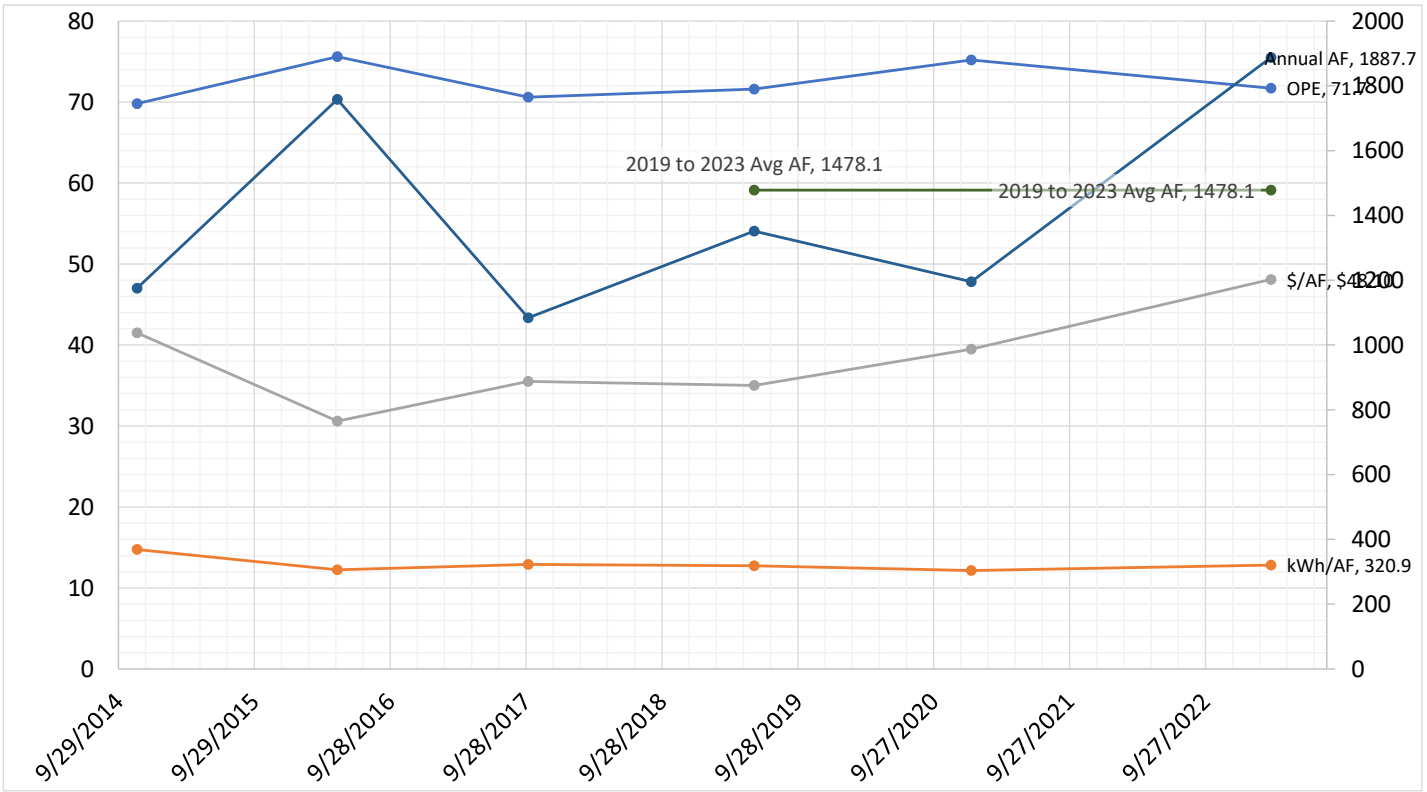
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Pump Name: PLT 6 B3
Location: 34 CAMPUS-15TH UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8001061873
Meter: V349N-004361 Pump Ref. #: 14065





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HYDRAULIC TEST RESULTS: PLT 6 B4

Location:	34 CAMPUS-15TH UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8001061873
Meter:	V349N-004361	Pump Ref. #:	14066

In accordance with your request, an energy efficiency test was performed on your turbine booster pump on March 22, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 125

Pump:	JOHNS	No:	JU-6173
Motor:	US	No:	1326248

Results	Test 1
Discharge Pressure, PSI	96.2
Discharge Head, Feet	222.2
Suction Head, Feet	4.2
Total Head, Feet	226.4
Capacity, GPM	1,634
Acre Feet Pumped in 24 Hours	7.222
kW Input to Motor	98.8
HP Input to Motor	132.5
Motor Load (%)	97.8
Measured Speed of Pump, RPM	1,779
Customer Meter, GPM	
kWH per Acre Foot	**328**
Overall Plant Efficiency (%)	**70.5**

Tested with pump running by itself.

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Manager
PUMP TEST AND HYDRAULIC SERVICES

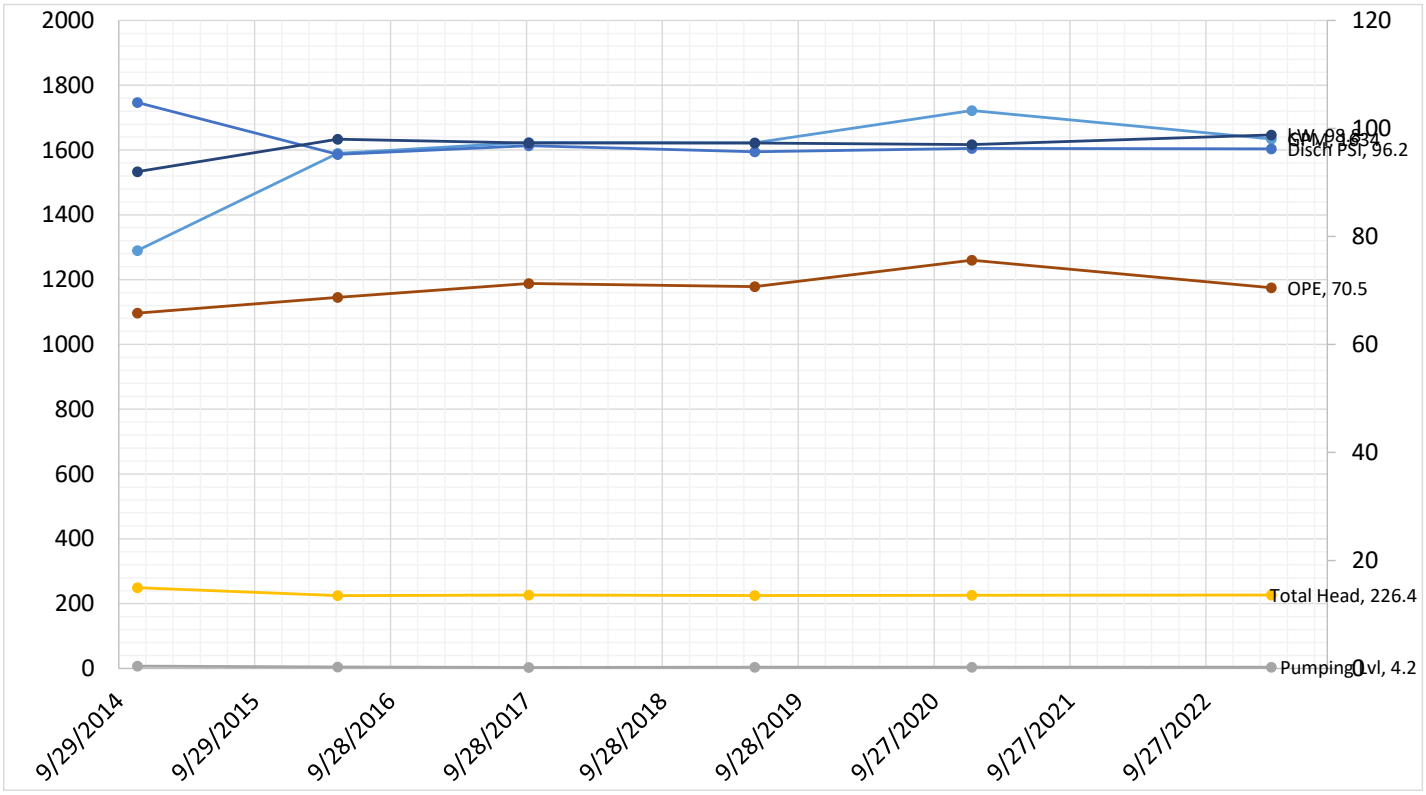
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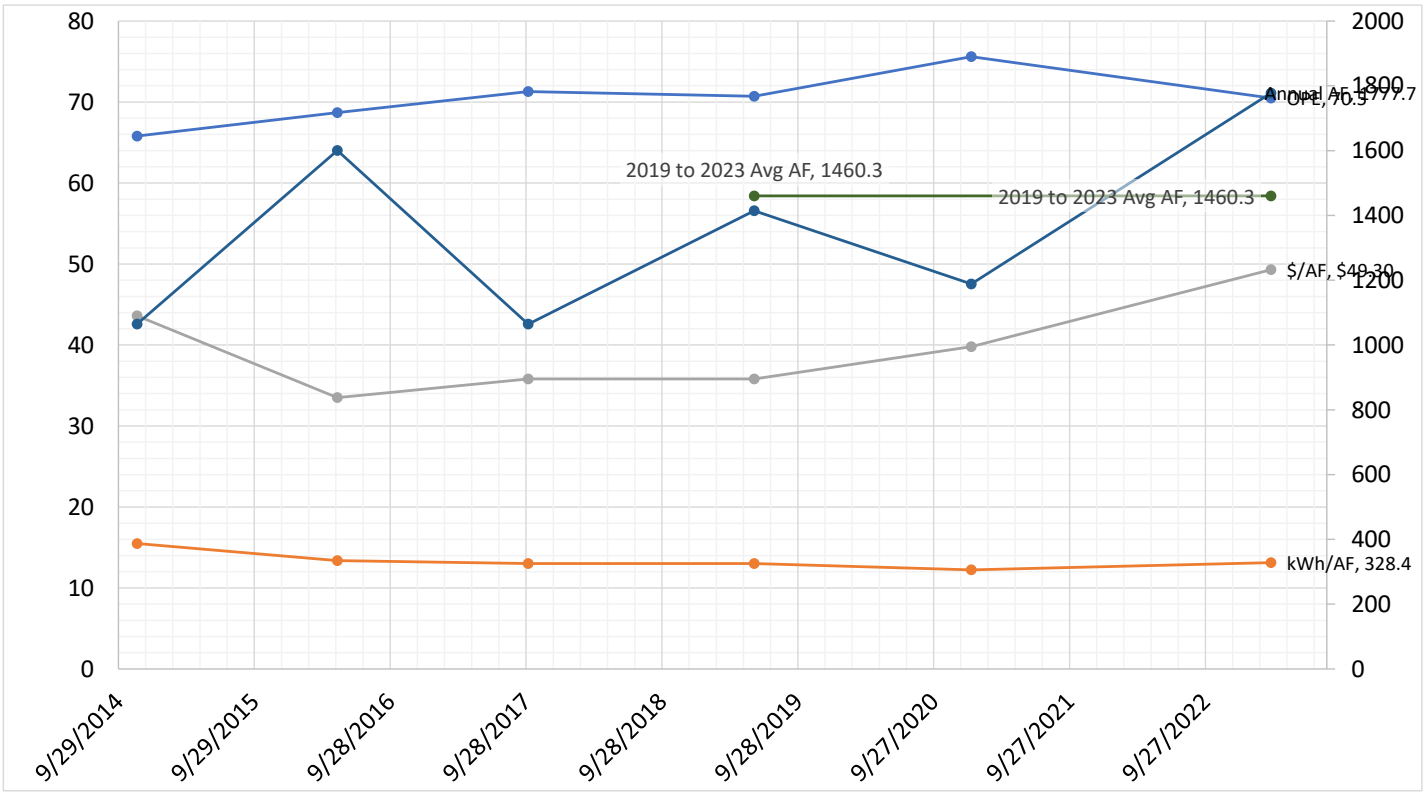
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UPLAND, CA 91786-4732

Pump Name: PLT 6 B4
Location: 34 CAMPUS-15TH UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8001061873
Meter: V349N-004361 Pump Ref. #: 14066





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HYDRAULIC TEST RESULTS: PLT 12 B1

Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35260

In accordance with your request, an energy efficiency test was performed on your centrifugal booster pump on April 6, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 100

Pump: PRLES No: 140005
Motor: MARAT No: Y53612

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	105.7	115.8	125.1
Discharge Head, Feet	244.2	267.5	289.0
Suction Head, Feet	3.2	4.9	6.7
Total Head, Feet	240.9	262.6	282.3
Capacity, GPM	1,288	1,018	602
Acre Feet Pumped in 24 Hours	5.693	4.500	2.661
kW Input to Motor	82.0	74.0	56.8
HP Input to Motor	110.0	99.2	76.2
Motor Load (%)	101.4	91.5	70.2
Measured Speed of Pump, RPM	1,787		
Customer Meter, GPM			
kWH per Acre Foot	**346**	**395**	**512**
Overall Plant Efficiency (%)	**71.3**	**68.0**	**56.3**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

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UPLAND, CITY OF
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UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: PLT 12 B1
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35260

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on April 06, 2023, billing history for the past 12 months, and your current rate of TP2D49.

1) Based on SCE testing between 2019 and 2023, the average annual acre-feet is 117.

Annual	
Total kWh	**1,464**
kW Input	**82.00**
kWh per Acre-Foot	**346**
Acre-Feet per Year	**4.2**
Average Cost per kWH	**$0.28000**
Average Cost per Acre-Foot	**$96.81**
Overall Plant Efficiency (%)	**71.26**
Total Annual Cost	**$410**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

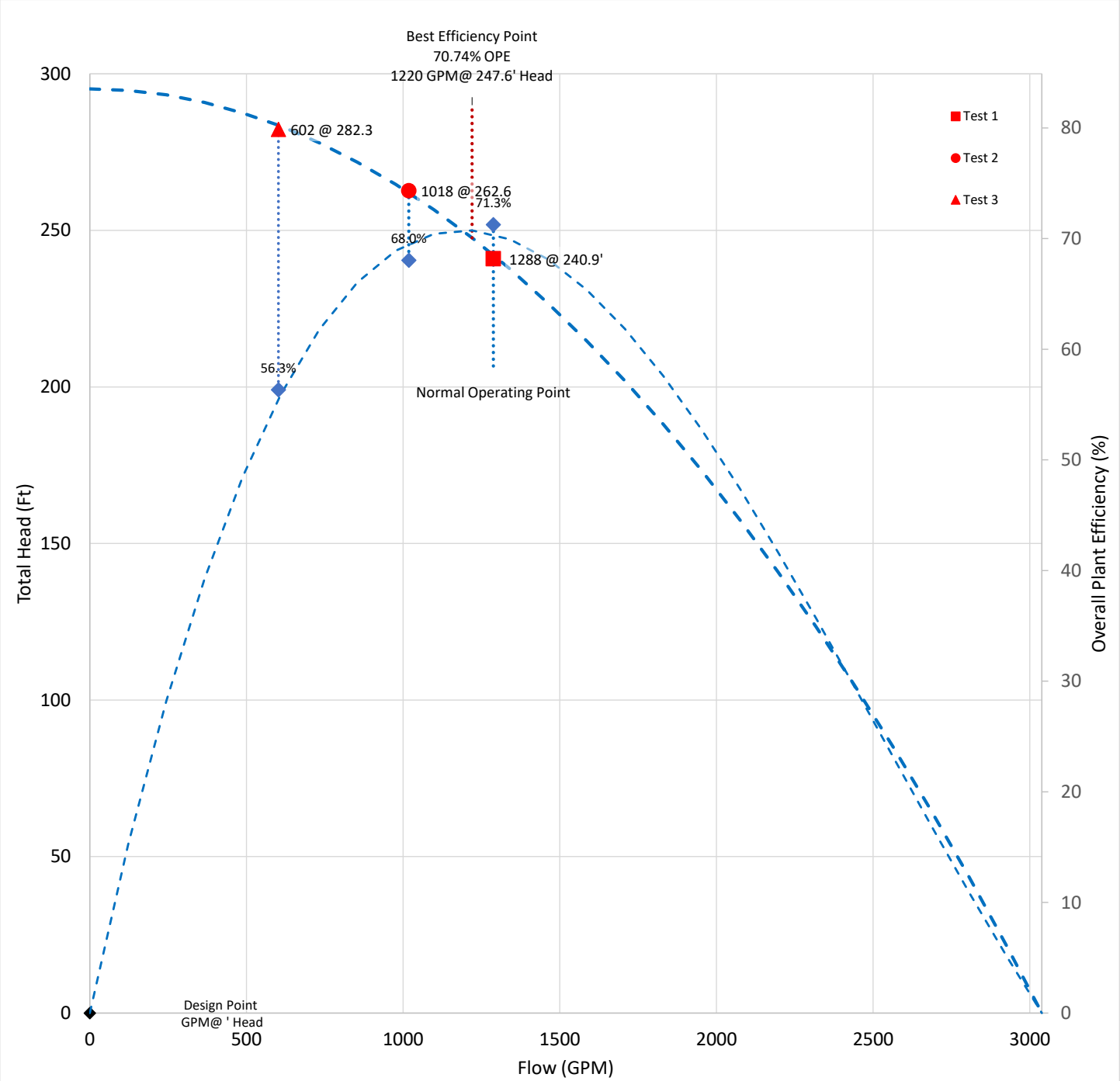
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JOHN ROBLES
UPLAND, CITY OF
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UPLAND, CA 91786-4732

Pump Name: PLT 12 B1
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35260



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1220	247.6	70.74%
Normal	1288	240.9	71.26%
Second	1018	262.6	68.04%
Third	602	282.3	56.34%

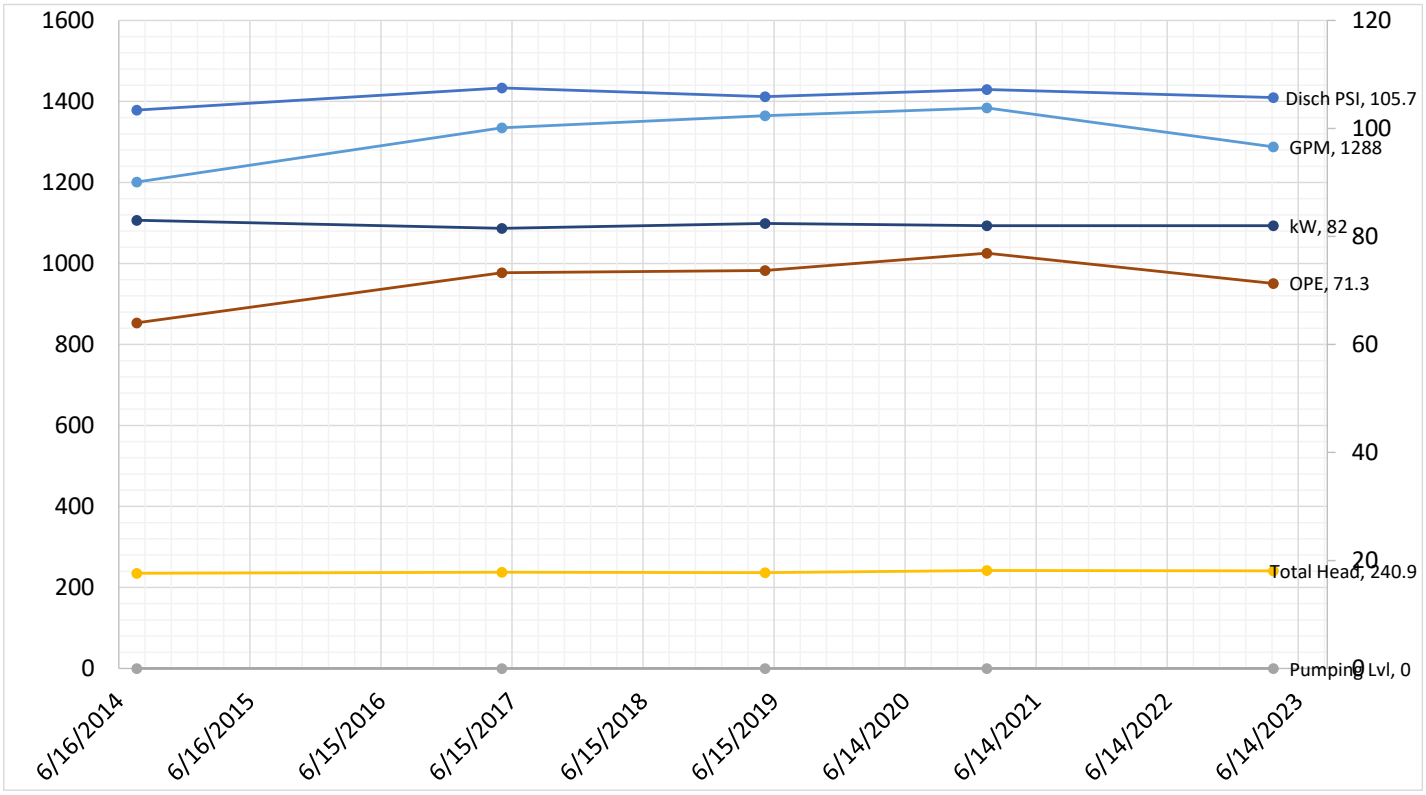
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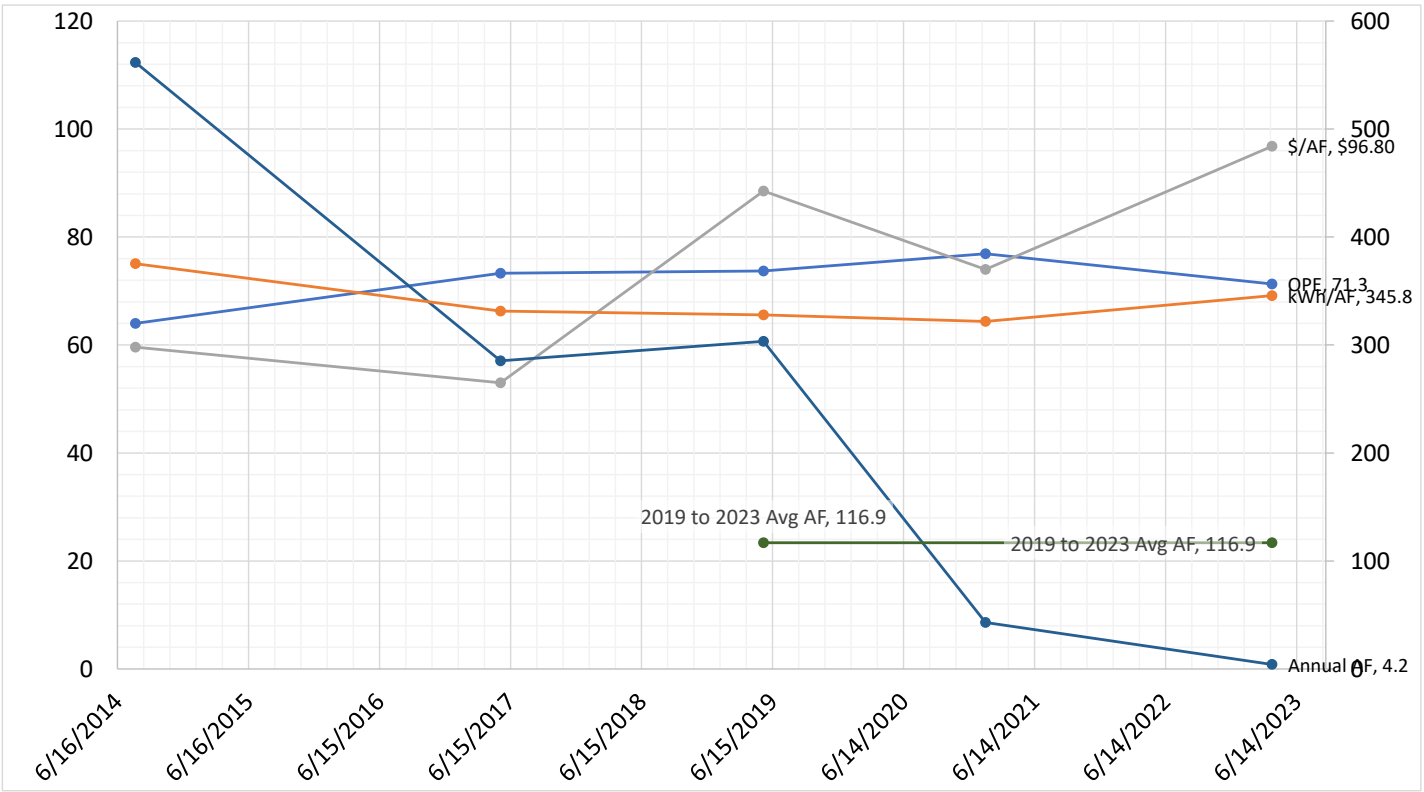
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JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 12 B1
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35260





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JOHN ROBLES
UPLAND, CITY OF
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UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 12 B2

Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35259

In accordance with your request, an energy efficiency test was performed on your centrifugal booster pump on April 6, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 100

Pump: WORTH No: A66278
Motor: MARAT No: T28688

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	103.2	105.1	107.4
Discharge Head, Feet	238.4	242.8	248.1
Suction Head, Feet	10.9	10.6	10.9
Total Head, Feet	227.5	232.2	237.2
Capacity, GPM	1,089	855	230
Acre Feet Pumped in 24 Hours	4.813	3.779	1.017
kW Input to Motor	68.7	61.4	41.0
HP Input to Motor	92.1	82.3	55.0
Motor Load (%)	84.9	75.9	50.7
Measured Speed of Pump, RPM	1,784		
Customer Meter, GPM			
kWH per Acre Foot	**343**	**390**	**968**
Overall Plant Efficiency (%)	**67.9**	**60.9**	**25.1**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. Pump impeller is most likely worn. Flow drops drastically when throttling.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

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JOHN ROBLES
UPLAND, CITY OF
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PUMPING COST ANALYSIS: PLT 12 B2
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35259

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on April 06, 2023, billing history for the past 12 months, and your current rate of TP2D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 67.9% to 70%.
2) This can save you up to 2 kWh and $1 annually.
3) These kWh savings translate to a .00-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2019 and 2023, the average annual acre-feet is .

Annual	Existing	Improved	Savings
Total kWh	**72**	**70**	**2**
kW Input	**68.70**	**66.66**	**2.04**
kWh per Acre-Foot	**343**	**332**	**10**
Acre-Feet per Year	**0.2**		
Average Cost per kWH	**$0.28000**		
Average Cost per Acre-Foot	**$95.93**	**$93.08**	**$2.85**
Overall Plant Efficiency (%)	**67.92**	**70.00**	
Total Annual Cost	**$20**	**$20**	**$1**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

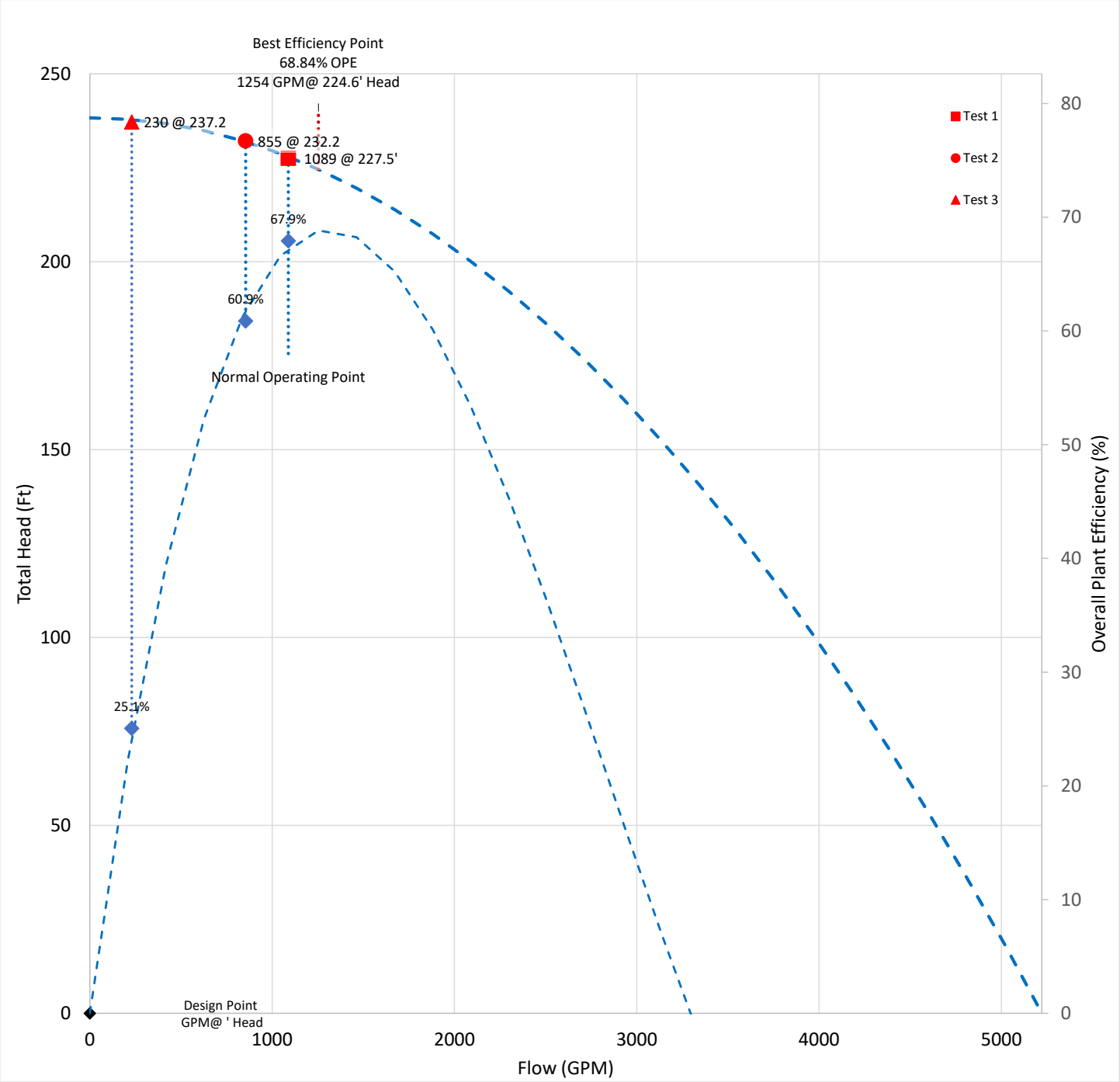
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JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 12 B2
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35259



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1254	224.6	68.84%
Normal	1089	227.5	67.92%
Second	855	232.2	60.88%
Third	230	237.2	25.06%

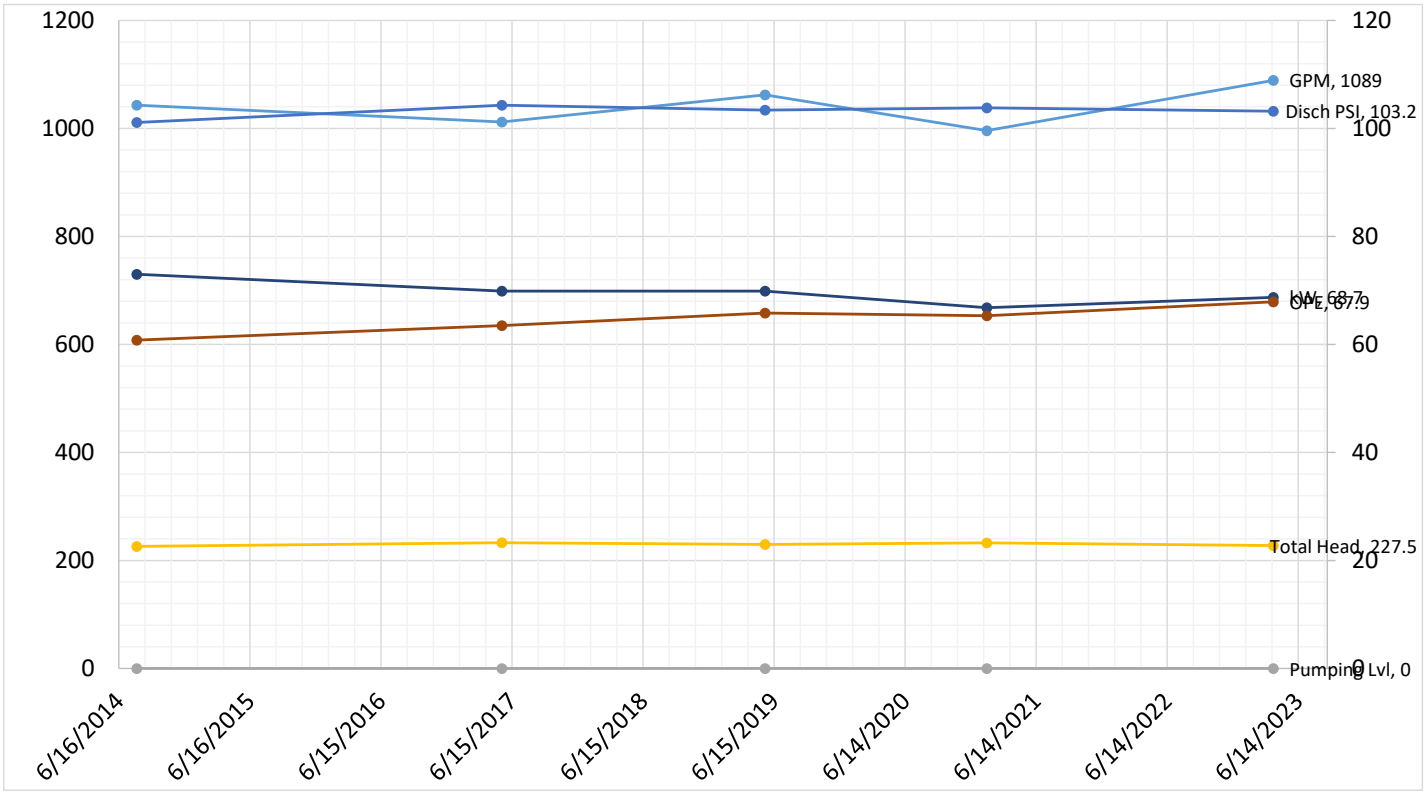
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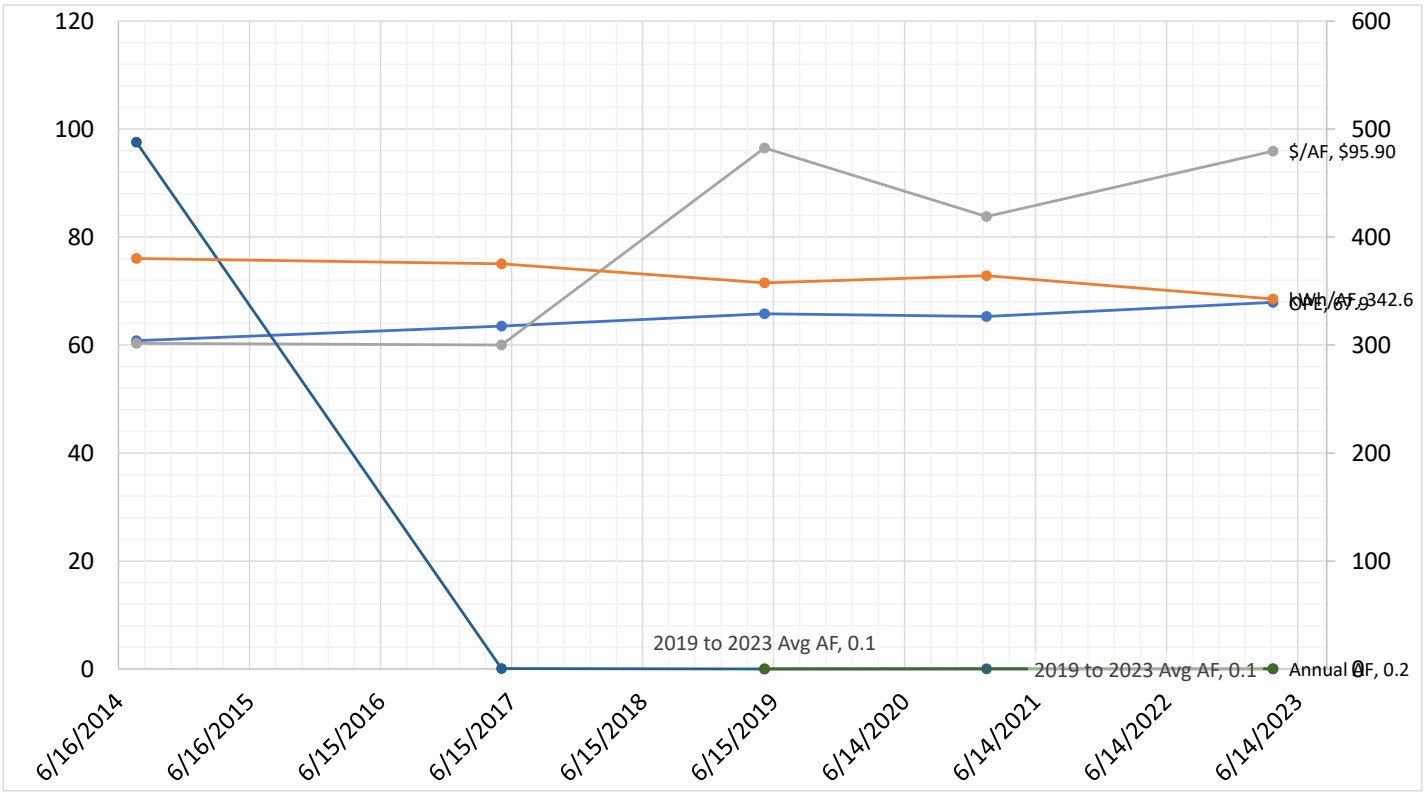
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Pump Name: PLT 12 B2
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35259





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JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: PLT 12 B3

Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35258

In accordance with your request, an energy efficiency test was performed on your centrifugal booster pump on April 6, 2023. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 100

Pump: PRLES No: 205065
Motor: US No: 1322334

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	106.3	116.7	126.7
Discharge Head, Feet	245.6	269.6	292.7
Suction Head, Feet	10.6	9.9	9.5
Total Head, Feet	234.9	259.6	283.2
Capacity, GPM	1,353	1,034	524
Acre Feet Pumped in 24 Hours	5.980	4.570	2.316
kW Input to Motor	81.7	72.9	52.1
HP Input to Motor	109.6	97.8	69.9
Motor Load (%)	101.0	90.1	64.4
Measured Speed of Pump, RPM	1,785		
Customer Meter, GPM			
kWH per Acre Foot	**328**	**383**	**540**
Overall Plant Efficiency (%)	**73.3**	**69.4**	**53.6**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

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April 27, 2023

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: PLT 12 B3

Location:	1258 W 9TH ST UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8000185728
Meter:	359150-006501	Pump Ref. #:	35258

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on April 06, 2023, billing history for the past 12 months, and your current rate of TP2D49.

1) Based on SCE testing between 2019 and 2023, the average annual acre-feet is 463.

Annual	
Total kWh	**160,632**
kW Input	**81.70**
kWh per Acre-Foot	**328**
Acre-Feet per Year	**489.8**
Average Cost per kWH	**$0.28000**
Average Cost per Acre-Foot	**$91.82**
Overall Plant Efficiency (%)	**73.26**
Total Annual Cost	**$44,977**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
PUMP TEST AND HYDRAULIC SERVICES

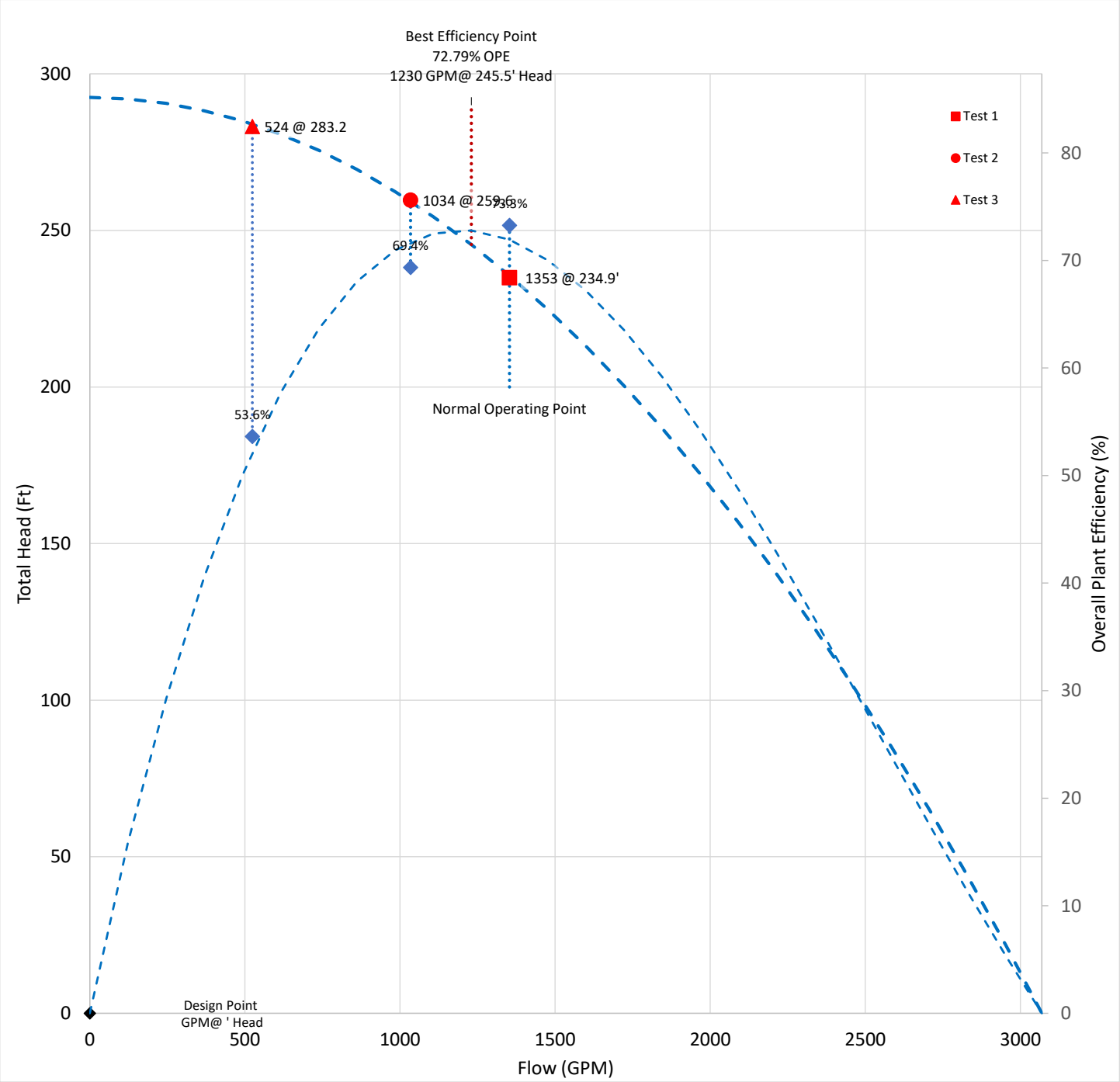
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April 27, 2023

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 12 B3
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35258



Point Name	GPM	Head	Plant Efficiency
Design			
Best Efficiency	1230	245.5	72.79%
Normal	1353	234.9	73.26%
Second	1034	259.6	69.35%
Third	524	283.2	53.64%

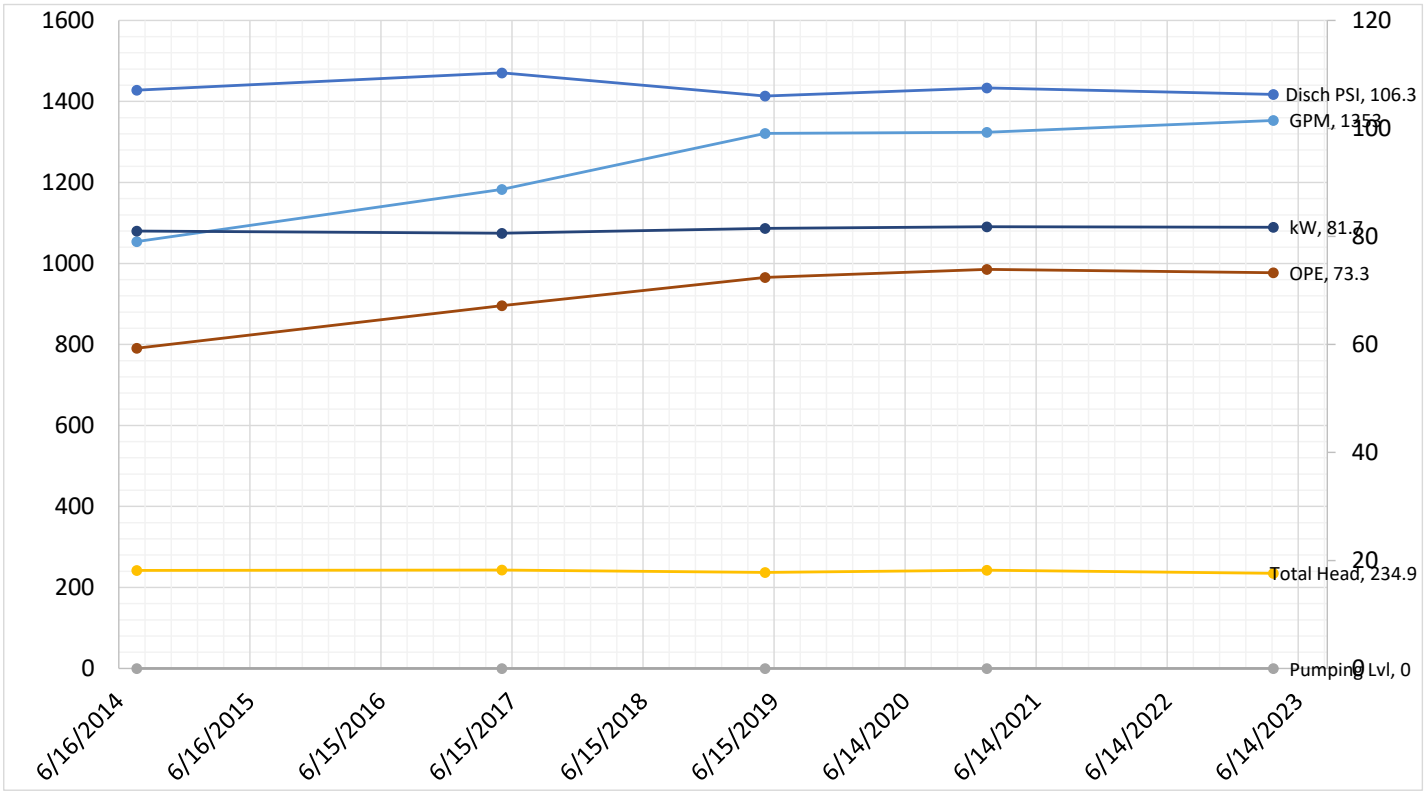
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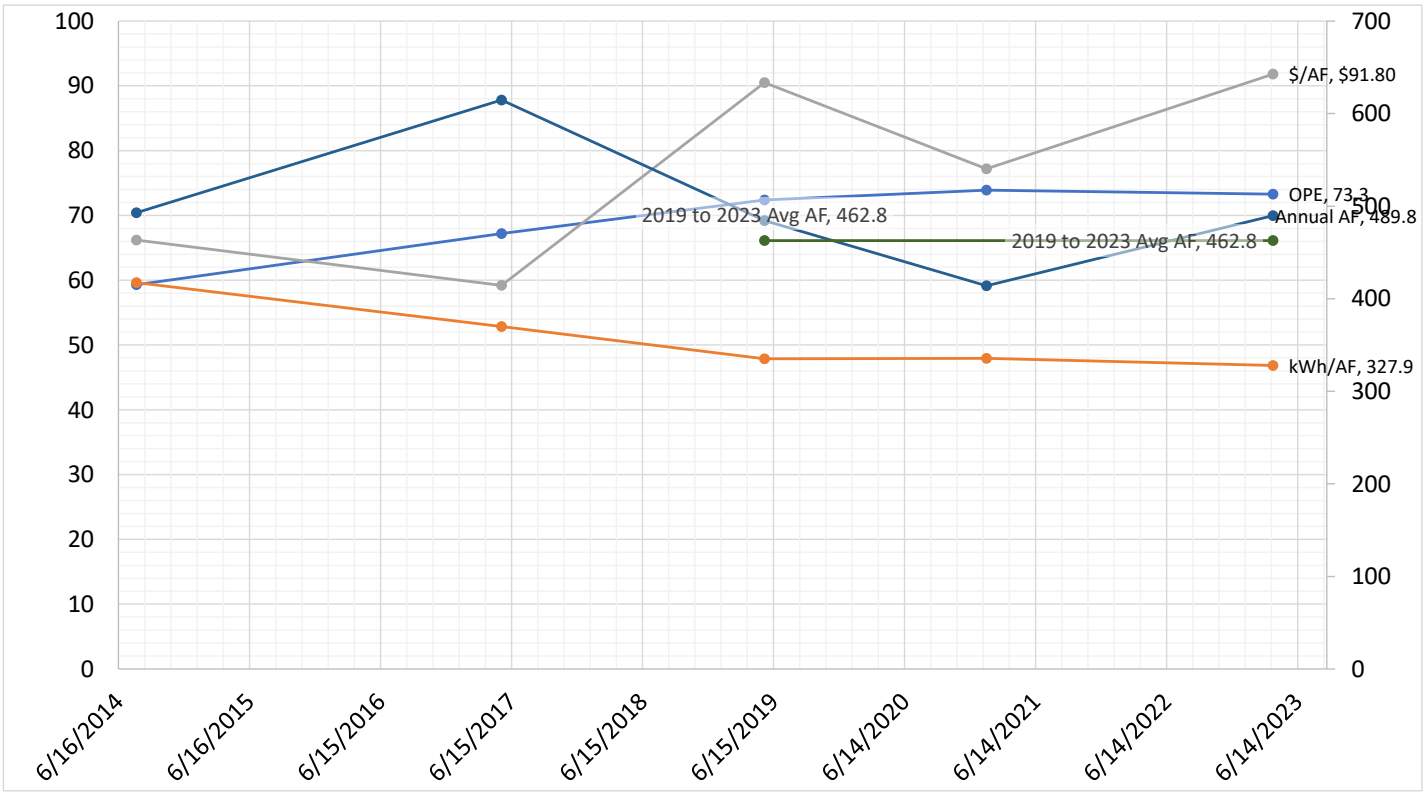
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April 27, 2023

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: PLT 12 B3
Location: 1258 W 9TH ST UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000185728
Meter: 359150-006501 Pump Ref. #: 35258





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October 28, 2022

JOHN ROBLES
WEST END CONSOLIDATED WATER
PO BOX 460
UPLAND, CA 91785-0460

HYDRAULIC TEST RESULTS: WEST END W4
Location: 1850 W 16TH ST UPLAND CA US 91784
Bus.Part.ID: 1003698483 Contract ID: 8000179906
Meter: V349N-007118 Pump Ref. #: 13421

In accordance with your request, an energy efficiency test was performed on your turbine well pump on October 4, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 150
Pump: VERTI No:
Motor: US No: 092380008R0001

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	106.4	74.1	53.8
Standing Water Level, Feet			
Drawdown, Feet			
Discharge Head, Feet	245.8	171.2	124.3
Pumping Water Level, Feet	401.8	408.5	413.3
Total Head, Feet	647.6	579.7	537.6
Capacity, GPM	569	647	698
GPM per Foot Drawdown			
Acre Feet Pumped in 24 Hours	2.515	2.860	3.085
kW Input to Motor	106.0	108.9	109.6
HP Input to Motor	142.1	146.0	147.0
Motor Load (%)	90.8	93.3	93.9
Measured Speed of Pump, RPM	1,784		
Customer Meter, GPM	562	641	692
kWH per Acre Foot	**1,012**	**914**	**853**
Overall Plant Efficiency (%)	**65.5**	**64.9**	**64.5**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. At the time of arrival of the test crew, the pump was operating and was not shut down to obtain a standing water level. Recommend VFD for well due to throttling so pump doesn't break suction.

RON FORD
Manager
HYDRAULIC SERVICES

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RIALTO, CA 92376

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October 28, 2022

JOHN ROBLES
WEST END CONSOLIDATED WATER
PO BOX 460
UPLAND, CA 91785-0460

PUMPING COST ANALYSIS: WEST END W4
Location: 1850 W 16TH ST UPLAND CA US 91784
Bus.Part.ID: 1003698483 Contract ID: 8000179906
Meter: V349N-007118 Pump Ref. #: 13421

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 04, 2022, billing history for the past 12 months, and your current rate of TP2D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 65.5% to 69%.
2) This can save you up to 21,753 kWh and $3,915 annually.
3) These kWh savings translate to a 11.57-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2018 and 2022, the average annual acre-feet is 566.

Annual	Existing	Improved	Savings
Total kWh	**424,032**	**402,279**	**21,753**
kW Input	**106.00**	**100.56**	**5.44**
kWh per Acre-Foot	**1012**	**960**	**52**
Acre-Feet per Year	**419.1**		
Average Cost per kWH	**$0.18000**		
Average Cost per Acre-Foot	**$182.11**	**$172.77**	**$9.34**
Overall Plant Efficiency (%)	**65.46**	**69.00**	
Total Annual Cost	**$76,326**	**$72,410**	**$3,915**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

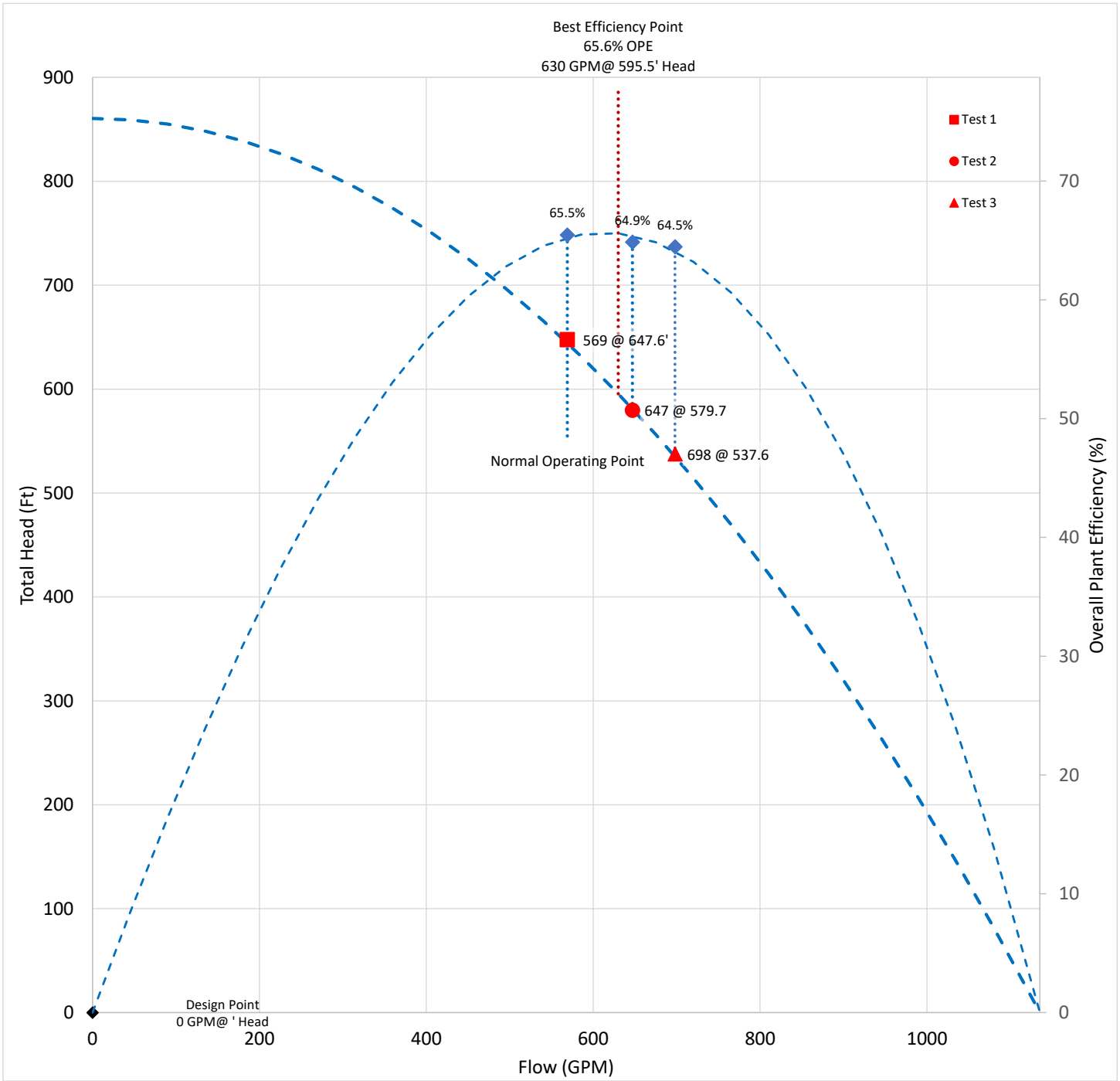
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October 28, 2022

JOHN ROBLES
WEST END CONSOLIDATED WATER
PO BOX 460
UPLAND, CA 91785-0460

Pump Name: WEST END W4
Location: 1850 W 16TH ST UPLAND CA US 91784
Bus.Part.ID: 1003698483 Contract ID: 8000179906
Meter: V349N-007118 Pump Ref. #: 13421



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	630	595.5	65.60%
Normal	569	647.6	65.46%
Second	647	579.7	64.85%
Third	698	537.6	64.47%

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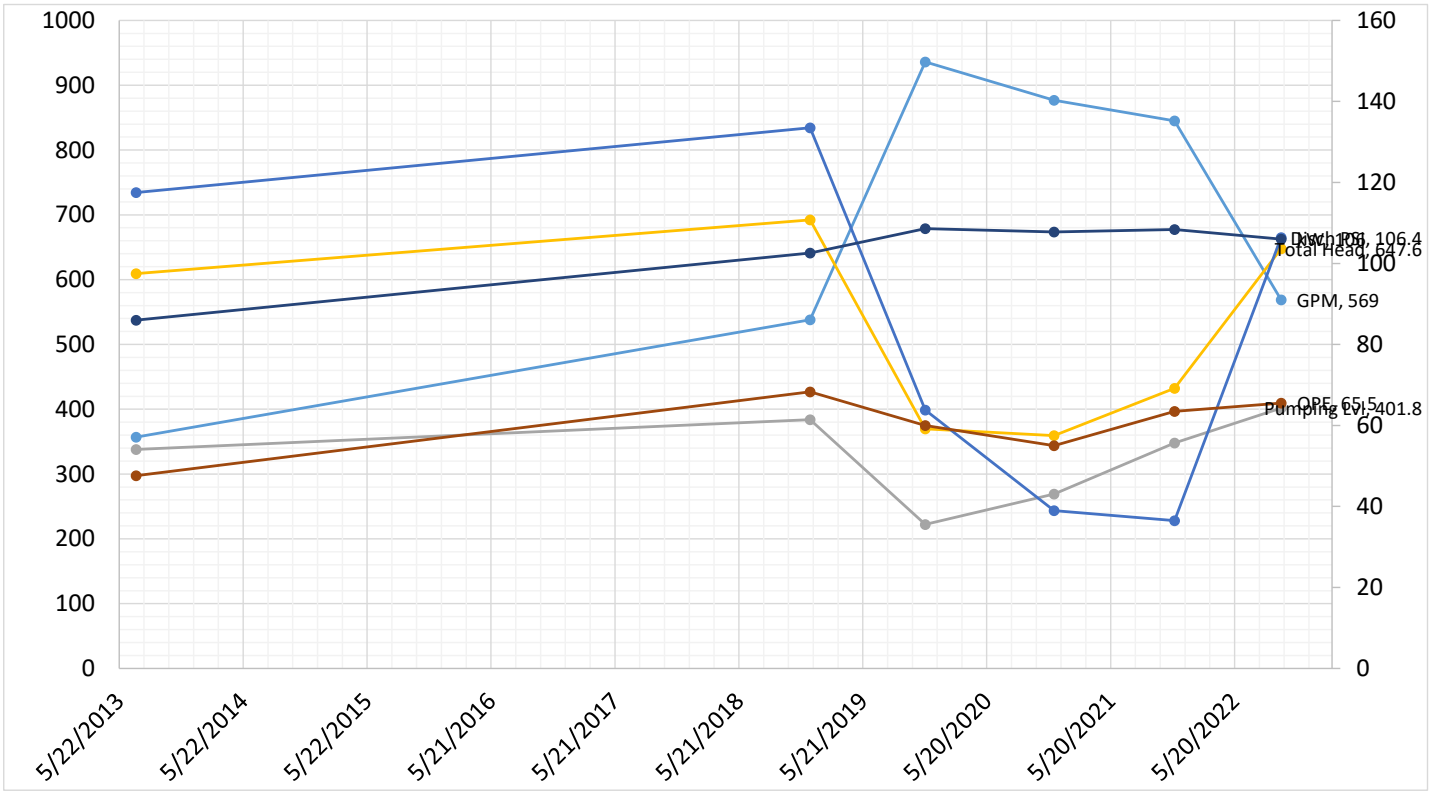
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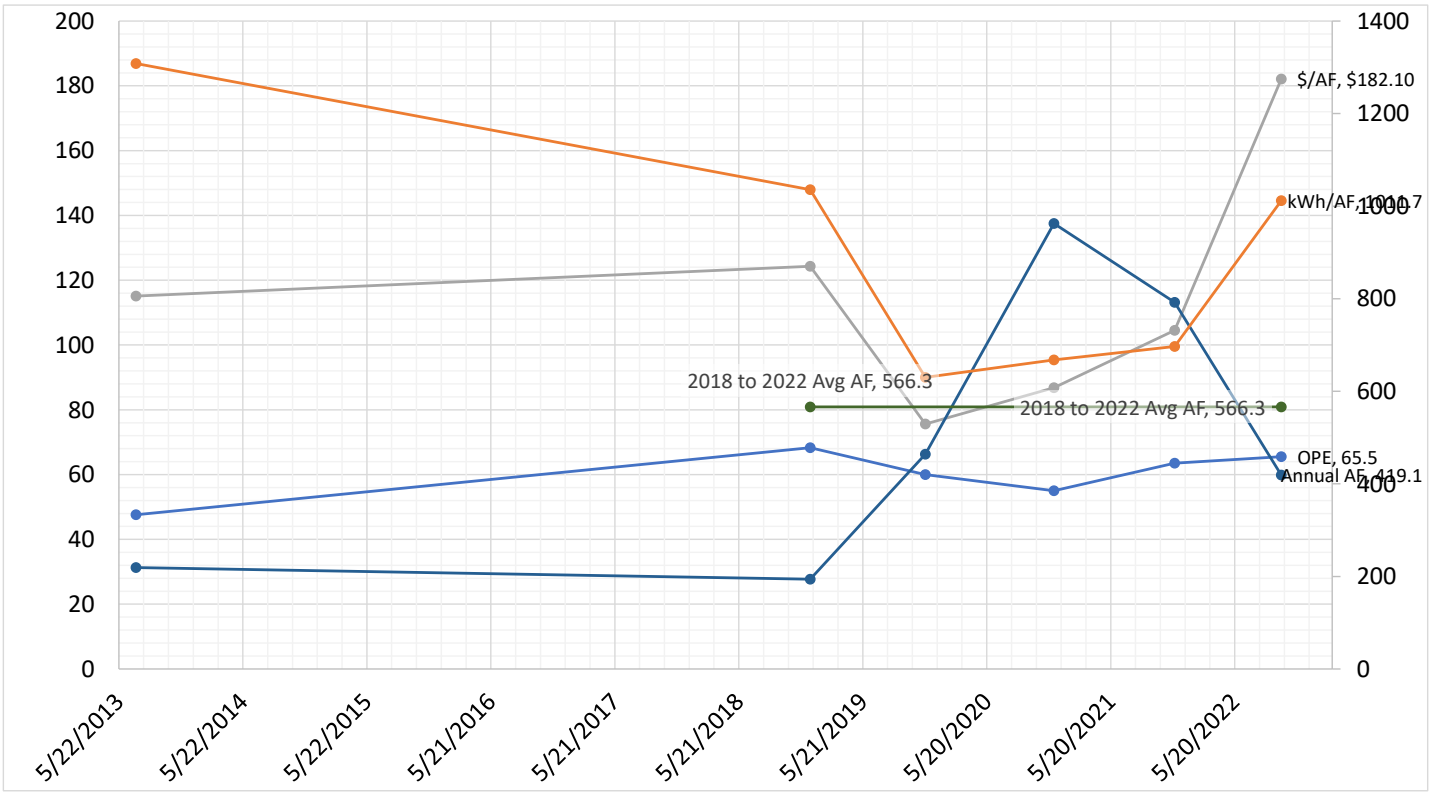
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October 28, 2022

JOHN ROBLES
WEST END CONSOLIDATED WATER
PO BOX 460
UPLAND, CA 91785-0460

Pump Name: WEST END W4
Location: 1850 W 16TH ST UPLAND CA US 91784
Bus.Part.ID: 1003698483 Contract ID: 8000179906
Meter: V349N-007118 Pump Ref. #: 13421





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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: WELL #5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14088

In accordance with your request, an energy efficiency test was performed on your submersible well pump on October 6, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 125
Pump: Exodyne No: G8970202B
Motor: EXODYNE No: G89702026

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	6.9	1.9	14.6
Standing Water Level, Feet			
Drawdown, Feet			
Discharge Head, Feet	15.9	4.4	33.7
Pumping Water Level, Feet	304.8	311.9	289.8
Total Head, Feet	320.7	316.3	323.5
Capacity, GPM	558	609	501
GPM per Foot Drawdown			
Acre Feet Pumped in 24 Hours	2.466	2.692	2.214
kW Input to Motor	65.5	66.7	62.2
HP Input to Motor	87.8	89.4	83.4
Motor Load (%)	61.1	62.3	58.1
Customer Meter, GPM	557	607	498
kWH per Acre Foot	**637**	**595**	**674**
Overall Plant Efficiency (%)	**51.5**	**54.4**	**49.1**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. At the time of arrival of the test crew, the pump was operating and was not shut down to obtain a standing water level. Well is run throttled. Recommend VFD.

RON FORD
Manager
HYDRAULIC SERVICES

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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: WELL #5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14088

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 06, 2022, billing history for the past 12 months, and your current rate of TP3D49.

Assuming the water requirements will be the same as for the past year, and all operating conditions (annual hours of operation, head above and water pumping level) will remain the same as they were at the time of the pump test, it is estimated that:

1) Overall plant efficiency can be improved from 51.5% to 65%.
2) This can save you up to 72,091 kWh and $12,976 annually.
3) These kWh savings translate to a 38.35-ton decrease in CO^2 emissions.
4) Based on SCE testing between 2017 and 2022, the average annual acre-feet is 864.

Annual	**Existing**	**Improved**	**Savings**
Total kWh	**345,924**	**273,833**	**72,091**
kW Input	**65.50**	**51.85**	**13.65**
kWh per Acre-Foot	**637**	**505**	**133**
Acre-Feet per Year	**542.6**		
Average Cost per kWH	**$0.18000**		
Average Cost per Acre-Foot	**$114.75**	**$90.83**	**$23.91**
Overall Plant Efficiency (%)	**51.45**	**65.00**	
Total Annual Cost	**$62,266**	**$49,290**	**$12,976**

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

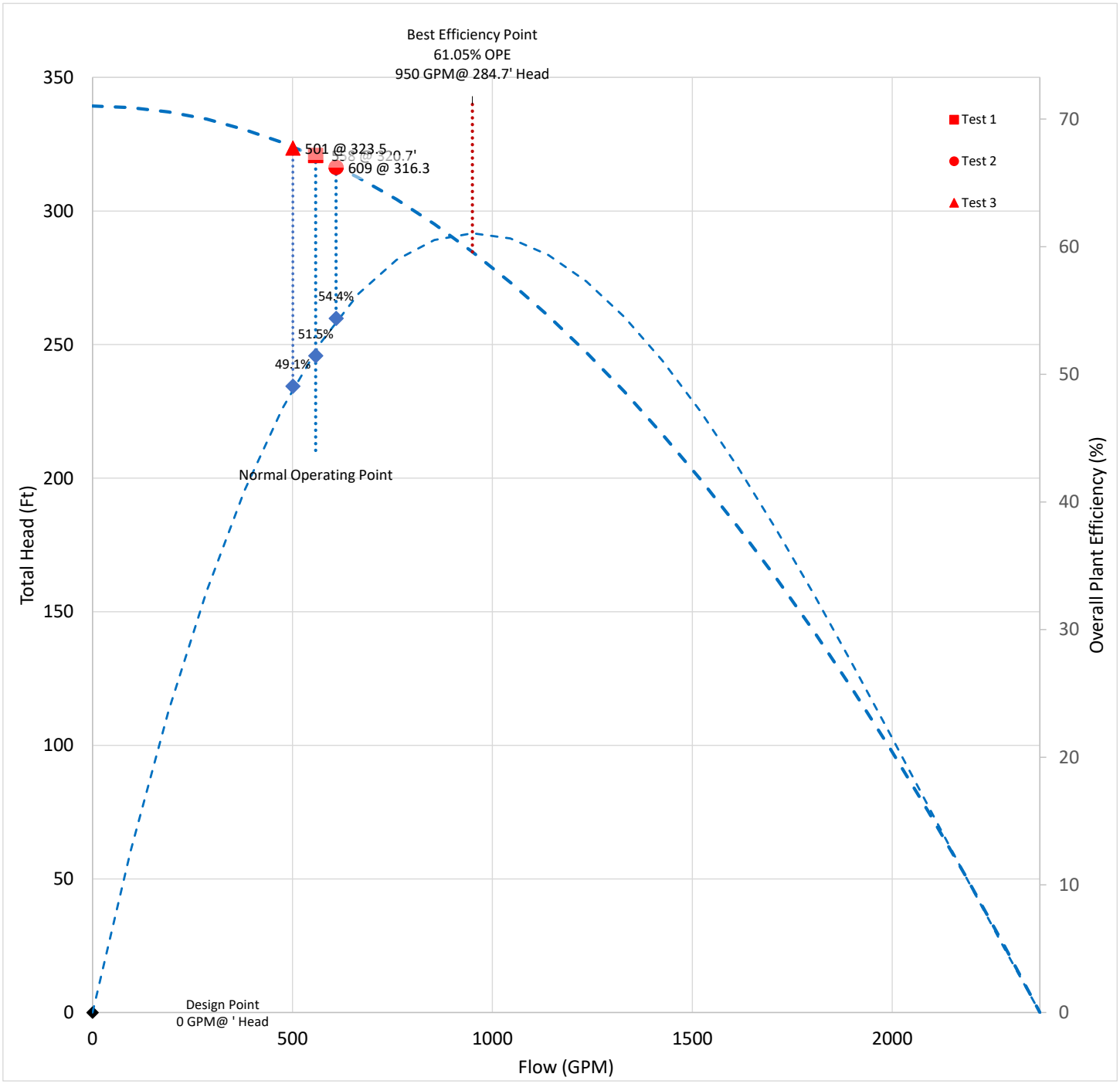
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: WELL #5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14088



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	950	284.7	61.05%
Normal	558	320.7	51.45%
Second	609	316.3	54.38%
Third	501	323.5	49.07%

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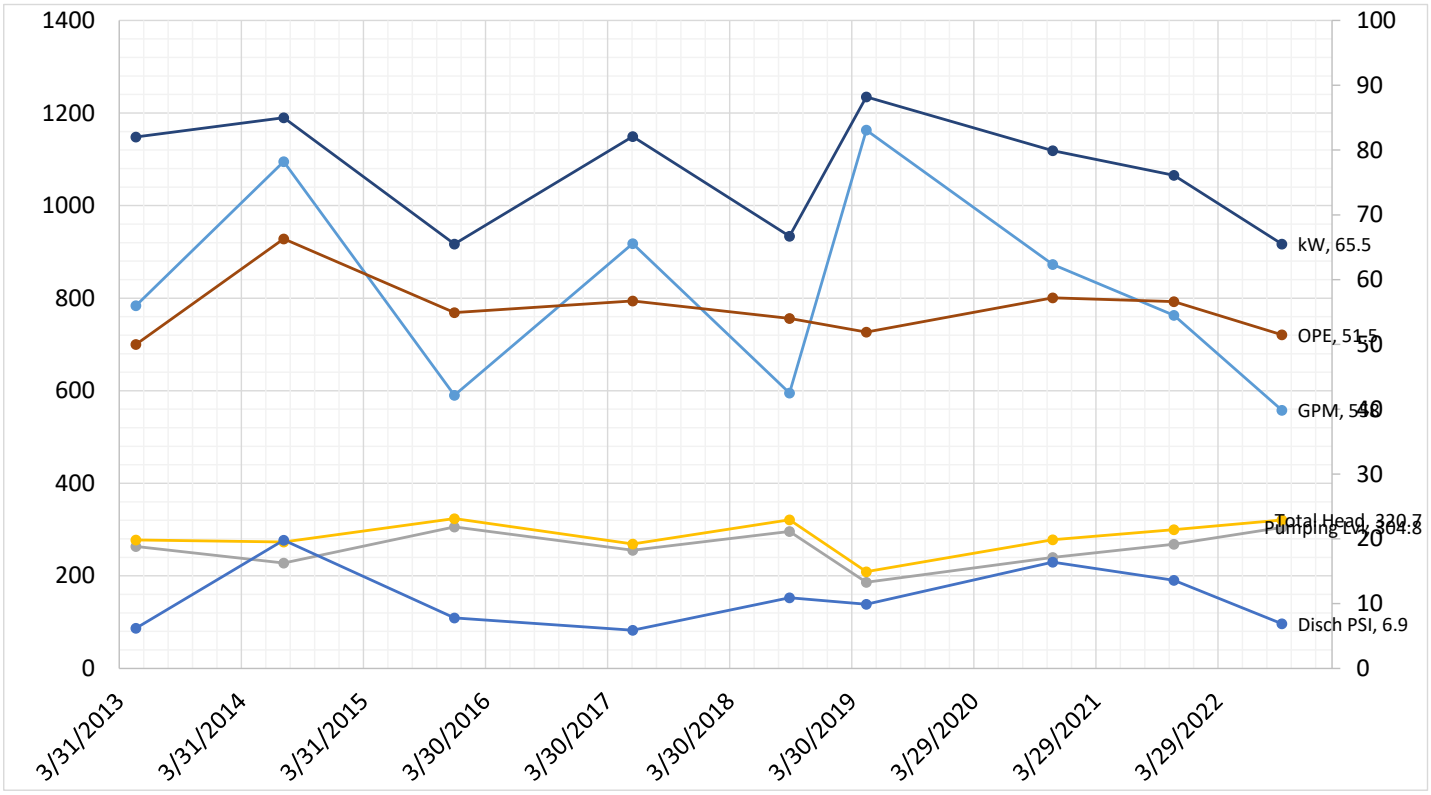
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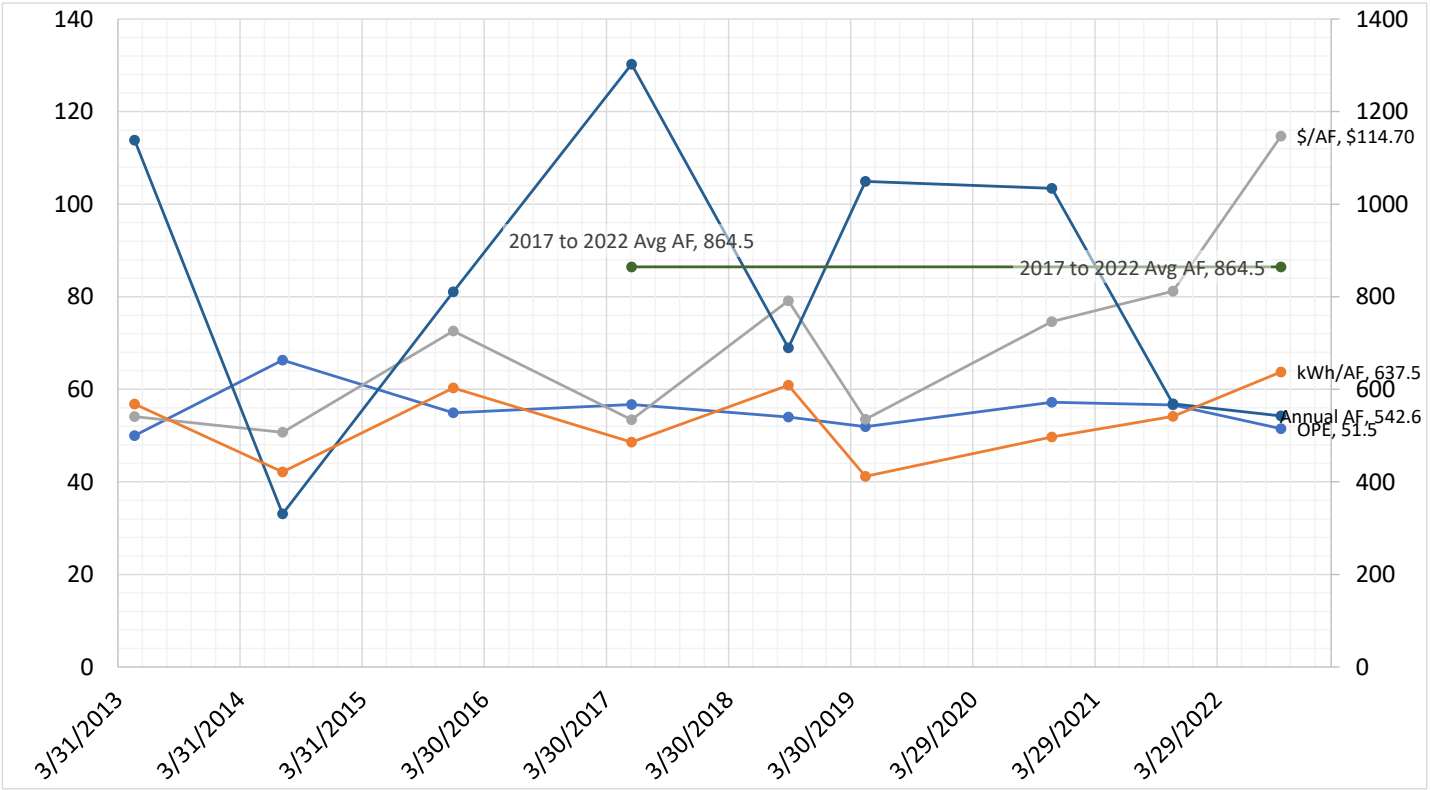
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: WELL #5
Location: 1090 W 22ND ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000980021
Meter: V349N-013216 Pump Ref. #: 14088





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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: WELL #8
Location: 149 N BENSON AVE UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000182858
Meter: 259000-077891 Pump Ref. #: 7106

In accordance with your request, an energy efficiency test was performed on your turbine well pump on October 11, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 200
Pump: VERT No: D11578
Motor: US No: 82001498005R03

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	12.6	22.7	33.9
Standing Water Level, Feet			
Drawdown, Feet			
Discharge Head, Feet	29.1	52.4	78.3
Pumping Water Level, Feet	581.7	580.2	578.3
Total Head, Feet	610.8	632.6	656.6
Capacity, GPM	728	667	583
GPM per Foot Drawdown			
Acre Feet Pumped in 24 Hours	3.218	2.948	2.577
kW Input to Motor	127.1	123.5	116.3
HP Input to Motor	170.4	165.6	156.0
Motor Load (%)	82.0	79.7	75.0
Measured Speed of Pump, RPM	1,788		
Customer Meter, GPM	726	667	582
kWH per Acre Foot	**948**	**1,006**	**1,083**
Overall Plant Efficiency (%)	**65.9**	**64.3**	**62.0**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. At the time of arrival of the test crew, the pump was operating and was not shut down to obtain a standing water level.

RON FORD
Manager
HYDRAULIC SERVICES

SOUTHERN CALIFORNIA EDISON
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: WELL #8

Location:	149 N BENSON AVE UPLAND CA US 91786		
Bus.Part.ID:	1003638587	Contract ID:	8000182858
Meter:	259000-077891	Pump Ref. #:	7106

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 11, 2022, billing history for the past 12 months, and your current rate of TP2D49.

1) Based on SCE testing between 2017 and 2022, the average annual acre-feet is 314.

Annual	
Total kWh	**349,824**
kW Input	**127.10**
kWh per Acre-Foot	**948**
Acre-Feet per Year	**369.0**
Average Cost per kWH	**$0.20000**
Average Cost per Acre-Foot	**$189.63**
Overall Plant Efficiency (%)	**65.88**
Total Annual Cost	**$69,965**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

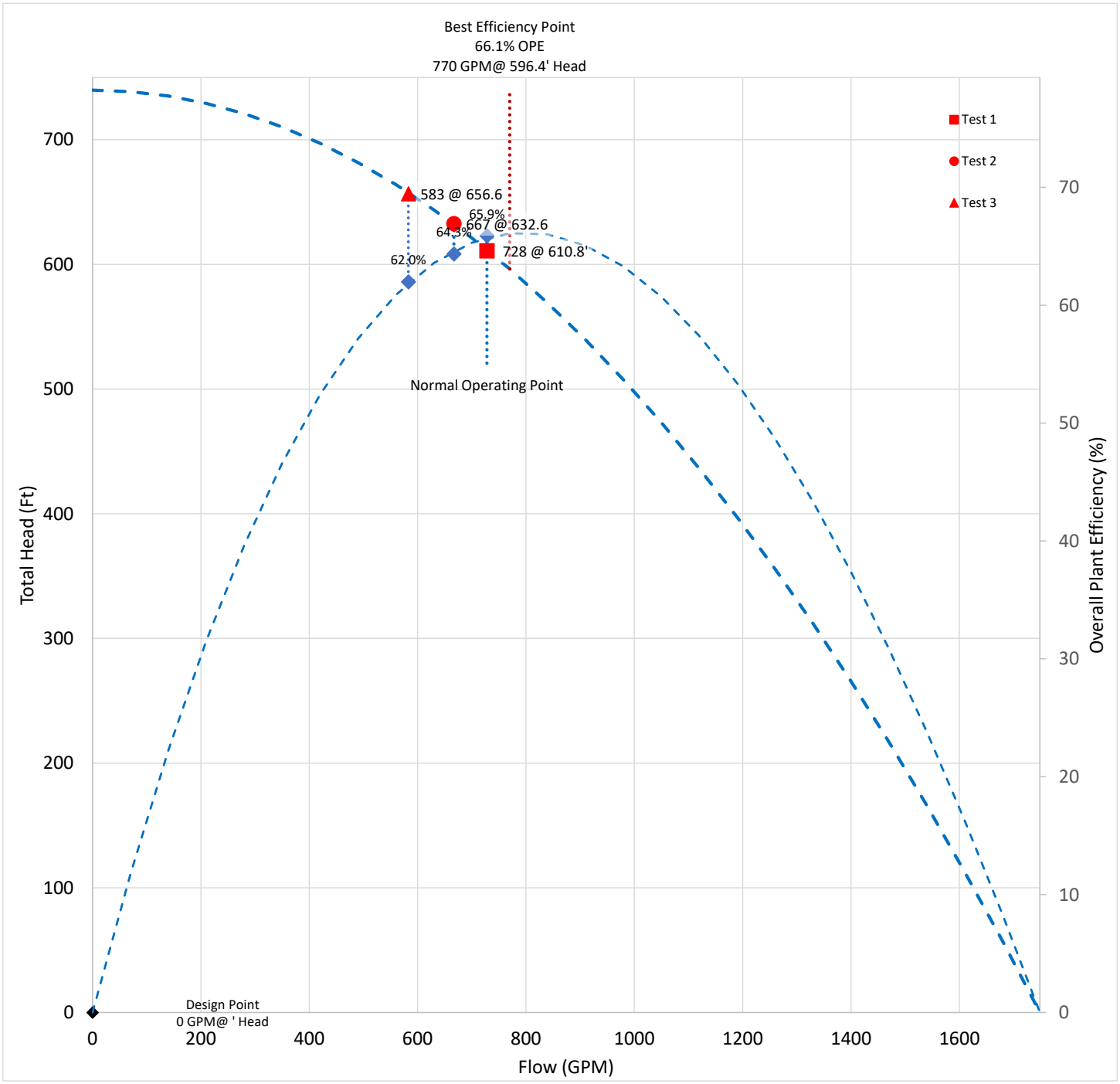
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: WELL #8
Location: 149 N BENSON AVE UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000182858
Meter: 259000-077891 Pump Ref. #: 7106



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	770	596.4	66.10%
Normal	728	610.8	65.88%
Second	667	632.6	64.34%
Third	583	656.6	61.98%

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RIALTO, CA 92376

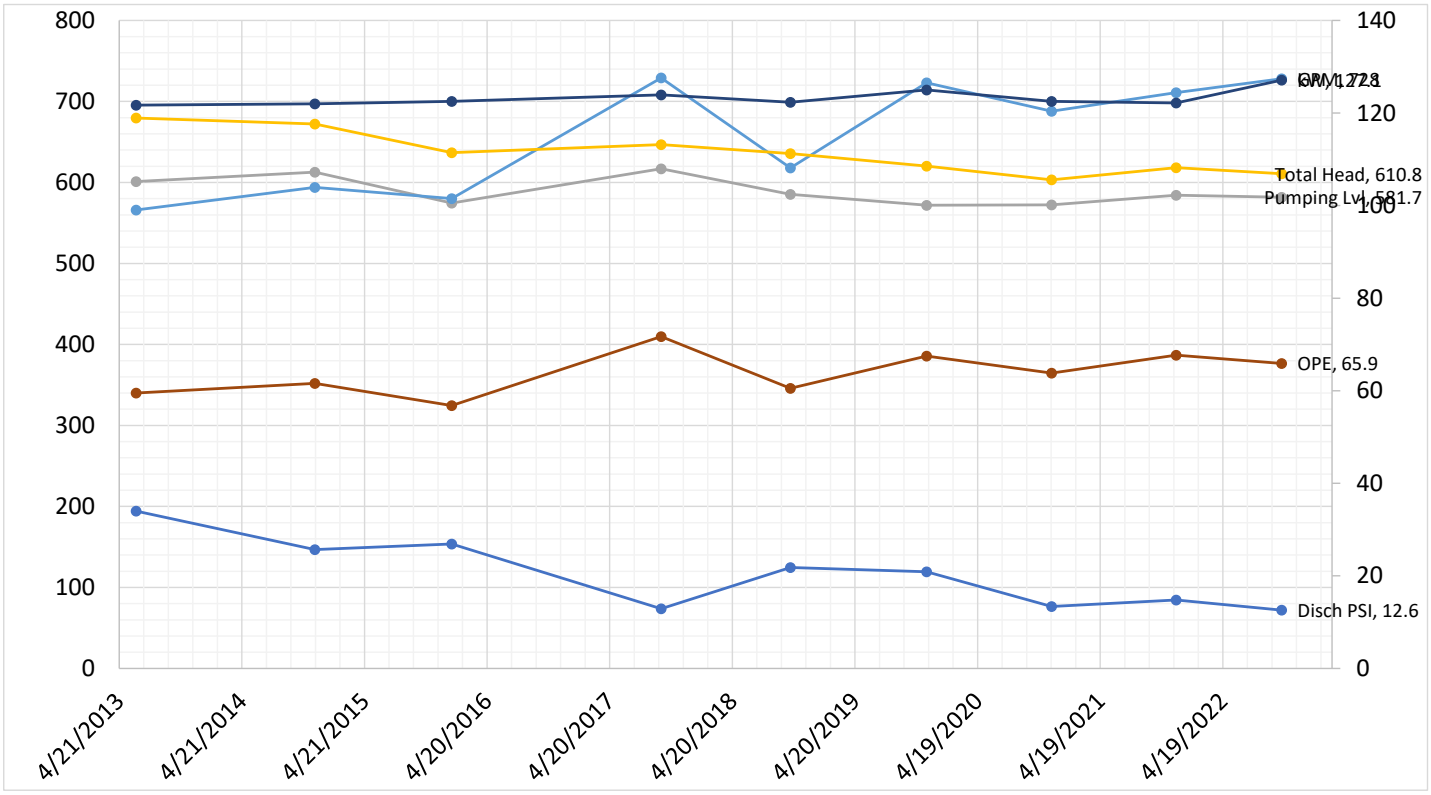
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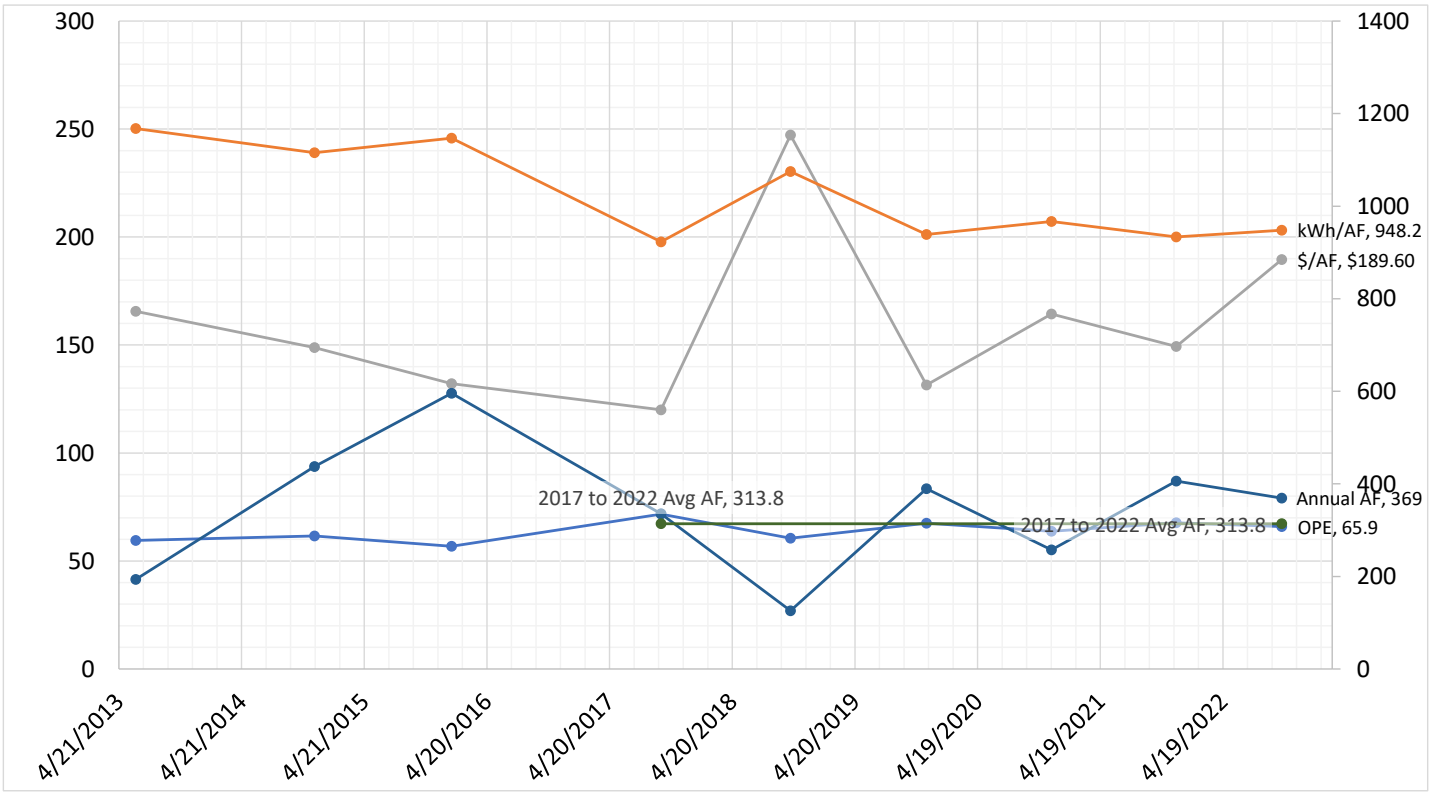
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

Pump Name: WELL #8
Location: 149 N BENSON AVE UPLAND CA US 91786
Bus.Part.ID: 1003638587 Contract ID: 8000182858
Meter: 259000-077891 Pump Ref. #: 7106





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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: WELL 15
Location: 2006 N CAMPUS AVE UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8004135168
Meter: V349N-000013 Pump Ref. #: 14194

In accordance with your request, an energy efficiency test was performed on your turbine well pump on October 6, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment
HP: 500
Pump: FLOWY No: 1711201
Motor: US No: 6472490001GT01

Results	Test 1	Test 2	Test 3
Discharge Pressure, PSI	47.1	85.3	110.6
Standing Water Level, Feet			
Drawdown, Feet			
Discharge Head, Feet	108.8	197.0	255.5
Pumping Water Level, Feet	615.2	603.8	590.6
Total Head, Feet	724.0	800.8	846.1
Capacity, GPM	1,759	1,477	1,276
GPM per Foot Drawdown			
Acre Feet Pumped in 24 Hours	7.775	6.528	5.640
kW Input to Motor	302.8	288.9	270.9
HP Input to Motor	406.1	387.4	363.3
Motor Load (%)	77.8	74.2	69.6
Measured Speed of Pump, RPM	1,786		
Customer Meter, GPM	1,863	1,534	1,442
kWH per Acre Foot	**935**	**1,062**	**1,153**
Overall Plant Efficiency (%)	**79.2**	**77.1**	**75.0**

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge. At the time of arrival of the test crew, the pump was operating and was not shut down to obtain a standing water level. Airline has a small leak. Pumping level is approximate.

RON FORD
Manager
HYDRAULIC SERVICES

300 NORTH PEPPER AVE
RIALTO, CA 92376

SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

Confidential / Proprietary

October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: WELL 15
Location: 2006 N CAMPUS AVE UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8004135168
Meter: V349N-000013 Pump Ref. #: 14194

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 06, 2022, billing history for the past 12 months, and your current rate of TP3D49.

1) Based on SCE testing between 2017 and 2022, the average annual acre-feet is 2,017.

Annual	
Total kWh	**2,486,820**
kW Input	**302.80**
kWh per Acre-Foot	**935**
Acre-Feet per Year	**2,660.0**
Average Cost per kWH	**$0.13000**
Average Cost per Acre-Foot	**$121.53**
Overall Plant Efficiency (%)	**79.20**
Total Annual Cost	**$323,287**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

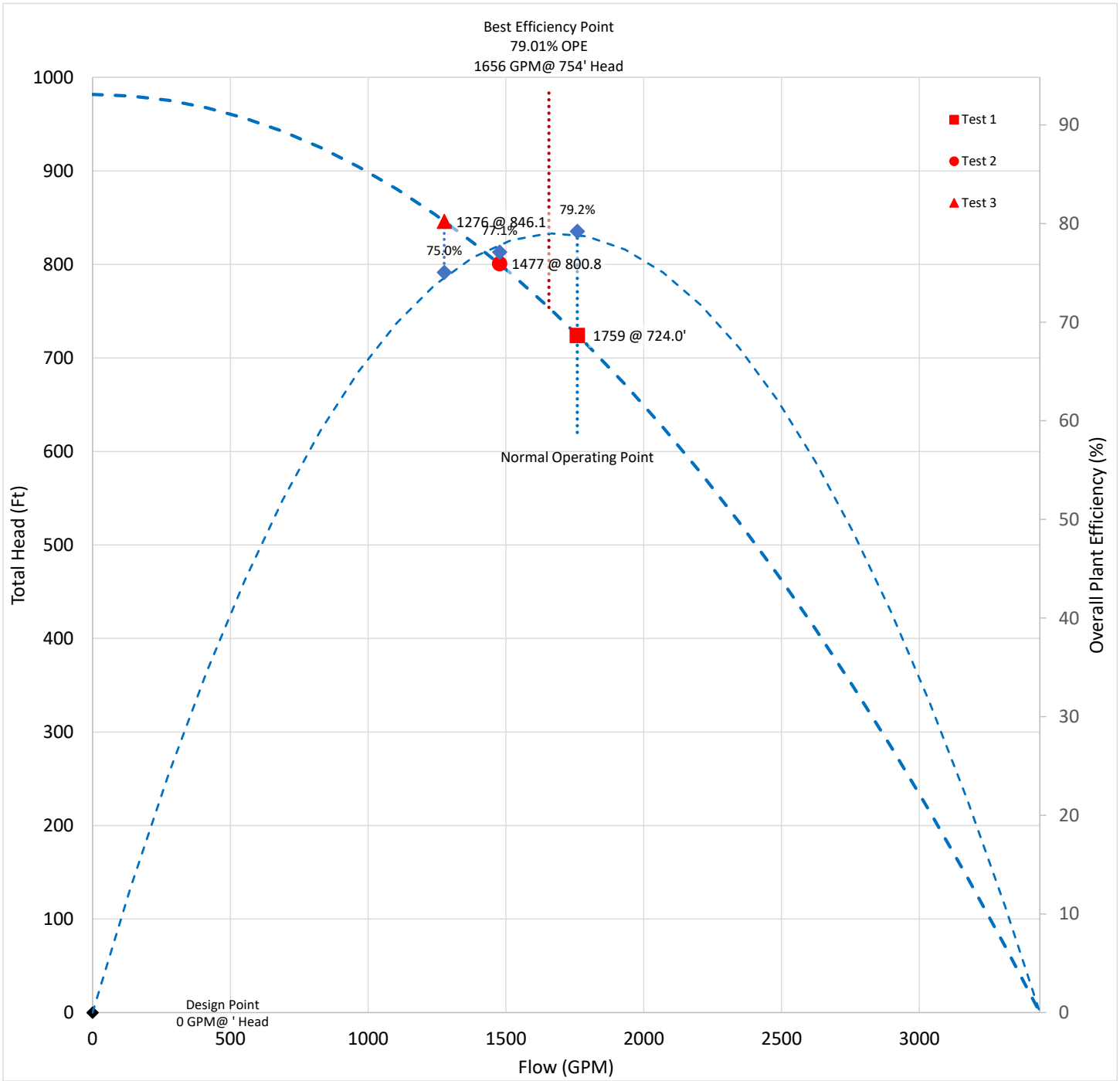
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Meter: V349N-000013 Pump Ref. #: 14194



Point Name	GPM	Head	Plant Efficiency
Design	0	0.0	
Best Efficiency	1656	754.0	79.01%
Normal	1759	724.0	79.20%
Second	1477	800.8	77.10%
Third	1276	846.1	75.05%

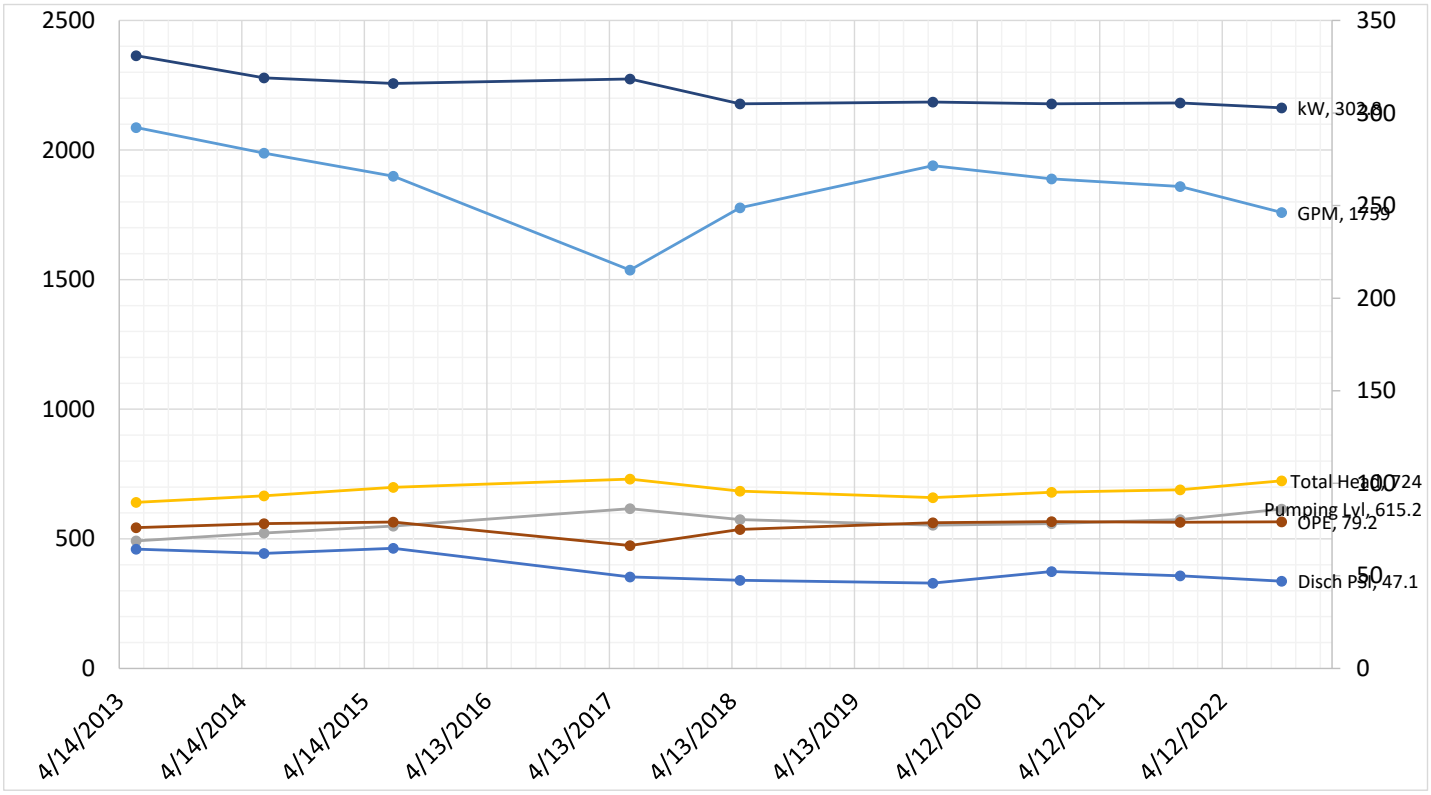
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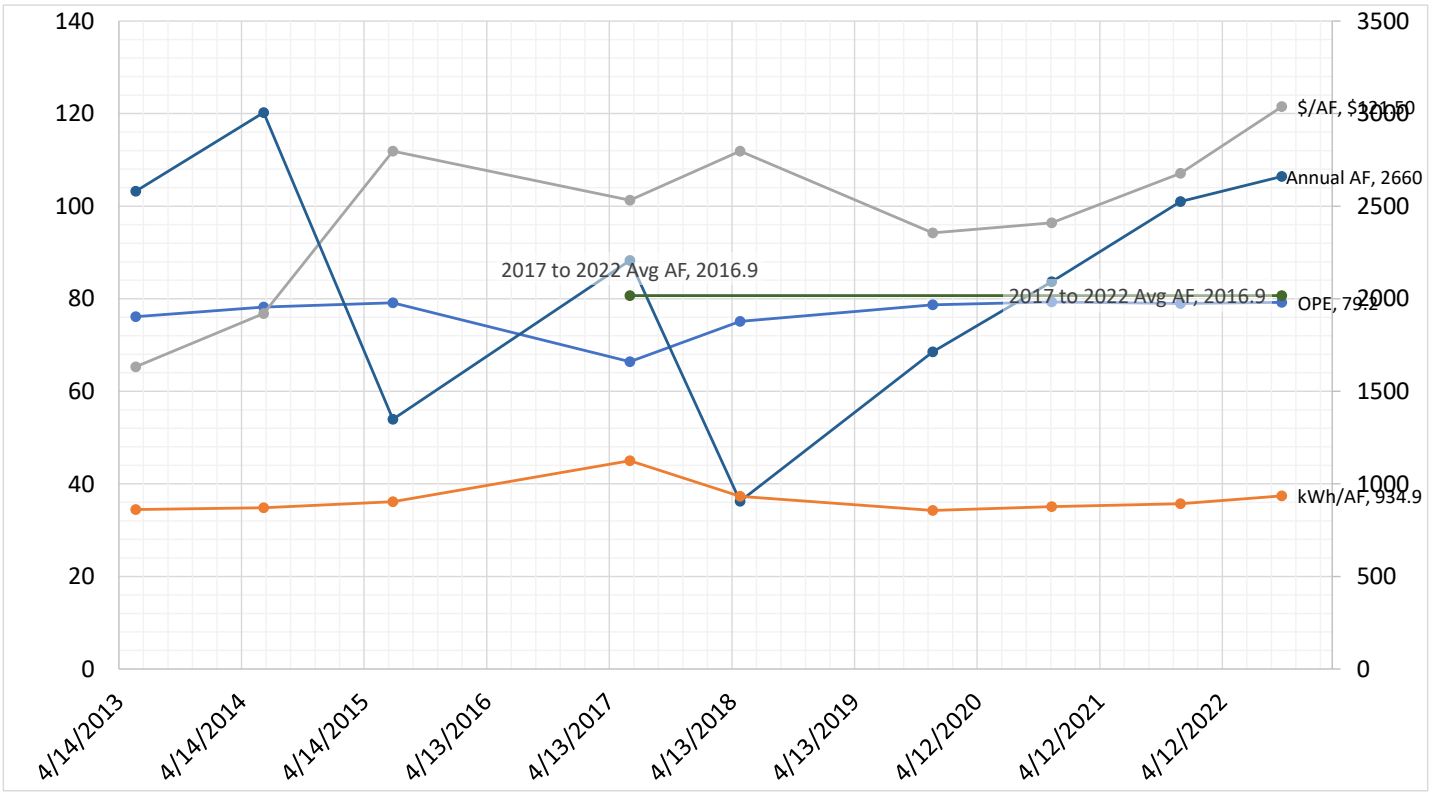
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UPLAND, CITY OF
460 N EUCLID AVE
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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

HYDRAULIC TEST RESULTS: WELL #20

Location:	401 E 19TH ST UPLAND CA US 91784		
Bus.Part.ID:	1003638587	Contract ID:	8000812727
Meter:	259000-077781	Pump Ref. #:	14984

In accordance with your request, an energy efficiency test was performed on your turbine well pump on October 11, 2022. If you have any questions regarding the results which follow, please contact ADAM MCCAMISH at (909) 820-5269.

Equipment

HP: 60

Pump:	Gould	No:	N/A
Motor:	U.S.	No:	7379180001GT01

Results	Test 1
Discharge Pressure, PSI	5.8
Standing Water Level, Feet	
Drawdown, Feet	
Discharge Head, Feet	13.4
Pumping Water Level, Feet	388.1
Total Head, Feet	401.5
Capacity, GPM	288
GPM per Foot Drawdown	
Acre Feet Pumped in 24 Hours	1.273
kW Input to Motor	33.7
HP Input to Motor	45.2
Motor Load (%)	71.6
Measured Speed of Pump, RPM	1,788
Customer Meter, GPM	288
kWH per Acre Foot	**635**
Overall Plant Efficiency (%)	**64.6**

At the time of arrival of the test crew, the pump was operating and was not shut down to obtain a standing water level.

RON FORD
Manager
HYDRAULIC SERVICES

SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

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October 28, 2022

JOHN ROBLES
UPLAND, CITY OF
460 N EUCLID AVE
UPLAND, CA 91786-4732

PUMPING COST ANALYSIS: WELL #20
Location: 401 E 19TH ST UPLAND CA US 91784
Bus.Part.ID: 1003638587 Contract ID: 8000812727
Meter: 259000-077781 Pump Ref. #: 14984

The following energy efficiency analysis is presented as an aid to your cost accounting. This is an estimate based on the conditions present during the Edison pump test performed on October 11, 2022, billing history for the past 12 months, and your current rate of TP2D49.

1) Based on SCE testing between 2017 and 2022, the average annual acre-feet is 416.

Annual	
Total kWh	**218,244**
kW Input	**33.70**
kWh per Acre-Foot	**635**
Acre-Feet per Year	**343.4**
Average Cost per kWH	**$0.16000**
Average Cost per Acre-Foot	**$101.68**
Overall Plant Efficiency (%)	**64.61**
Total Annual Cost	**$34,919**

The hydraulic test results indicate that this pump is operating in an efficient manner.

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum energy efficiency will be continued. If you have any questions regarding this report, please contact ADAM MCCAMISH at (909) 820-5269.

RON FORD
Manager
HYDRAULIC SERVICES

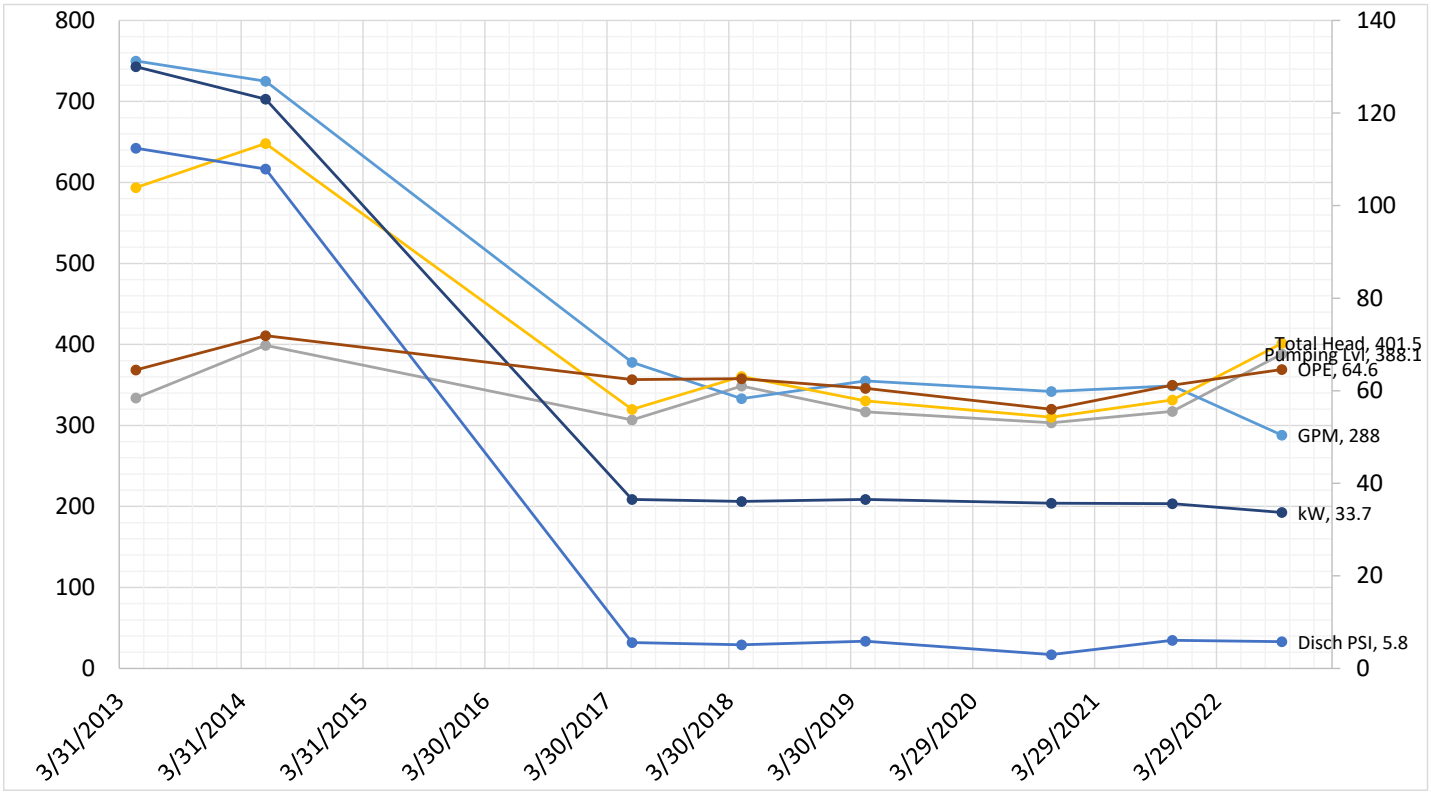
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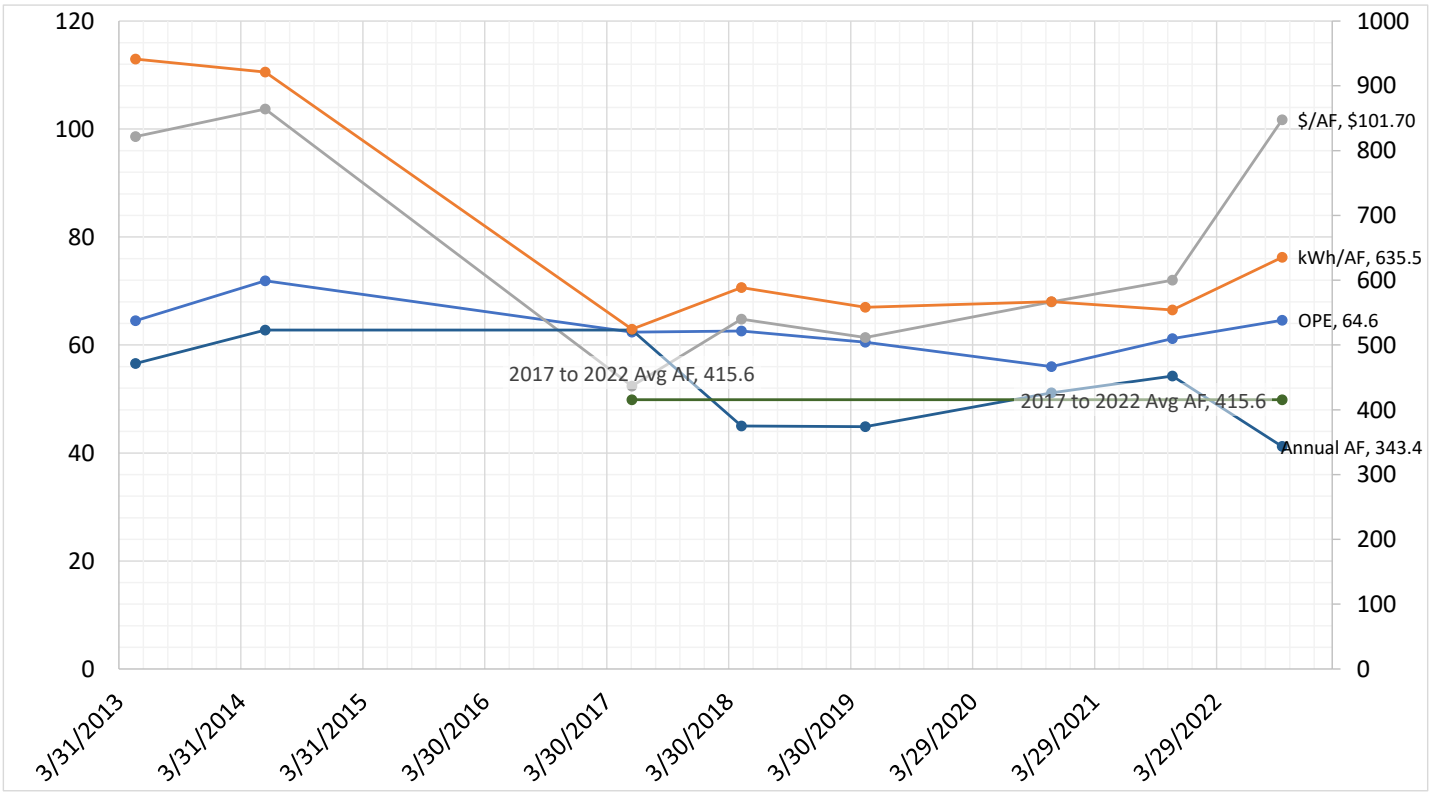
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Pump Name: WELL #20
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Bus.Part.ID: 1003638587 Contract ID: 8000812727
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Appendix F: Storage Reservoir Condition Assessment

Harper and Associates Engineering Inc. (December 2024)

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HARPER & ASSOCIATES ENGINEERING, INC.

CONSULTING ENGINEERS

1240 E. Ontario Ave., Ste. 102-312, Corona, CA 92881-8671
Phone (951) 372-9196 Fax (951) 372-9198
www.harpereng.com

PRIORITIZATION REPORT

PROJECT:	Prioritization of Twelve Potable Water Storage Reservoirs
OWNER:	City of Upland
LOCATION:	Upland, California
PREPARED BY:	Krista Harper, Principal Engineer
DATE:	December 2024

I. GENERAL INFORMATION

This report is filed in response to a request by the City of Upland for prioritization of twelve potable water storage reservoirs in their system. To prepare the Prioritization Report, HAE accomplished a field evaluation of all twelve (12) reservoirs. The evaluations included an interior evaluation by diving method and an exterior evaluation. Detailed reports, including photographic surveys, were prepared and forwarded to the City with remedial repair, recoating, and repainting recommendations and cost estimates for the recommended work. This prioritization report and the attached spreadsheet provide a summary of the recommendations and estimated costs for each reservoir which will assist the City in preparing a water system master plan.

II. CRITERION FOR PRIORITIZATION

HAE has over four decades of experience evaluating reservoirs, which gives us a unique understanding of what causes coatings and paint to fail prematurely and the areas within reservoirs that are most affected by structural related corrosion damage. The following are the primary criteria HAE has determined most critical in prioritizing rehabilitation of reservoirs:

- We believe the primary criterion for the long-term life of a welded steel reservoir is the condition of the coating on the roof and structural members. The surfaces above the waterline cannot be protected by the cathodic protection system. If severe corrosion is allowed to develop, it can be very costly to repair or replace rafters, girders, bolted connections, gusset plates, or center support plates and, if left unattended, structural connections will eventually fail, causing rafters to fall into the reservoir.

- When HAE is prioritizing reservoirs, if the coating on the roof and structural members is in similar condition in multiple reservoirs, the second criterion HAE considers is the condition of the coating on the surfaces below the waterline. If the coating is in poor

condition, severe corrosion and pitting can occur on these surfaces. However, if the coating on the roof and structural members is in fair to good condition, a galvanic (sacrificial anode) cathodic protection system could be installed in the reservoir to extend the life of the coating system below the waterline until the coating on the roof and structural members gets worse requiring coating of the reservoir.

- If the interior coating is in similar condition in multiple reservoirs, the next criterion HAE considers is the condition of the exterior paint system. When prioritizing the exterior, the roof is the primary criterion. Although corrosion develops significantly slower on the exterior surfaces versus interior surfaces, there are factors that can accelerate the corrosion rate on the exterior roof of a reservoir. Ponding water and debris from trees adjacent to reservoirs tend to be the primary issue that accelerates the corrosion and can lead to severe corrosion and pitting.

- The criterion for prioritizing concrete reservoirs is very different than welded steel reservoirs. Typically, the concrete surfaces are in overall good condition. However, the sealants only have a 12-15 year life cycle and are often found to be deteriorated and saturated in many reservoirs. We recommend agencies do a static leak test for their reservoir to determine if any significant leaking is occurring as this can be a contributing factor in determining how soon the sealant should be replaced. Also, when prioritizing concrete reservoirs, the steel appurtenances are factored into the prioritization as they are often severely corroded. Concrete reservoirs can have various types of roof structures, including concrete, welded steel, aluminum dome, or wood structures. The City's Reservoir No. 4 is a unique situation in terms of prioritization. The City will need to determine how and when to address the issue of the excessive moisture on the roof and structural members contributing to the premature deterioration of the roof and structural members as a result of the mixing system.

- In addition to prioritizing the reservoirs, HAE typically groups reservoirs in similar conditions into categories within the prioritization schedule. We have found although a particular reservoir may be higher on the list, the difference in the condition of the reservoirs may not be as significant as the list might make it appear. HAE realizes the condition of the reservoir may not be the only determining factor in when to rehabilitate the reservoir. The City's ability to take a reservoir out of service can be an overriding factor in determining which reservoir will be addressed before another. The funds available in a given fiscal year can also be a factor. So, the categories provide agencies with more flexibility to factor in these other variables. Once the City reviews the recommended prioritization for the reservoirs in the draft report in accordance with the criterion noted above, HAE will review the list with the City and adjust the list based on the City's restrictions for the final report.

III. PRIORITATION SUMMARY

Included in this report is a table which prioritizes the reservoirs from worst to best condition and by category. The table prioritizes according to the criterion noted above and input from the City. The following is the summary for each reservoir and the reasons for their location within the prioritization and a category.

Category No. 1: The first three reservoirs in this category are in overall good condition but have issues on the roof that should not be postponed. If the issues for each reservoir are addressed, the complete rehabilitation of the reservoir can be performed after reservoirs in worse condition are rehabilitated. The reservoirs in this category are also in another category for when they need to be rehabilitated.

1. Reservoir No. 2: The coating system is in generally fair to good condition. However, moderate corrosion is present on the center support cone. As noted in the report for this reservoir, HAE has recently determined that Pitt-Des Moines, Inc. reservoirs built in the late-1980 to mid-1990 timeframe have a design flaw. The support cone does not have a plate across the top of the cone. The rafters are only welded to a narrow flange. It is difficult to properly coat the inside of the cone, the flange, and rafter ends, so HAE has found severe corrosion on these areas when the center vent cover is removed. If the ends of the rafters and the narrow flange are severely corroded, there is a potential for a structural failure in this area. HAE recommends the center vent be removed to further inspect the interior of the support cone and rafters. If severe corrosion is found on the interior of the cone and rafters, it may be necessary to recoat the center support area to extend the life of the coating system. If the corrosion and metal loss are as bad as we have seen in other reservoirs with similar design, it may be necessary to install a new center support structure.

2. Reservoir No. 10: There is structural damage occurring at the rafter ends and center support area in this reservoir, but the coating on most of the interior surfaces is in good condition. If the center support area is not coated soon and the severe corrosion is allowed to continue, the structural damage will worsen, and rafters and the center support plate will need to be repaired or replaced. If left too long, structural connections could fail, causing the rafters to fall into the reservoir. However, there are reservoirs in worse overall condition than this reservoir, so it is recommended to only recoat the center support area at this time to mitigate the corrosion and extend the life of the structural members. The City could elect to include the safety/structural upgrades now or wait until the complete rehabilitation project.

3. Reservoir No. 4: As discussed above, Reservoir No. 4 is a unique situation in terms of prioritization. The City will need to determine how and when to address the issue of the excessive moisture on the roof and structural members that is prematurely deteriorating the wood roofing and structural members because of the mixing system. If not done soon, it may be necessary to install a completely new roof.

4. Reservoir No. 16: The joint sealants on the interior wall and floor are in poor condition and need to be replaced. Also, the below water inlet pipe, flapper valve, and nuts and bolts need to be recoated. Based on the funds available, the City elected to include this concrete reservoir in Category No. 1.

Category No. 2: The four reservoirs in this category are in poor condition and should be rehabilitated as soon as possible. The coating in Reservoir No. 14 and No. 7 is older and in worse overall condition than Reservoir No. 12 and No. 13. However, there is more significant corrosion

and metal loss on the structural members and connections in Reservoir No. 12 and No. 13 and if not rehabilitated soon, there is potential for failure occurring at these connections.

5. Reservoir No. 12: There is moderate general corrosion on the roof and structural members with severe corrosion and metal loss on the bolted connections at the rafters, girders, and columns, and blistered coating on the shell. The exterior roof paint system is also in poor condition with severe corrosion and perforations on the center vent and adjacent roof plates. Structural repairs will need to be accomplished when the reservoir is rehabilitated and estimated costs for this work have been included in the Summary of Cost included in the detailed report for this reservoir.

6. Reservoir No. 13: There is random general corrosion on the roof and structural members with severe corrosion and metal loss on the bolted connections at the rafters, girders, and columns, and blistered coating on the shell. The exterior roof paint system is also in poor condition with severe corrosion and perforations on the center vent and adjacent roof plates. Structural repairs will need to be accomplished when the reservoir is rehabilitated and estimated costs for this work have been included in the Summary of Cost included in the detailed report for this reservoir.

7. Reservoir No. 14: The coating system on the interior surfaces is in very poor condition and there is general corrosion present on all surfaces. The coating appears to be the original system, making it 53 years old. There are random areas of moderate pitting and etching of the substrate on the bottom, but the City could take the reservoir out of service and weld plates on these small areas to stop them from getting worse, if the reservoir cannot be rehabilitated in the next 2-3 years.

8. Reservoir No. 7: The coating system on the interior surfaces is in very poor condition and there is general corrosion present on the roof, structural members, and upper shell surfaces. The exterior roof is also in very poor condition with general corrosion present, but the corrosion rate is significantly slower, so it is not a determining factor between No. 7 and No. 14. This reservoir is listed after Reservoir No. 14 because the coating on the interior shell appears to be in worse condition in No. 14. There may be random areas of pitting and etching of the substrate on the bottom, but the City could take the reservoir out of service and weld plates on these small areas to stop them from getting worse, if the reservoir cannot be rehabilitated in the next 2-3 years.

Category No. 3: The four reservoirs in this category are all concrete reservoirs. They all have work that needs to be done, but it is not as critical as the work needed for the steel reservoirs in Category No. 2. Also, the costs associated with the recommended repairs are substantially less than rehabilitation of the steel reservoir. Based on the funds available, the City could elect to include one or two of the concrete reservoir projects in the same year that a steel reservoir rehabilitation project is being accomplished.

9. Reservoir No. 3: The roof walkway is in poor condition, and the guardrailing is falling over. The walkway is in an unsafe condition and should not be used by City personnel. There is a peeled back section of the roof ridge that should be

repaired as soon as possible so water and contamination cannot get into the reservoir and potentially damage the wood structural members. The joint sealant also needs to be replaced in the next 3-5 years along with other random deficiencies.

10. Reservoir No. 13A: Moderate to severe corrosion is present on the interior piping and outlet cover and blistered coating and corrosion are present on the overflow pipe. The joint sealant is in poor condition and the concrete curb on the center vent is cracked and both should be repaired.

11. Reservoir No. 12A: Moderate to severe corrosion is present on the interior piping and outlet cover and blistered coating and corrosion are present on the overflow pipe. The joint sealant is in poor condition and needs to be replaced when the reservoir is rehabilitated or sooner if it is found to be leaking.

12. Reservoir No. 4: When the City determines how and when to address the issue of the excessive moisture on the roof from the mixing system, the other repair items outlined in the report for this reservoir, could also be considered at that time or at a later date.

Category No. 4: The three reservoirs in this category are in overall good condition at this time, except for the repairs recommended for Reservoir No. 14 and No. 2 in Category No. 1. After the repairs are completed, these three reservoirs should be inspected again in the next 2-3 years to monitor the corrosion rate on the roof and structural members. The prioritization should be updated based on the findings from the inspections. The City could install a galvanic (sacrificial anode) cathodic protection system within the reservoirs to protect the surfaces below the water level from corrosion and pitting until they are rehabilitated.

13. Reservoir No. 11: There is random general corrosion on the roof and structural members, but overall, the coating system is in good condition. The exterior surfaces are in fair to good condition. As noted above, the reservoir should be inspected again in the next 2-3 years to monitor the corrosion rate on the roof and structural members.

14. Reservoir No. 10: After the repairs are completed in accordance with Category No. 1, the reservoir should be inspected again in the next 2-3 years to monitor the corrosion rate on the remaining roof and structural members. It is recommended to install a cathodic protection system as part of the Category No. 1 repairs to protect the surfaces below the water level. The exterior surfaces are in fair to good condition.

15. Reservoir No. 2: The condition of the center support structure is unknown until the center vent is removed to further inspect the area. After the vent cover is removed or if repairs are completed in accordance with Category No. 1, the reservoir should be inspected again in the next 2-3 years to monitor the corrosion rate on the remaining roof and structural members. It is recommended to install a cathodic protection system as part of the Category No. 1 repairs to protect the surfaces below the water level. The exterior surfaces are in fair condition.

The above prioritization has been adjusted based on the City's budget constraints and/or operational requirements for each reservoir. Unfortunately, as noted above many of the reservoirs have areas of severe corrosion and metal loss, so the longer it takes to recoat the interior of the reservoirs, the more structural repairs that will likely be required, which increases the cost of the rehabilitation for each reservoir.

IV. SAFETY AND HEALTH CODE VIOLTIONS

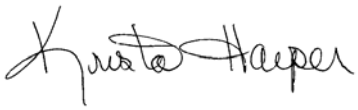
Currently, all 12 reservoirs are not Cal/OSHA compliant for one or more appurtenances and, in accordance with Cal/OSHA Regulations, the items should be red tagged. However, due to the high cost of implementing some of the safety modifications and the infrequent need for City personnel to access the reservoirs, it is industry standard to repair or replace the safety items when the reservoirs are rehabilitated. The high costs to perform some of the safety modifications prior to rehabilitating the reservoirs are primarily due to the reservoirs needing to be drained to perform most of the modifications and the coating and paint systems need to be repaired where the modifications are accomplished.

V. SUMMARY

An overall study of all the City's reservoirs has been performed to prioritize the reservoirs based on coating condition, structural integrity, and Cal/OSHA safety compliance. The Prioritization Report shall assist the City in understanding the condition of the reservoirs and determining the operational and budget constraints for each reservoir, so the City can prepare the water systems master plan and plan for rehabilitating the reservoirs. HAE recommends the Prioritization Report be updated every three to five years, as the conditions in the reservoirs will change and may require modifications to the categories.

Respectfully submitted,

HARPER & ASSOCIATES ENGINEERING, INC.



Krista Harper, P.E.
Principal Engineer

CITY OF UPLAND
PRIORITIZATION LIST

Priority	Category	Reservoir	Year Built	Capacity (MG)	Construction Type	Dimensions (Dia. x Ht.)	Age of Coating	Year for Work	Exterior Paint	Interior Coating	Structural/ Safety Upgrades	Optional Items	CP System	Total Cost
1	1	2	1988	5	Steel	175' x 27'-9"	-	1	$30,000	$80,000	$36,600	$48,800	$22,000	$217,400
2	1	10	1955	1.5	Steel	104' x 24'	-	1	$30,000	$60,000	$77,200	$40,000	$18,000	$225,200
3	1	4*	-	0.2	Concrete	65' x 40' (LxW)	-	1	-			$472,000	-	$472,000
4	1	16	-	10	Concrete	225' x 40'	-	5	-	$165,000	$13,700	$16,000	-	$194,700
								Total Category No. 1	$60,000	$305,000	$127,500	$576,800	$40,000	$1,109,300
5	2	12	-	4	Steel	215' x 16'	-	2	$910,000	$2,128,600	$41,200	$303,100	$36,000	$3,418,900
6	2	13	1964	5.4	Steel	175' x 32'	-	3	$875,000	$1,885,600	$56,700	$315,900	$32,000	$3,165,200
7	2	14	1971	0.2	Steel	24' x 40'	53	4	$88,000	$155,500	$81,200	$53,300	$9,000	$387,000
8	2	7	-	1.5	Steel	108' x 22'	-	4	$350,000	$748,000	$77,200	$102,400	$18,000	$1,295,600
								Total Category No. 2	$2,223,000	$4,917,700	$256,300	$774,700	$95,000	$8,266,700
9	3	3	-	4.3	Concrete	347' x 114' (LxW)	-	5	-	$134,500	$25,900	$16,000	-	$176,400
10	3	13A	-	5.6	Concrete	170' x 32'	-	5	-	$100,300	$20,800	$16,000	-	$137,100
11	3	12A	-	5	Concrete	238' x 16'	-	5	-	$98,500	$20,800	$24,800	-	$144,100
12	3	4	-	0.2	Concrete	65' x 40' (LxW)	-	5	-	$76,000	$46,000		-	$122,000
								Total Category No. 3	$0	$409,300	$113,500	$56,800	$0	$579,600
13	4	11	-	0.2	Steel	45' x 16'	-	6	$80,900	$160,000	$62,700	$24,800	$9,000	$337,400
14	4	10	1955	1.5	Steel	104' x 24'	-	6	$350,000	$748,000	$77,200	$138,000		$1,313,200
15	4	2	1988	5	Steel	175' x 27'-9"	-	7	$710,100	$1,400,200	$36,600	$167,100		$2,314,000
								Total Category No. 4	$1,141,000	$2,308,200	$176,500	$329,900	$9,000	$3,964,600

STEEL AND CONCRETE TOTAL	$3,424,000	$7,940,200	$673,800	$1,738,200	$144,000	$13,920,200

*The optional item cost of $472,000 for Reservoir No. 4 roof may not be needed, but provided as budget cost only. The extent of the work cannot be determined at this time.

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Appendix G: Project Cost Estimates

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Project Identification: Cond-P1 through Cond-P10
Project Name: Pipe condition improvement projects 1 through 10
System Type: Potable
Project Type: Condition
Project Size (LF): 15,720
Capital Cost: $ 16,629,000

Project Description:
These condition projects have been prioritized based on recent leak history, pipe age and size, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Projects Cond-P2, 7, P8, and P10 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source.

Project	Project Element	Pipe Diameter (in)	% of Pipe Length Upsized for Capacity Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-P1: N Laurel Ave (from N Redding Way to W 11th St)	Pipe	8	9%		660	$ 701	$ 463,000	$ 601,900	2031-40
Cond-P2: W 9th St (south side, 1,100' west of Mountain Ave to 585' west of Mountain Ave) and Mountain Plaza parking lot (from W 9th St around to N Mountain Ave)	Pipe	12	100%		1,720	$ 911	$ 1,567,000	$ 2,037,100	0
Cond-P3: Elm Way (north of Cedar Ct) and Juniper Ave (north of Cedar Ct)	Pipe	8	100%		690	$ 701	$ 484,000	$ 629,200	2028
Cond-P4: Norwood Ct (east of Brentwood Ave) and Brentwood Ave (from Norwood Ct to W 11th St)	Pipe	8	100%		1,090	$ 701	$ 765,000	$ 994,500	2029
Cond-P4: Norwood Ct (east of Brentwood Ave) and E	Pipe								2029
Cond-P5: Veterans Ct (west of N 13th Ave) and N 13th Ave (from Veterans Ct south about 150')	Pipe	8	83%		150	$ 701	$ 106,000	$ 137,800	2029
	Pipe	12			770	$ 911	$ 702,000	$ 912,600	2029
Cond-P6: Fairwood Way (north of Winn Dr) and Glenwood Way (north of Winn Dr)	Pipe	8	18%		480	$ 701	$ 337,000	$ 438,100	2029
Cond-P7: W 11th St (north side of street from 100' west of N Benson Ave for about 1,000' and south side of street for about 400') and north of W 11th St in Extra Space Storage site	Pipe	8	59%		60	$ 701	$ 43,000	$ 55,900	2030
	Pipe	12			2,590	$ 911	$ 2,360,000	$ 3,068,000	2030
	Pipe								2030
Cond-P8: Pipeline around Foothill Self Storage (east of Meadowbrook)	Pipe		99%						2030
	Pipe	8	99%		1,560	$ 701	$ 1,094,000	$ 1,422,200	2030
Cond-P9: W 9th St (from N Central Ave to S Loma Pl), N Central Ave (from Richton St south for about 300'), Vista Pl (from Huntington Dr to south of W 9th St), N Loma Pl (from Huntington Dr to south of W 9th St), and through parking lot near Foothill Animal Hospital (between Central Ave and Vista Pl)	Pipe		97%						2030
	Pipe	8			2,630	$ 701	$ 1,844,000	$ 2,397,200	2030
	Pipe	12			1,760	$ 911	$ 1,604,000	$ 2,085,200	2030
Cond-P10: W 9th St (from N Benson Ave east for about 1,500') and north of W 9th St to parking lot near McFadden Motorsports (for about 300')	Pipe	12	100%		1,560	$ 911	$ 1,422,000	$ 1,848,600	2031-40
	Total				**15,720**		**$ 12,791,000**	**$ 16,629,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 16,629,000
Developer Cost	0%	$ -
Total	100%	$ 16,629,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

Project Identification: Cond-P11 through Cond-P20
Project Name: Pipe condition improvement projects 11 through 20
System Type: Potable
Project Type: Condition
Project Size (LF): 28,180
Capital Cost: $ 35,385,000

Project Description:
These condition projects have been prioritized based on recent leak history, pipe age and size, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Project Cond-P19 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source.

Project	Project Element	Pipe Diameter (in)	% of Pipe Length Upsized for Capacity Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-P11: N Benson Ave (from Arrow Hwy to about 300' north of W 13th St) and W Foothill Blvd (from N Benson Ave to Central Ave)	Pipe	8	3%	Yes	300	$ 910	$ 273,000	$ 354,900	2027 / 2028
	Pipe	10			2,730	$ 1,090	$ 2,976,000	$ 3,868,800	2027 / 2028
	Pipe	12			990	$ 1,180	$ 1,169,000	$ 1,519,700	2027 / 2028
	Pipe	16			5,860	$ 1,270	$ 7,443,000	$ 9,675,900	2027 / 2028
Cond-P12: W Foothill Blvd (from N Mountain Ave to N San Antonio Ave)	Pipe	12	100%	Yes	3,250	$ 1,180	$ 3,835,000	$ 4,985,500	2027
Cond-P13: San Bernardino Rd (from E Arrow Hwy to about 300' east of N 11th Ave)	Pipe	8	100%		1,060	$ 701	$ 744,000	$ 967,200	2029
Cond-P14: W 9th St (north side from Lucerne Way to Euclid Ave and south side from Laurel Ave to Euclid Ave) and alley by Colonial Gardens Apartments (from W 9th St to W A St)	Pipe	8			290	$ 701	$ 204,000	$ 265,200	2031-40
	Pipe	16			1,470	$ 981	$ 1,443,000	$ 1,875,900	2031-40
Cond-P15: S Euclid Ave (from E 7th St to E 9th St)	Pipe	8		Yes	2,660	$ 910	$ 2,421,000	$ 3,147,300	2031-40
Cond-P16: Alley between N Laurel Ave and Euclid Ave (north of Vernon Dr for about 120')	Pipe	8			120	$ 701	$ 85,000	$ 110,500	2031-40
Cond-P17: N Laurel Ave (from W 16th St to W 17th St)	Pipe	8	5%		1,380	$ 701	$ 968,000	$ 1,258,400	2031-40
Cond-P18: W Buffington St (from N San Antonio Ave to Elaine Way), Derby Way/Baxter Way/Anton Way (north of W Buffington St), Coolcrest Ave (from W Buffington to north of W 19th St), W 19th St (from 100' west of Danube Way to N San Antonio Ave), Danube Way/Belmar Way/ Abbie Way (north of W 19th St), and the easement at north end of Coolcrest Way west past Danube Way	Pipe	8	2%		6,810	$ 701	$ 4,774,000	$ 6,206,200	2031-40
Cond-P19: Parking lot (east of N Mountain Ave and south of SPPE trail)	Pipe	8	100%		640	$ 701	$ 449,000	$ 583,700	2031-40
Cond-P20: Alley south of Vernon Dr (from N Palm Ave to alley east of N Laurel Ave)	Pipe	8	66%		620	$ 701	$ 435,000	$ 565,500	2031-40
Total					**28,180**		**$ 27,219,000**	**$ 35,385,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 35,385,000
Developer Cost	0%	$ -
Total	100%	$ 35,385,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Cond-P21 through Cond-P30
Project Name: Pipe condition improvement projects 21 through 30
System Type: Potable
Project Type: Condition
Project Size (LF): 17,360
Capital Cost: $ 19,130,000

Project Description:
These condition projects have been prioritized based on recent leak history, pipe age and size, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Project Cond-P30 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source.

Project	Project Element	Pipe Diameter (in)	% of Pipe Length Upsized for Capacity Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-P21: Silverwood Ave (from W Arrow Hwy to just south of Elmwood St) and Hallwood Ct (from Silverwood Ave west to dead end)	Pipe	8	100%		1,310	$ 910	$ 1,193,000	$ 1,550,900	2031-40
Cond-P22: Springfield St (from east of London Ave to east of Wilson Ave) and Wilson Ave (from W Foothill Blvd north about 600')	Pipe	8	34%		1,780	$ 701	$ 1,248,000	$ 1,622,400	2031-40
Cond-P23: Olive St (from S Campus Ave to S 11th Ave)	Pipe	8	69%		1,570	$ 701	$ 1,101,000	$ 1,431,300	2031-40
Cond-P24: Magnolia Ave (from W 11th Ave south to end of dead end)	Pipe	8	6%		540	$ 701	$ 379,000	$ 492,700	2031-40
Cond-P25: N Benson Ave (from W Foothill Blvd to north of W 13th St about 500') and W 13th St (from Cable Airport parking to just east of Maywood Ave)	Pipe	8	26%	Yes	2,150	$ 910	$ 1,957,000	$ 2,544,100	2031-40
	Pipe	10			20	$ 841	$ 17,000	$ 22,100	2031-40
	Pipe	12			1,240	$ 1,180	$ 1,464,000	$ 1,903,200	2031-40
	Pipe	20			1,850	$ 1,360	$ 2,516,000	$ 3,270,800	2031-40
Cond-P26: N Albright Ave (from W 14th St to W Cumberland St), W Emory Ct/W Stetson Ct (west of N Albright Ave)	Pipe	8	3%		1,470	$ 701	$ 1,031,000	$ 1,340,300	2031-40
Cond-P27: W 18th St (from 150' west of Balboa Way to N San Antonio Ave), Balboa Way (north of W 18th St), and Albright Way (from north deadend to about 300' south of W 18th St)	Pipe	8	5%		2,300	$ 701	$ 1,613,000	$ 2,096,900	2031-40
Cond-P28: Harrison Ct (about 200' at eastern end of dead end)	Pipe	8	16%		230	$ 701	$ 162,000	$ 210,600	2031-40
Cond-P29: S Euclid Ave (westside from 7th St to Olive St)	Pipe	8	100%		680	$ 701	$ 477,000	$ 620,100	2031-40
Cond-P30: W 7th St (from Fredricks Ln west about 500') and pipe around Mountain Crest Apartments	Pipe	8	79%		2,220	$ 701	$ 1,557,000	$ 2,024,100	2031-40
	Total				**17,360**		**$ 14,715,000**	**$ 19,130,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 19,130,000
Developer Cost	0%	$ -
Total	100%	$ 19,130,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

Project Identification: Cond-P31 through Cond-P38
Project Name: Pipe condition improvement projects 31 through 38
System Type: Potable
Project Type: Condition
Project Size (LF): 6,590
Capital Cost: $ 7,343,000

Project Description:
These condition projects have been prioritized based on recent leak history, pipe age and size, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Project Cond-P37 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source.

Project	Project Element	Pipe Diameter (in)	% of Pipe Length Upsized for Capacity Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-P31: W 7th St (from 50' east of Barlow Way to about 300' west of Barlow) and Barlow Way (south of W 7th St)	Pipe	8	52%		440	$ 701	$ 309,000	$ 401,700	2028
	Pipe	10			290	$ 841	$ 244,000	$ 317,200	2028
Cond-P32: Loma Pl (from W Arrow Rte to Woodlawn St) and Woodlawn St (about 350' on either side of Loma Pl)	Pipe	8	100%		30	$ 701	$ 22,000	$ 28,600	2030
	Pipe	10			50	$ 841	$ 43,000	$ 55,900	2030
	Pipe	12			1,420	$ 911	$ 1,294,000	$ 1,682,200	2030
Cond-P33: W Arrow Rte (from N Central Ave about 1,200' west)	Pipe	8	3%		60	$ 701	$ 43,000	$ 55,900	2031-40
	Pipe	10			1,020	$ 841	$ 858,000	$ 1,115,400	2031-40
Cond-P34: Alley west of Upland Town Square (north of W Foothill Blvd about 600')	Pipe	8	94%		570	$ 910	$ 519,000	$ 674,700	2027
Cond-P35: Alley east of Dalia's pizza (south from W Foothill Blvd about 300') and roadway at north end of development (west of alley for about 200')	Pipe	8	57%	Yes	560	$ 910	$ 510,000	$ 663,000	2027
Cond-P36: W Foothill Blvd (northern most pipe from Central St east about 500' and northern pipe from Central St to N Benson Ave)	Pipe	10			1,360	$ 841	$ 1,144,000	$ 1,487,200	2031-40
Cond-P37: Parking lot (north of W Foothill Blvd 225' east of Mulberry Ave)	Pipe	8	100%	Yes	510	$ 910	$ 465,000	$ 604,500	2027
Cond-P38: Wedgewood Ave (south of Woodbury Ct to dead end)	Pipe	8	93%		280	$ 701	$ 197,000	$ 256,100	2031-40
	Total				**6,590**		**$ 5,648,000**	**$ 7,343,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 7,343,000
Developer Cost	0%	$ -
Total	100%	$ 7,343,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

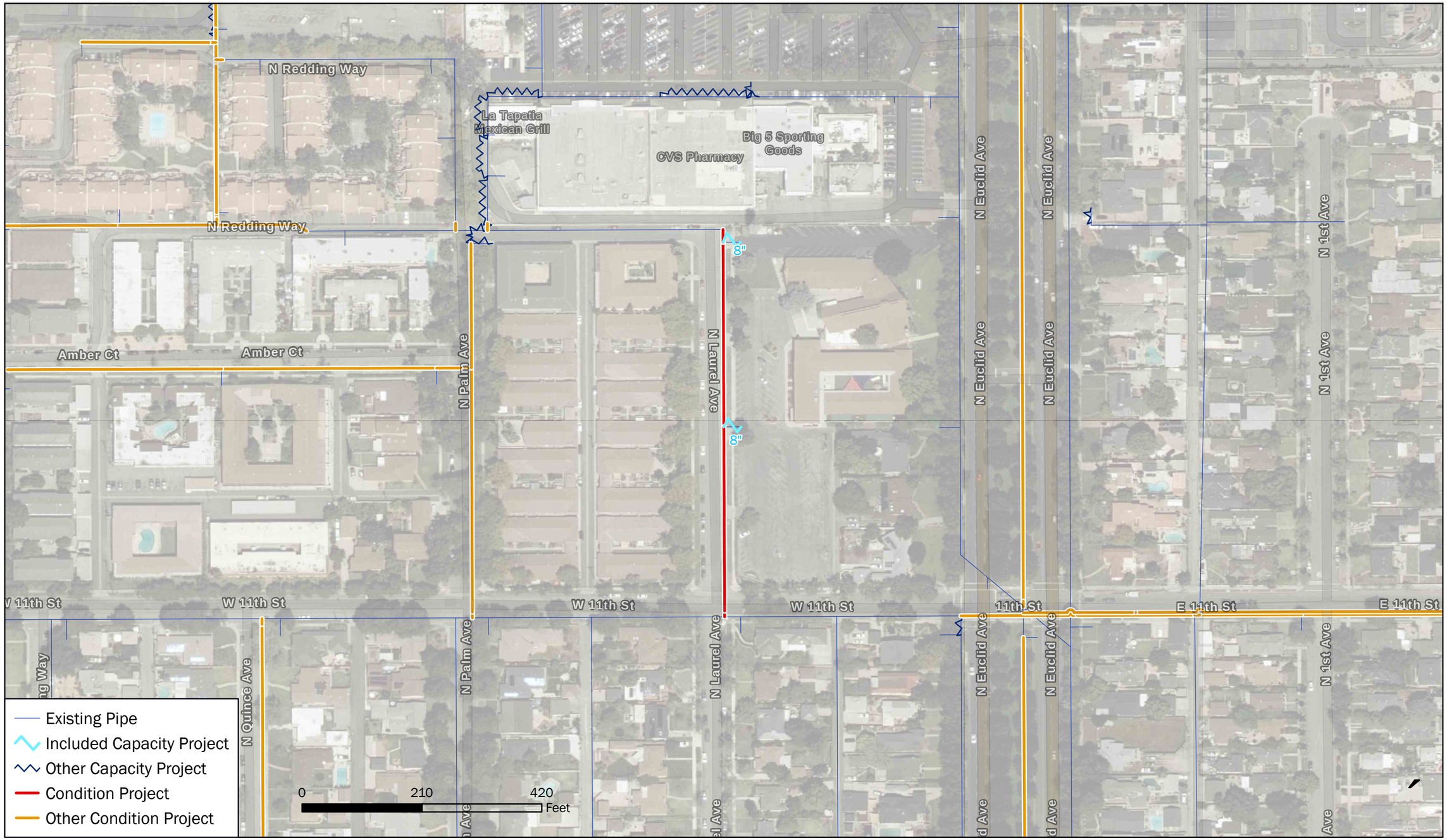


Figure 1. Cond-P1

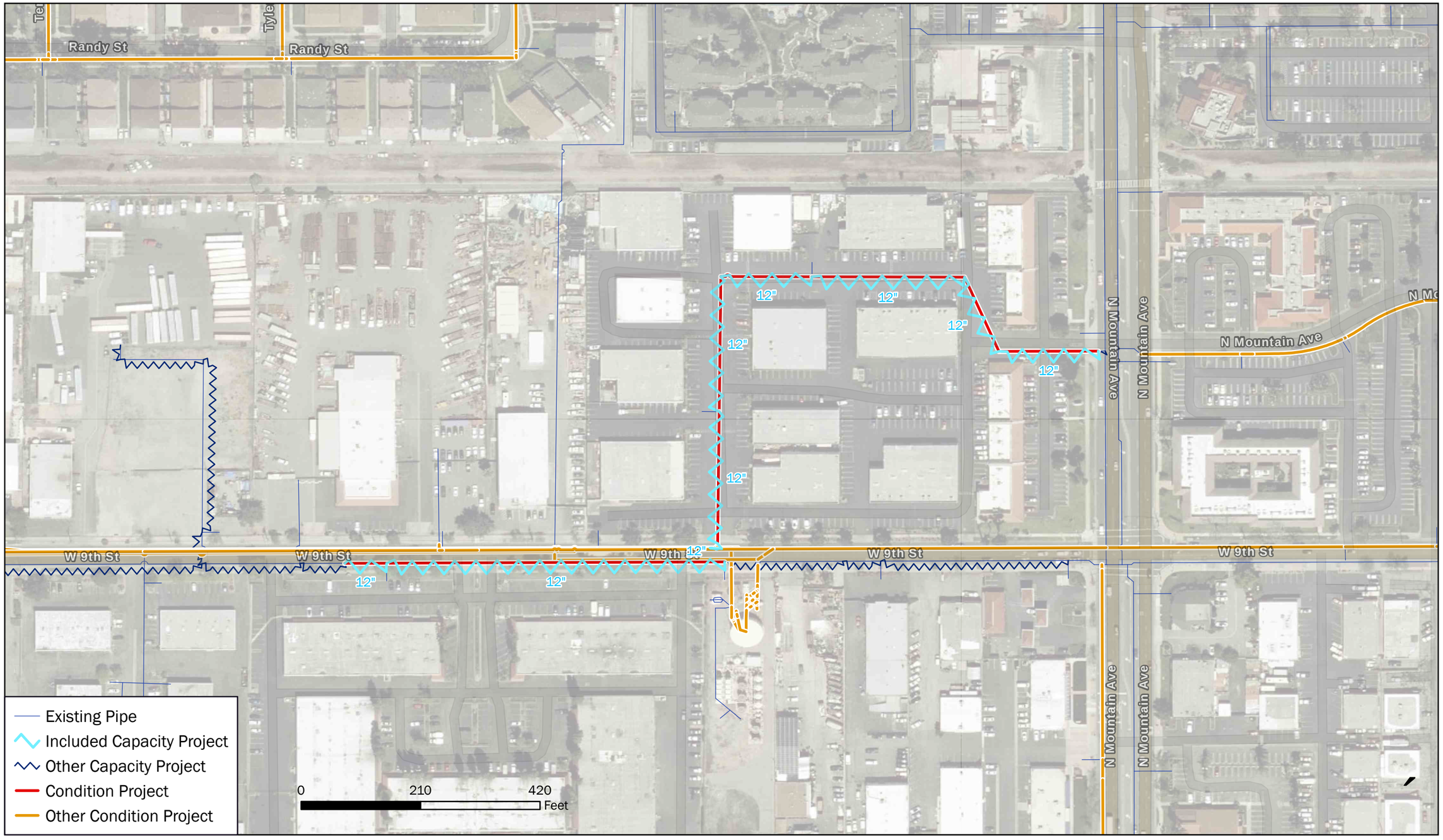


Figure 2. Cond-P2

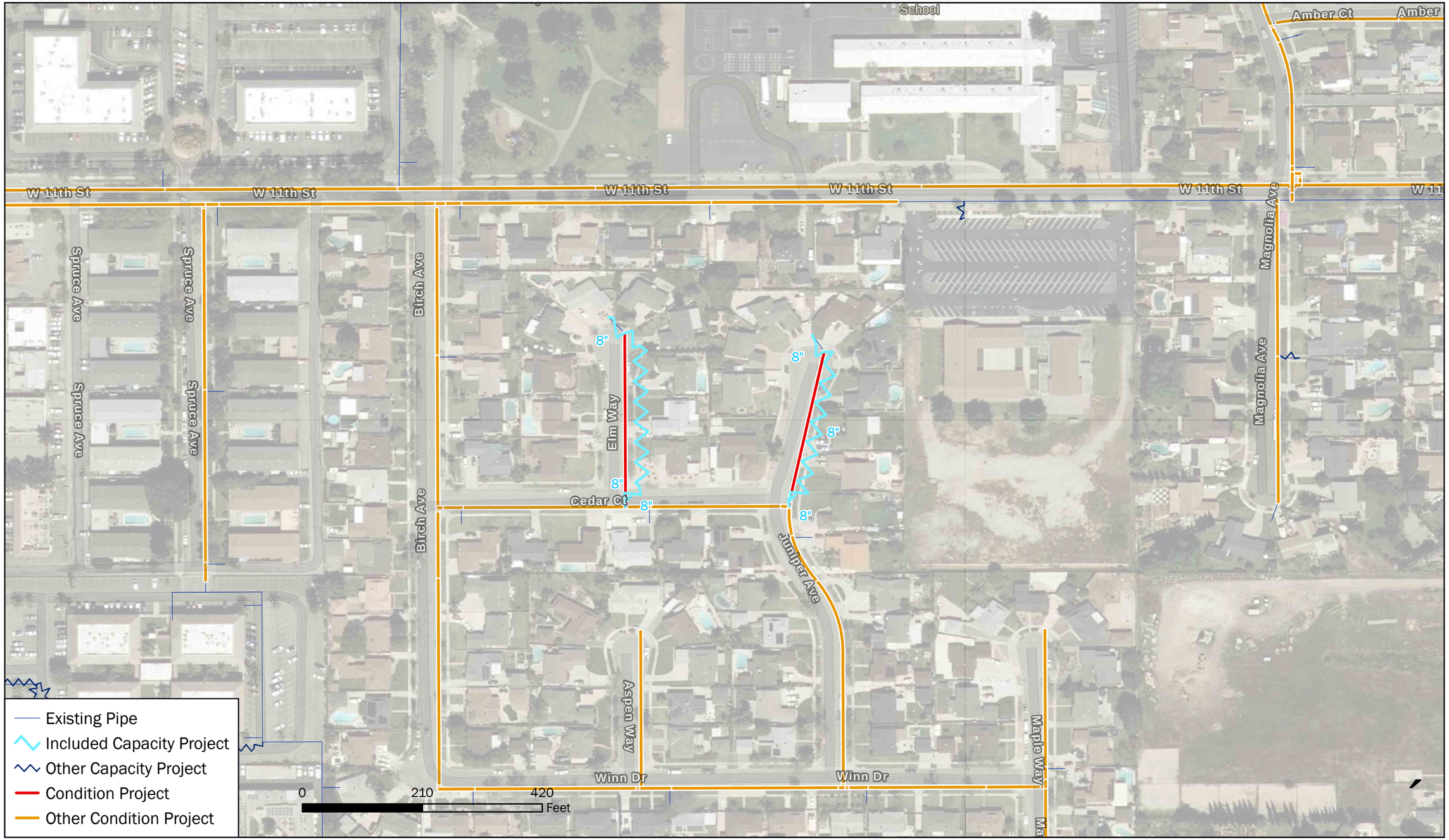


Figure 3. Cond-P3

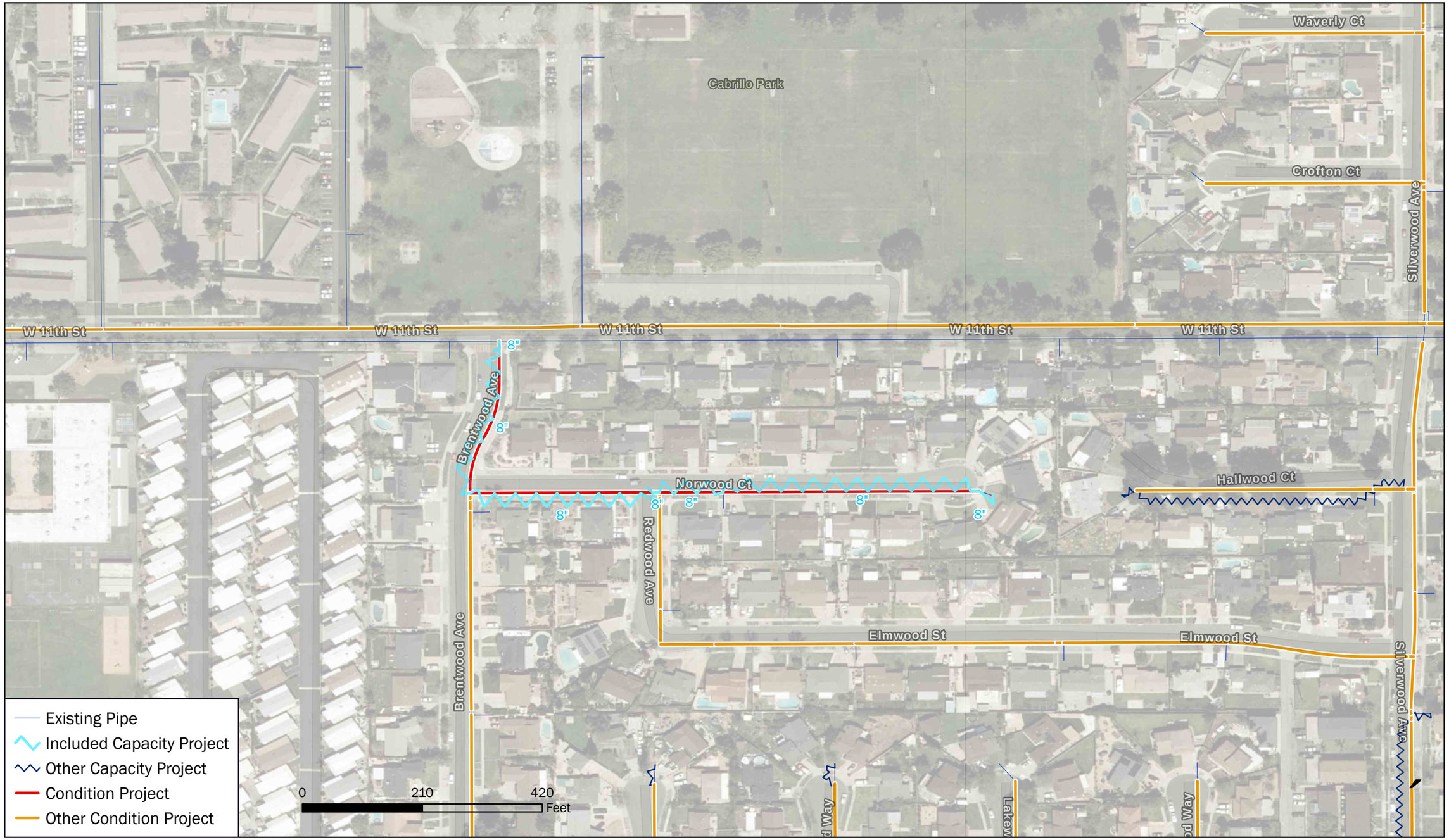


Figure 4. Cond-P4

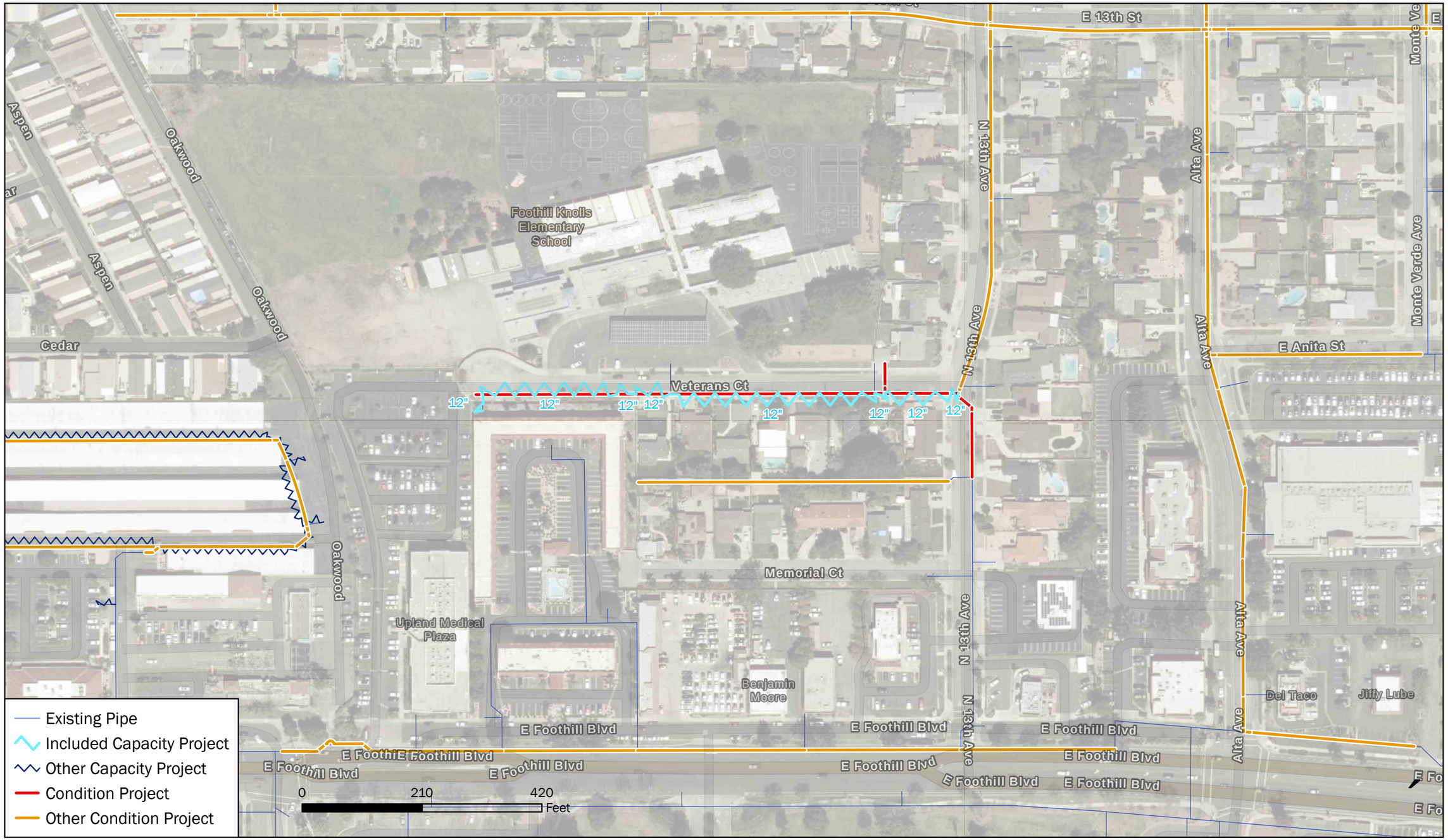


Figure 5. Cond-P5

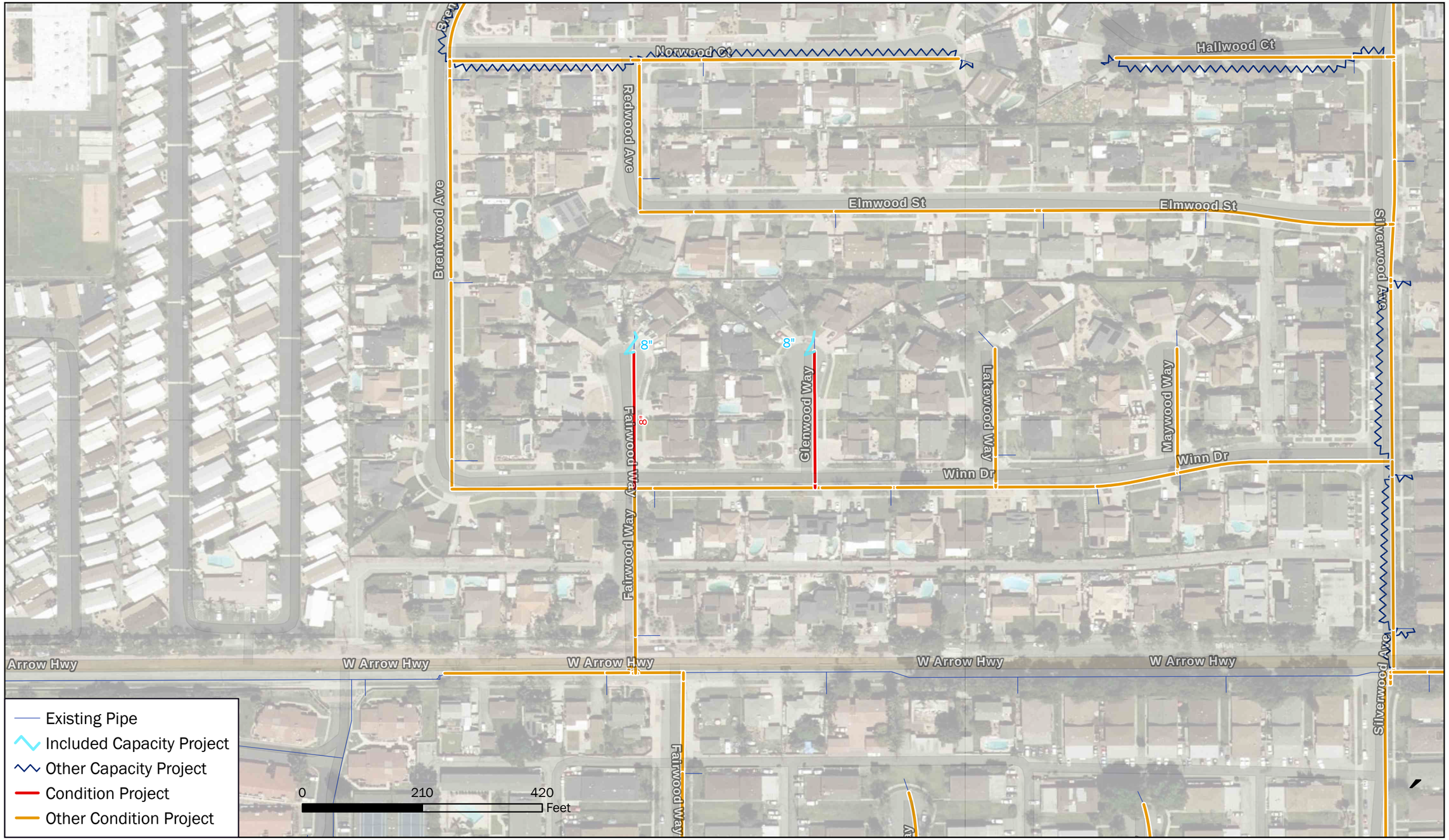


Figure 6. Cond-P6

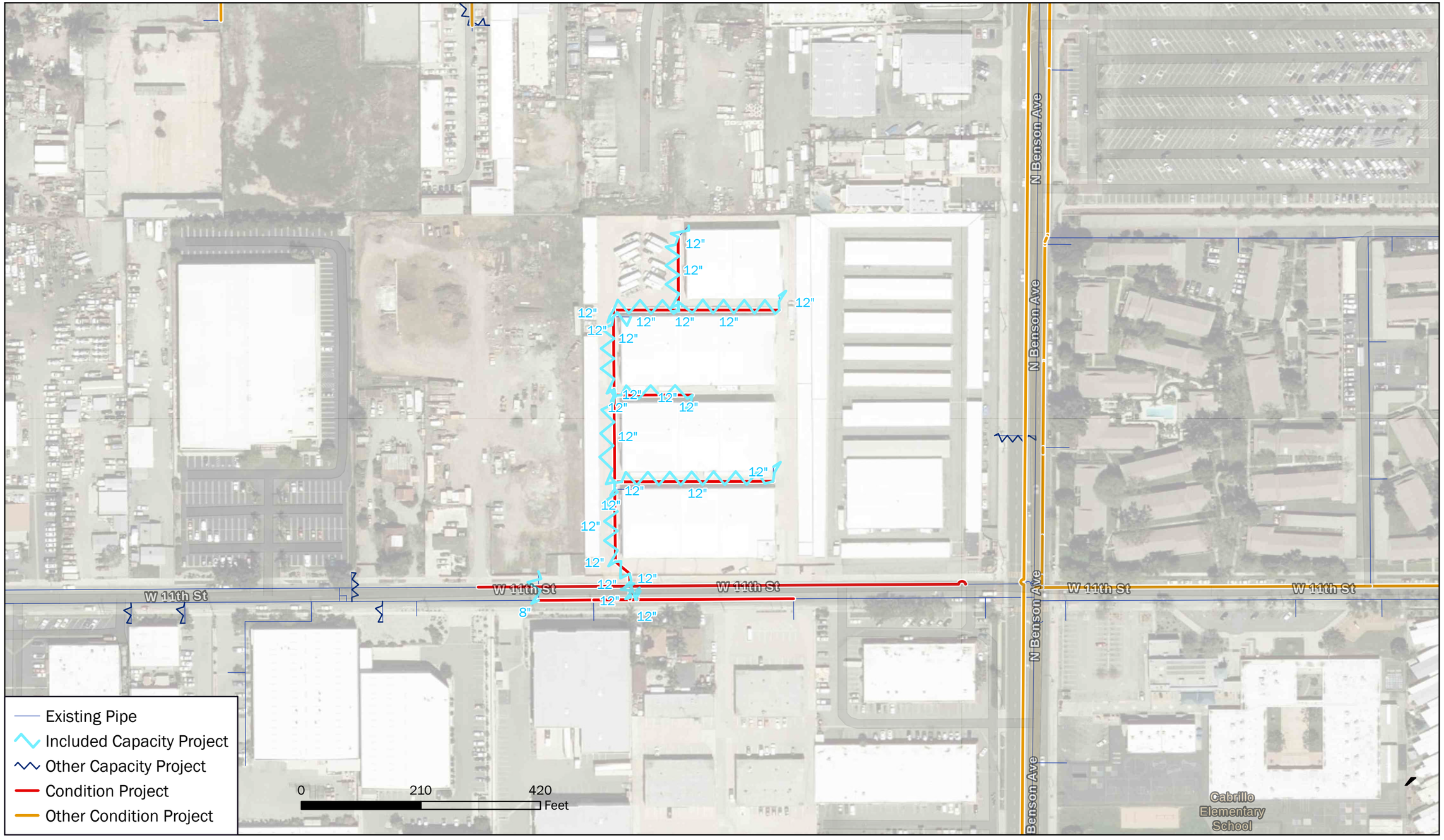


Figure 7. Cond-P7

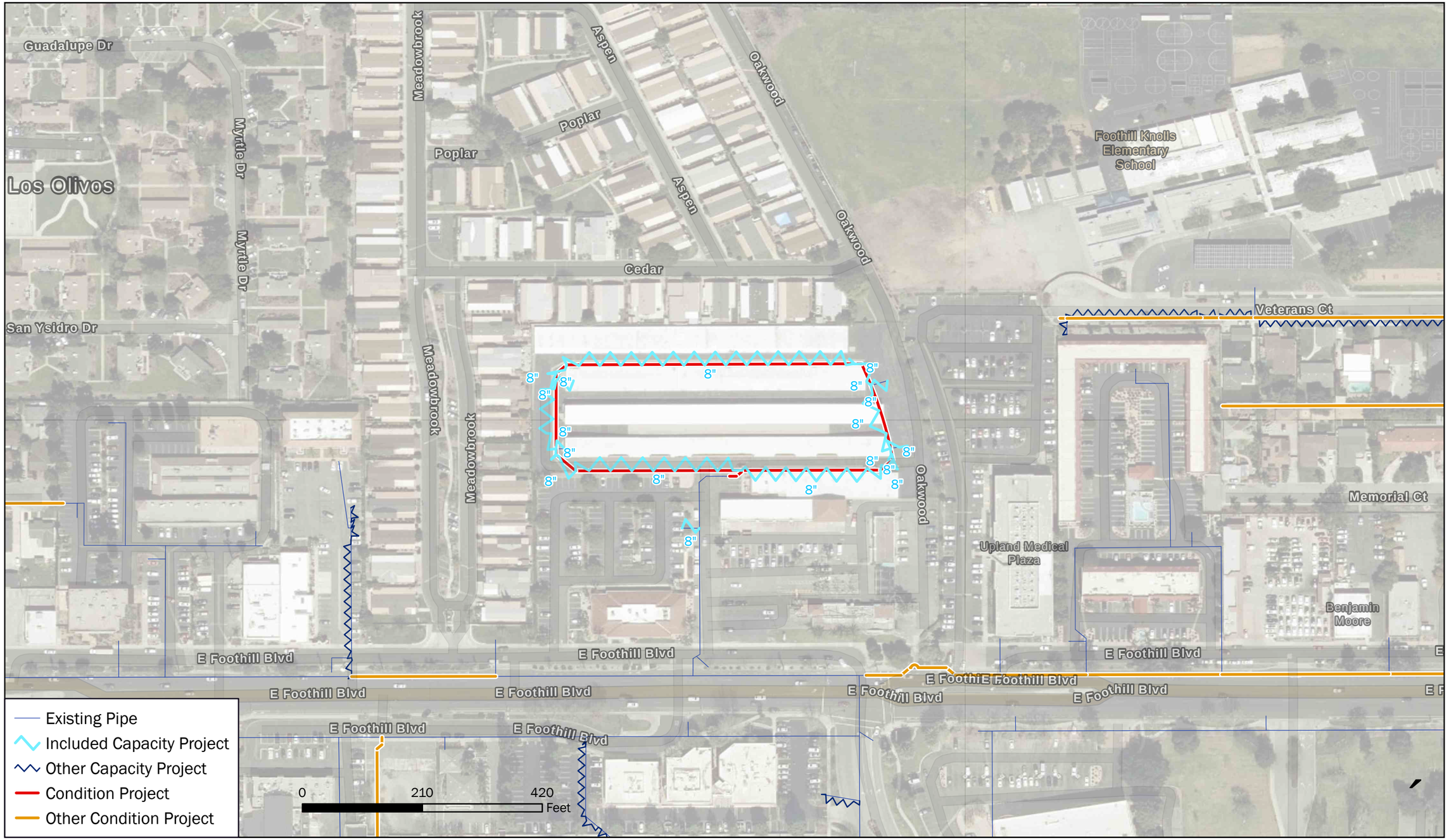


Figure 8. Cond-P8

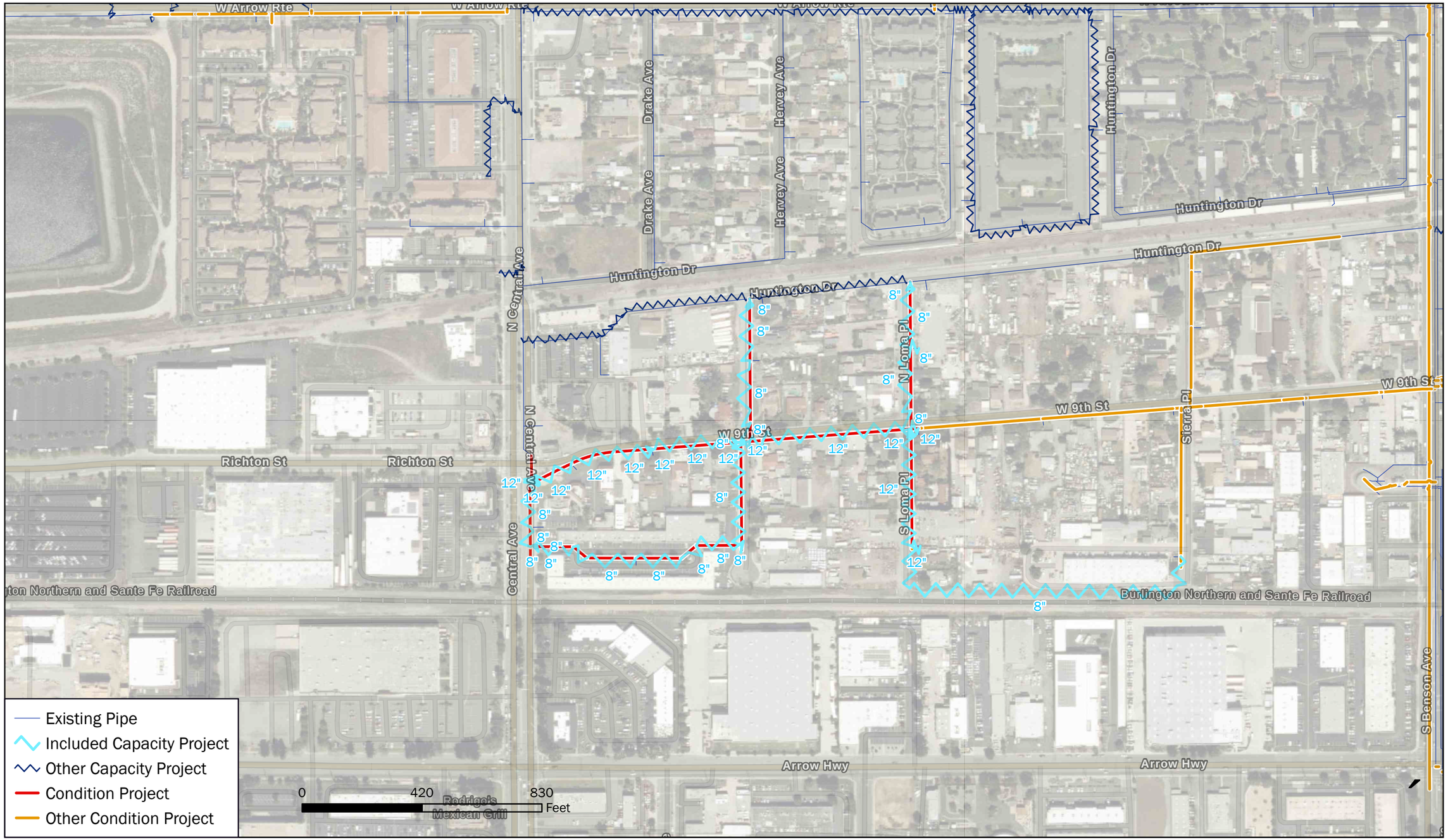


Figure 9. Cond-P9



Figure 10. Cond-P10

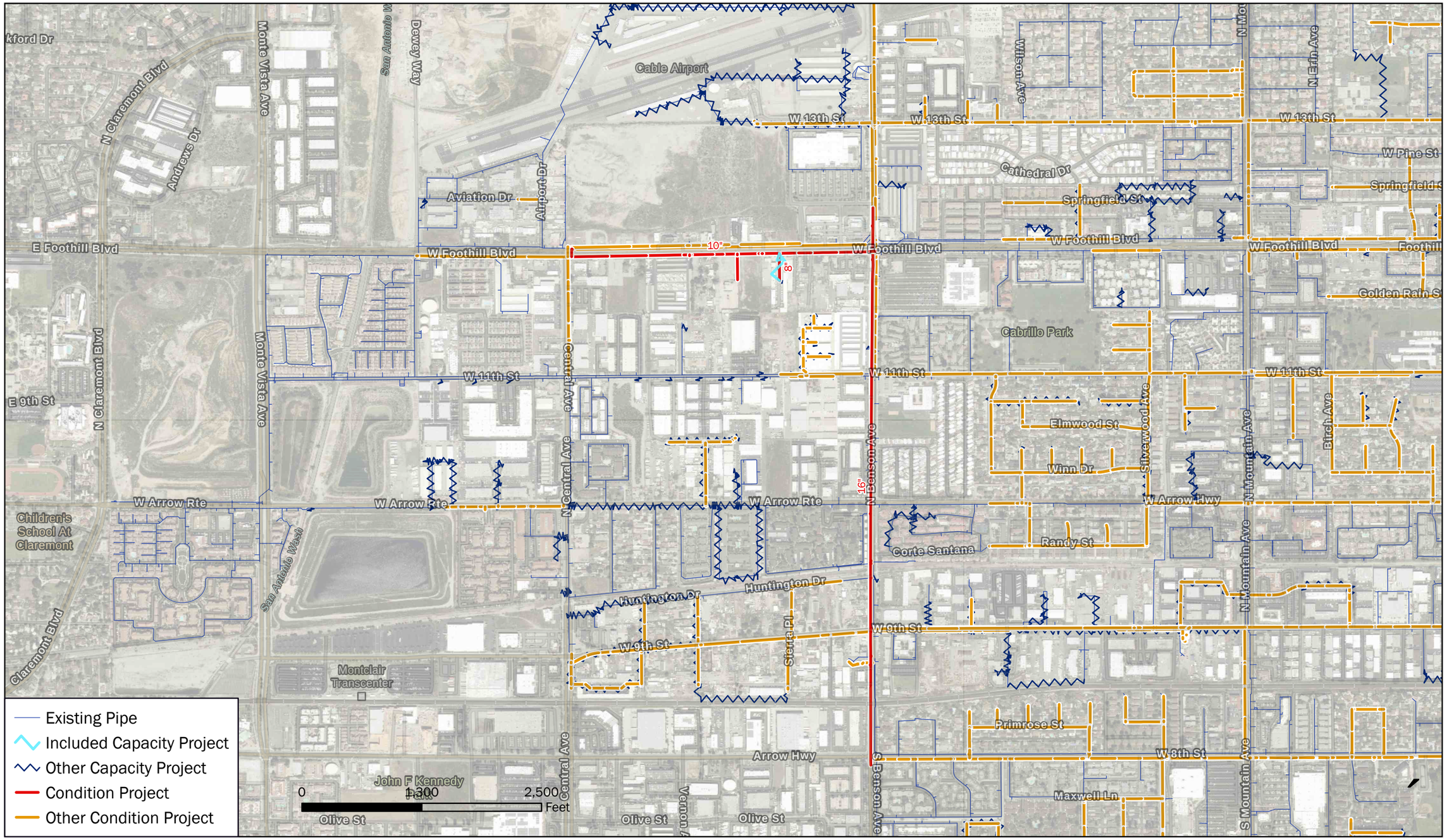


Figure 11. Cond-P11

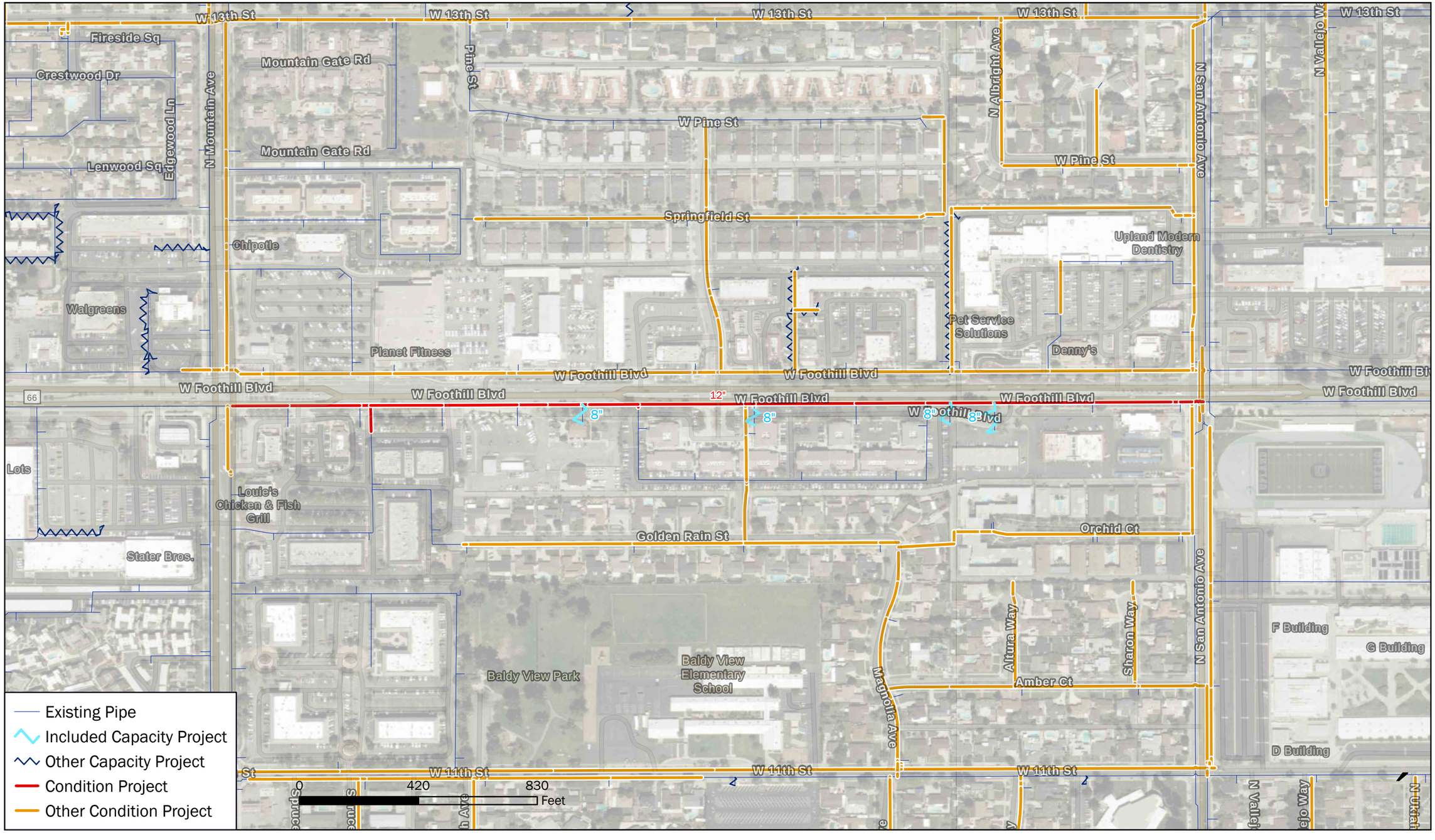


Figure 12. Cond-P12



Figure 13. Cond-P13



Figure 14. Cond-P14

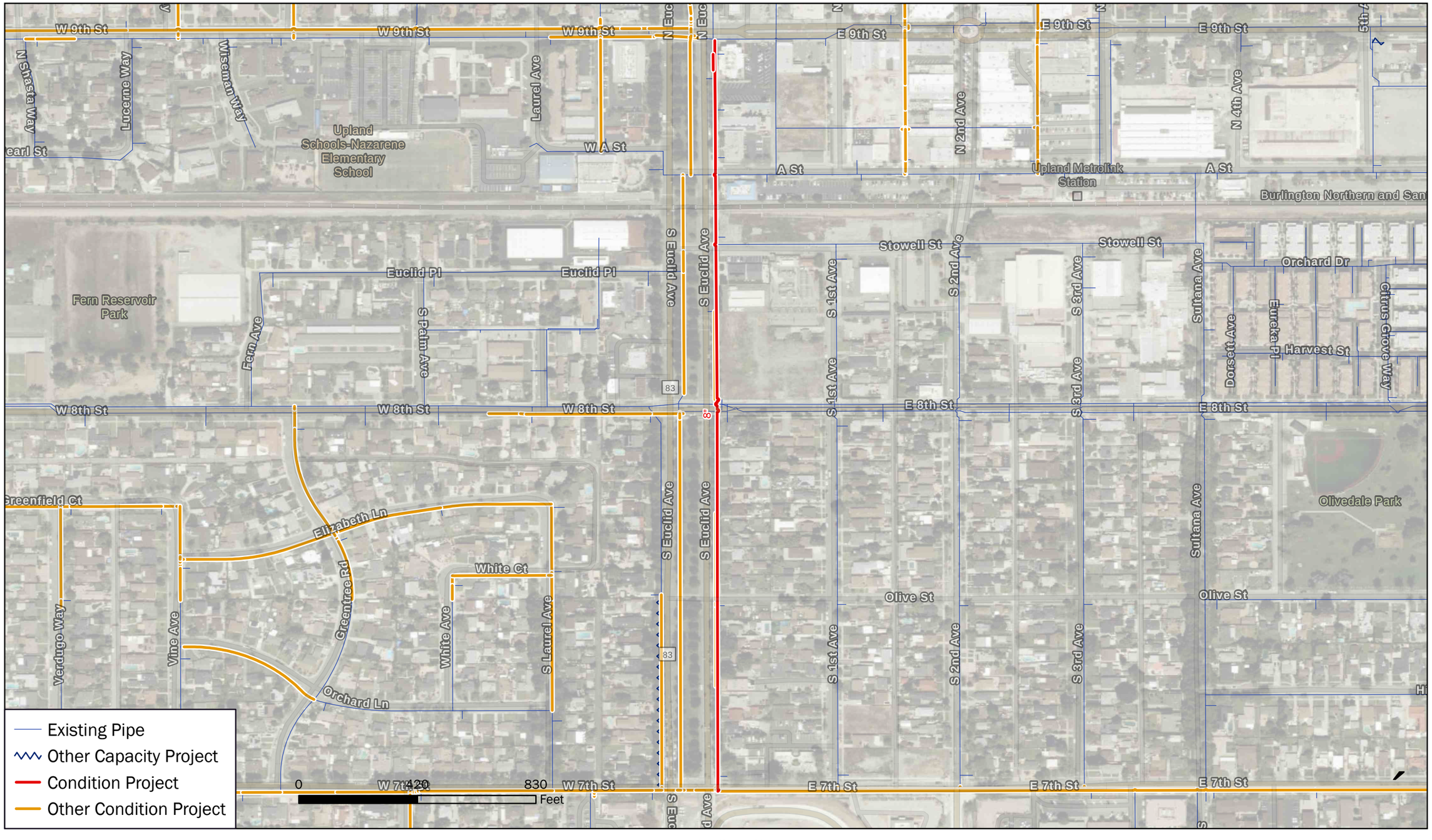


Figure 15. Cond-P15

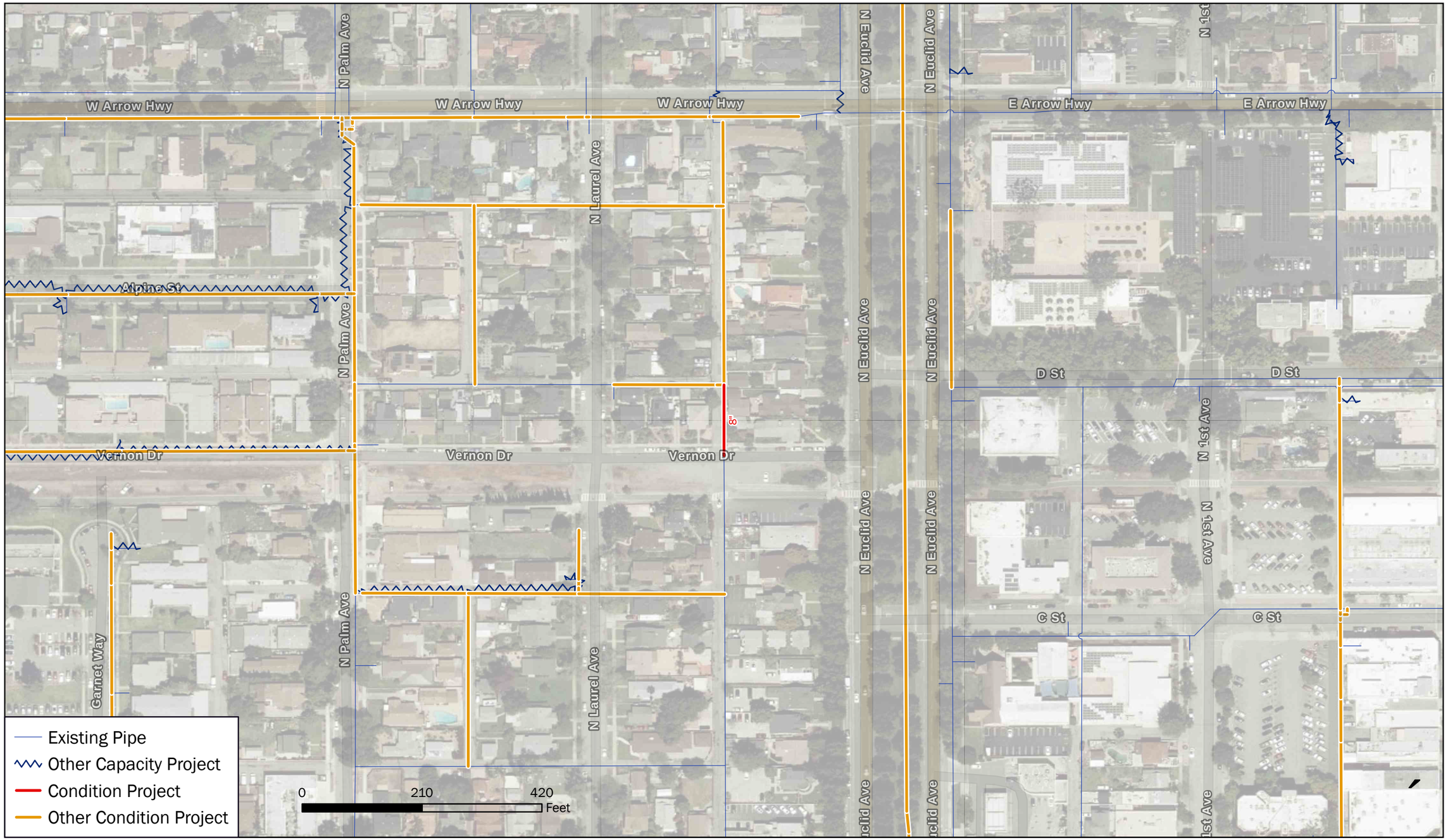


Figure 16. Cond-P16

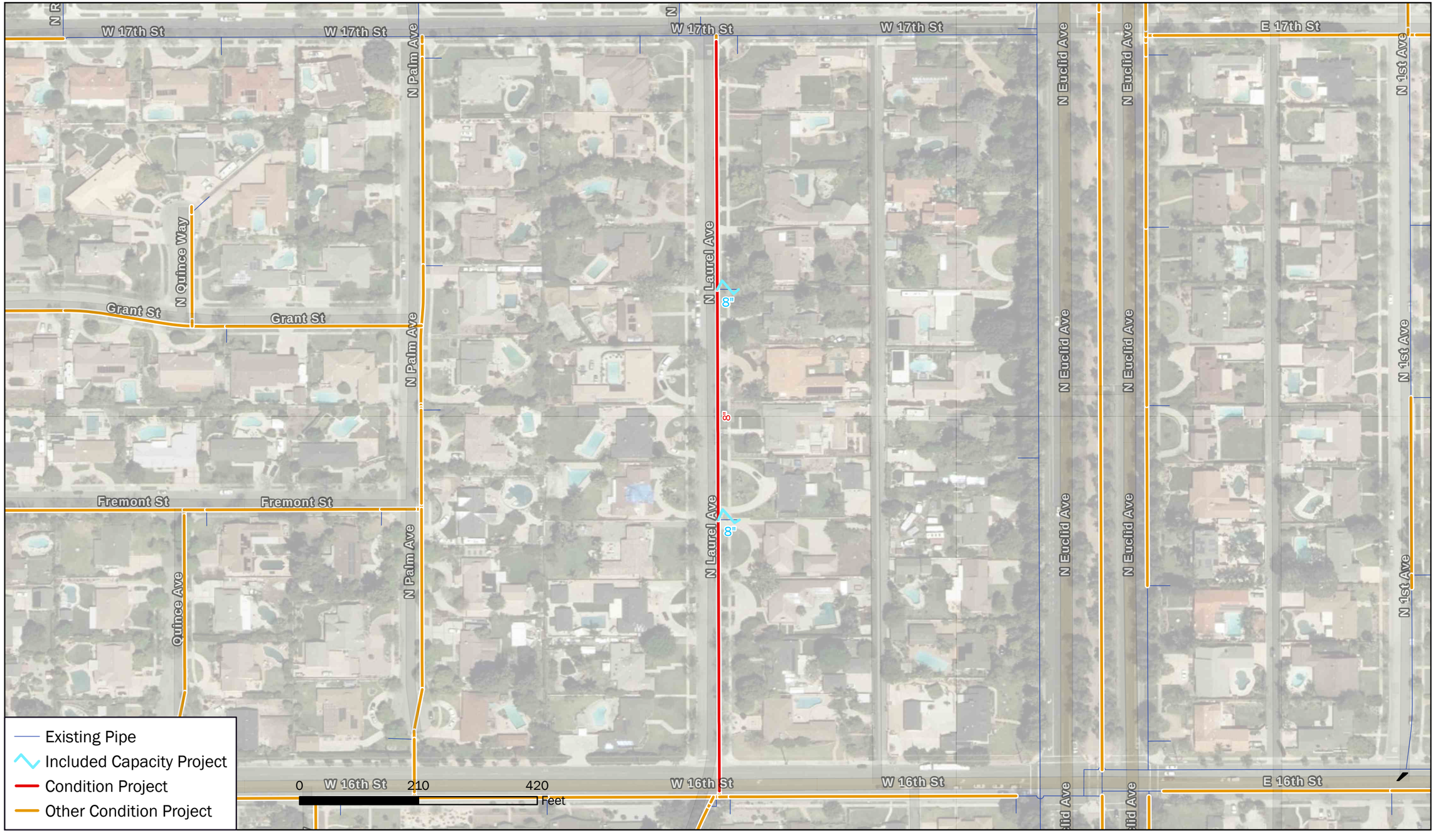


Figure 17. Cond-P17

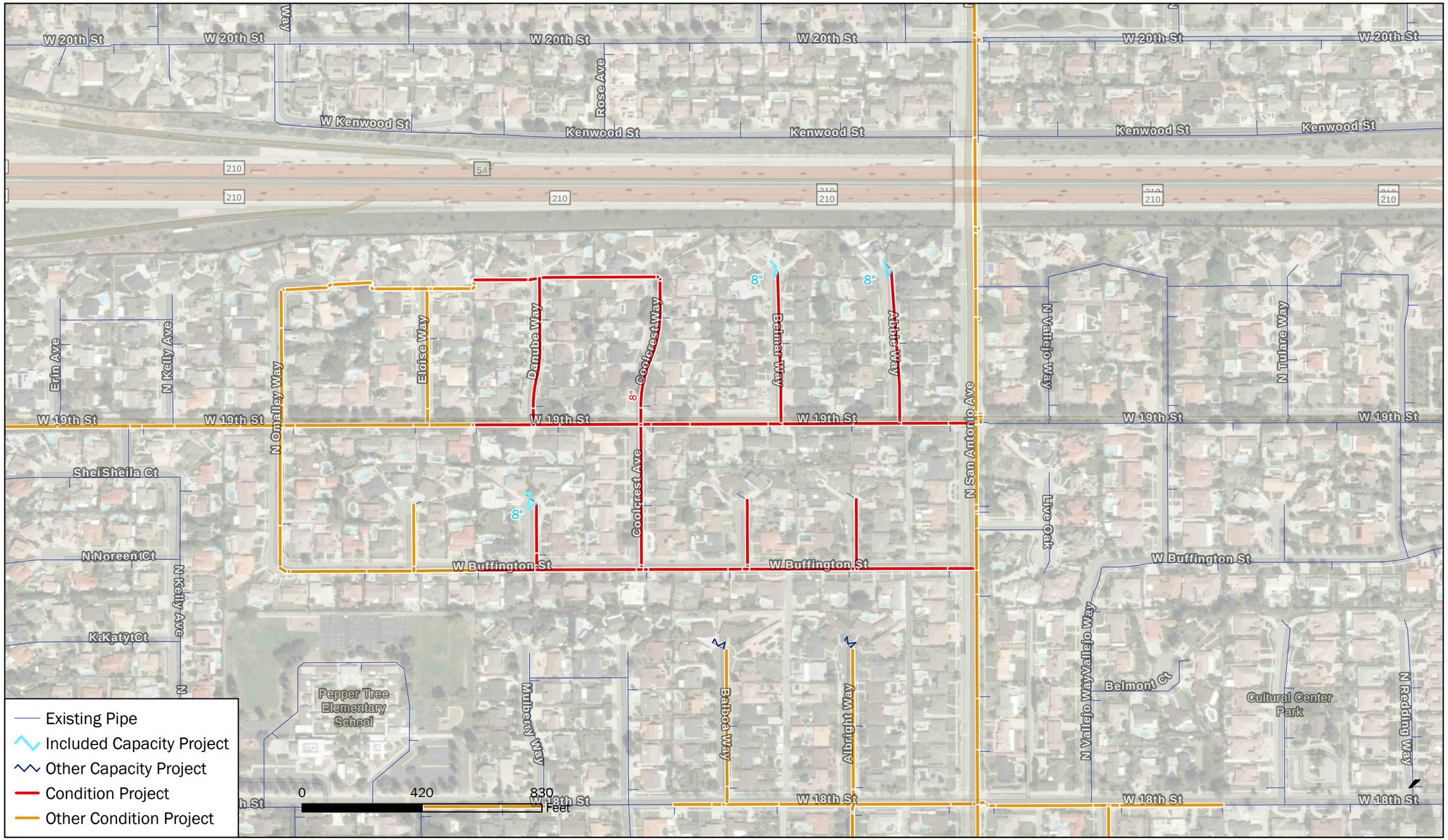


Figure 18. Cond-P18

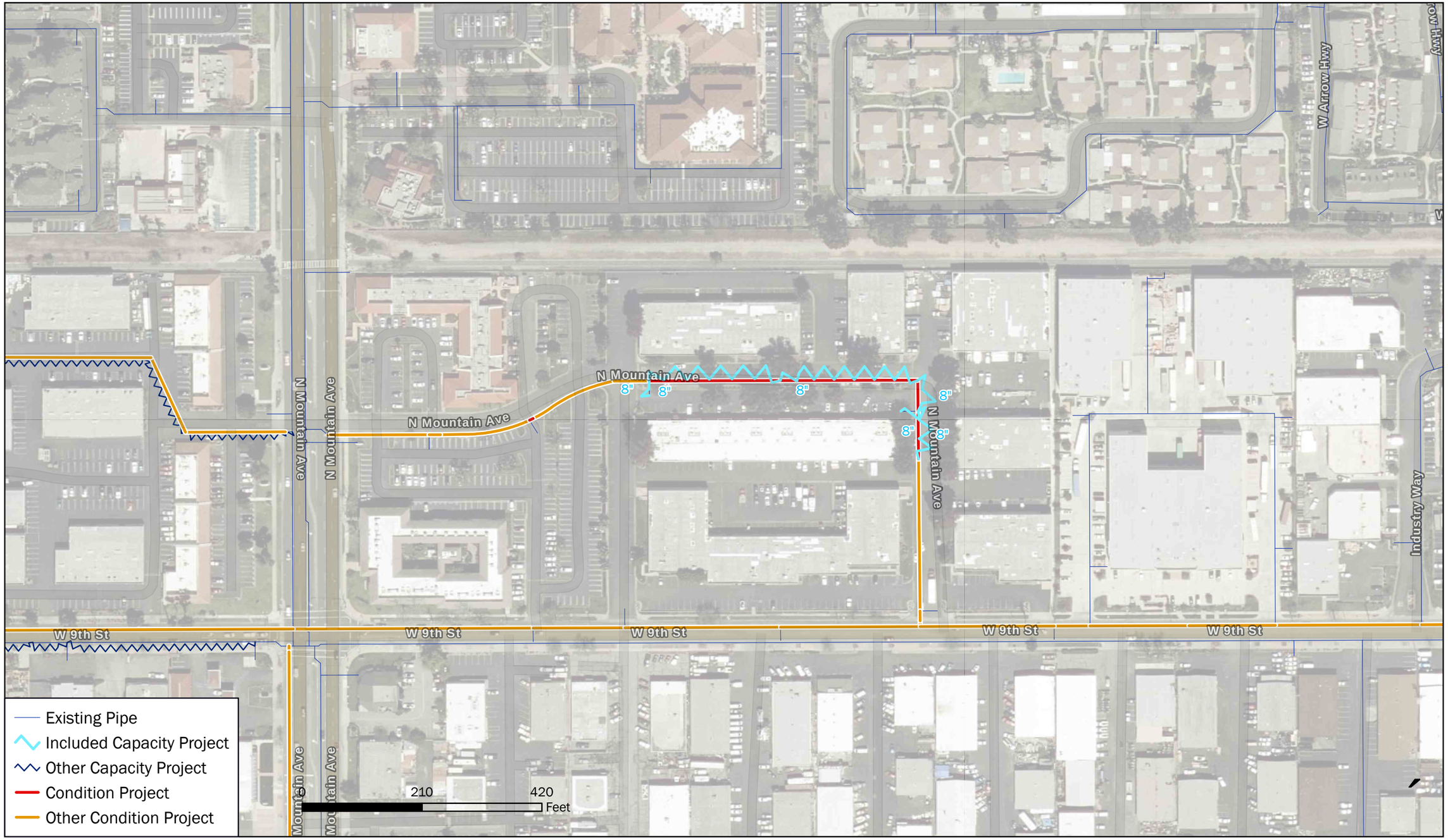


Figure 19. Cond-P19

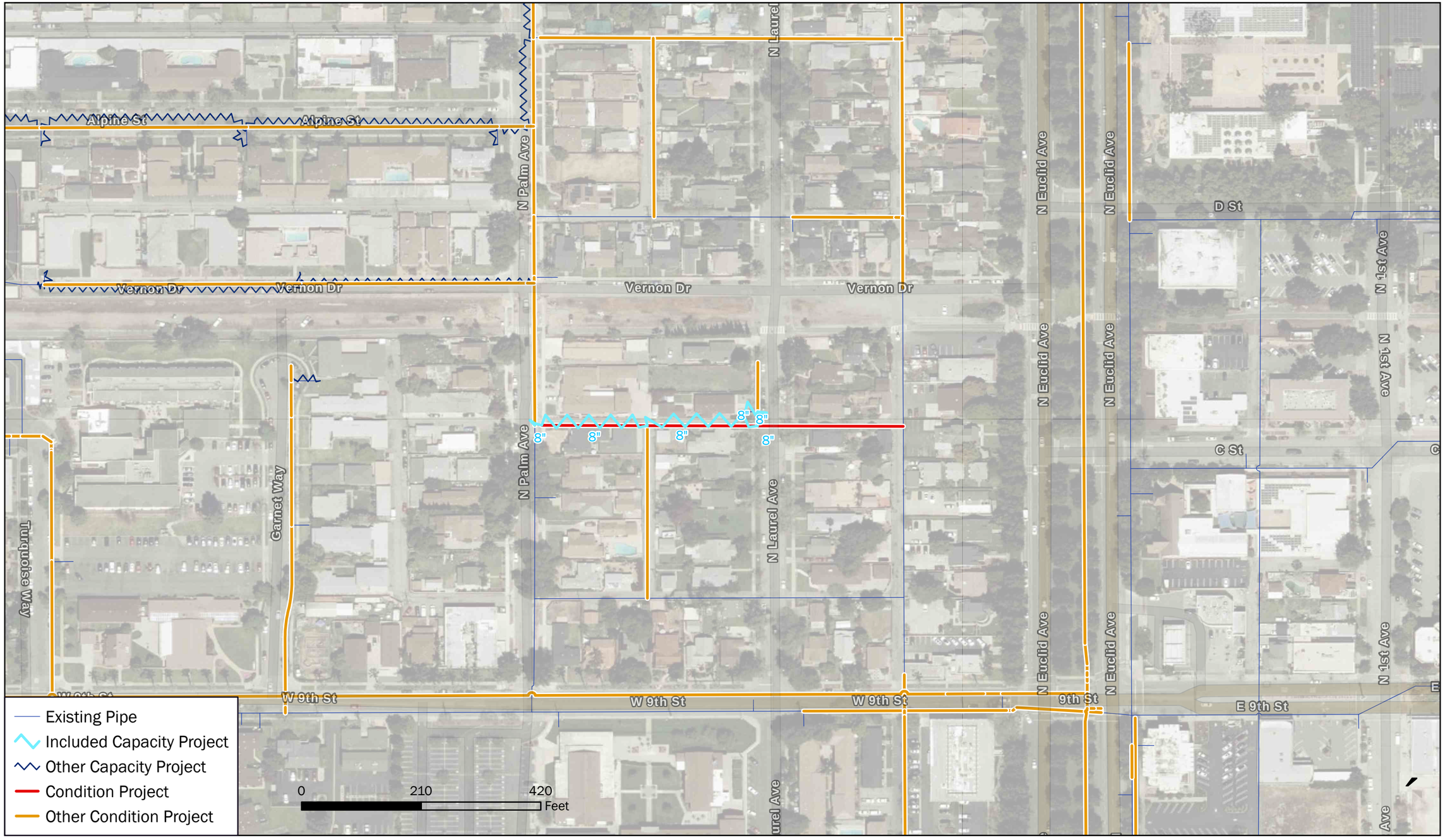


Figure 20. Cond-P20

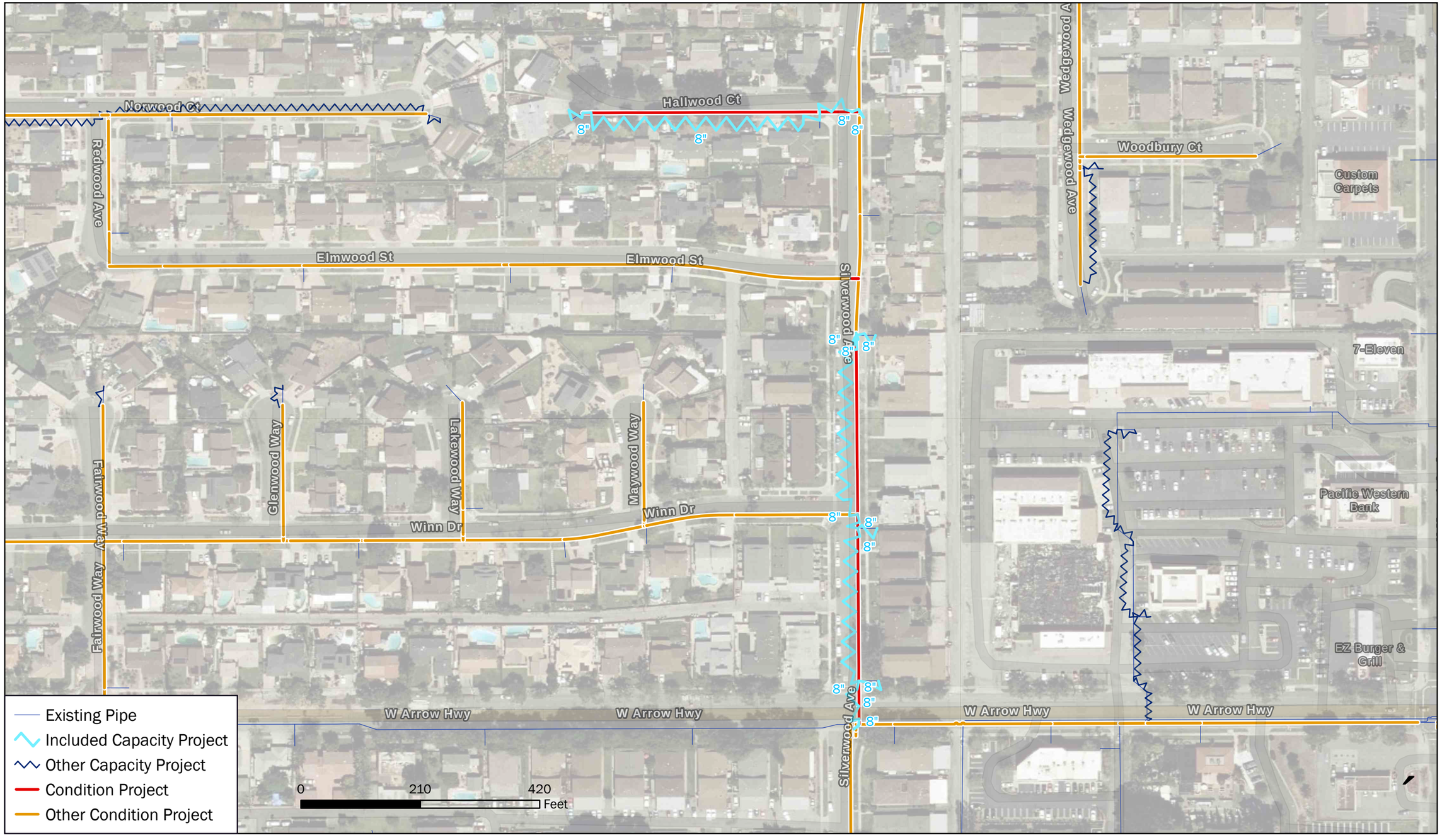


Figure 21. Cond-P21

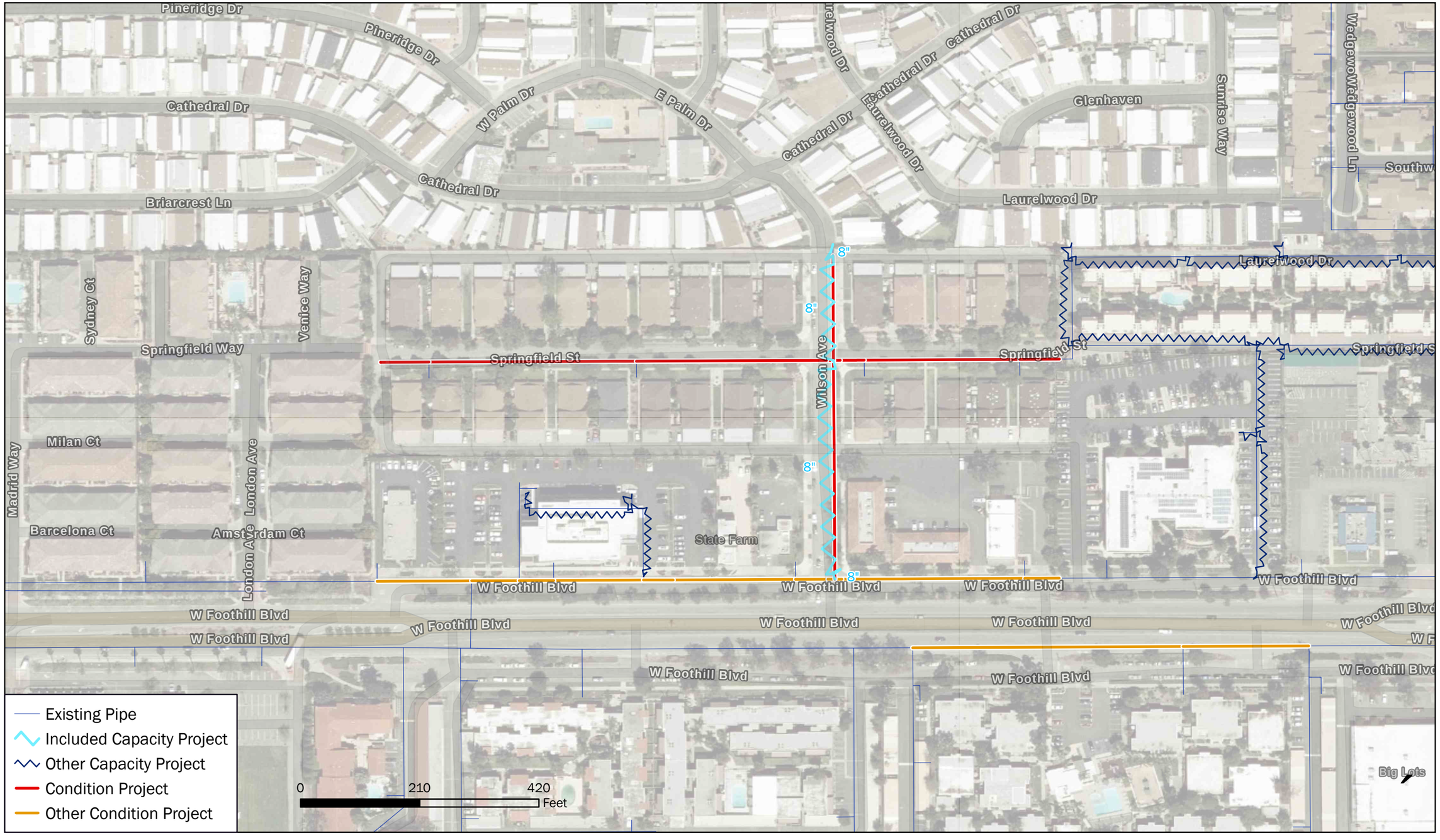


Figure 22. Cond-P22

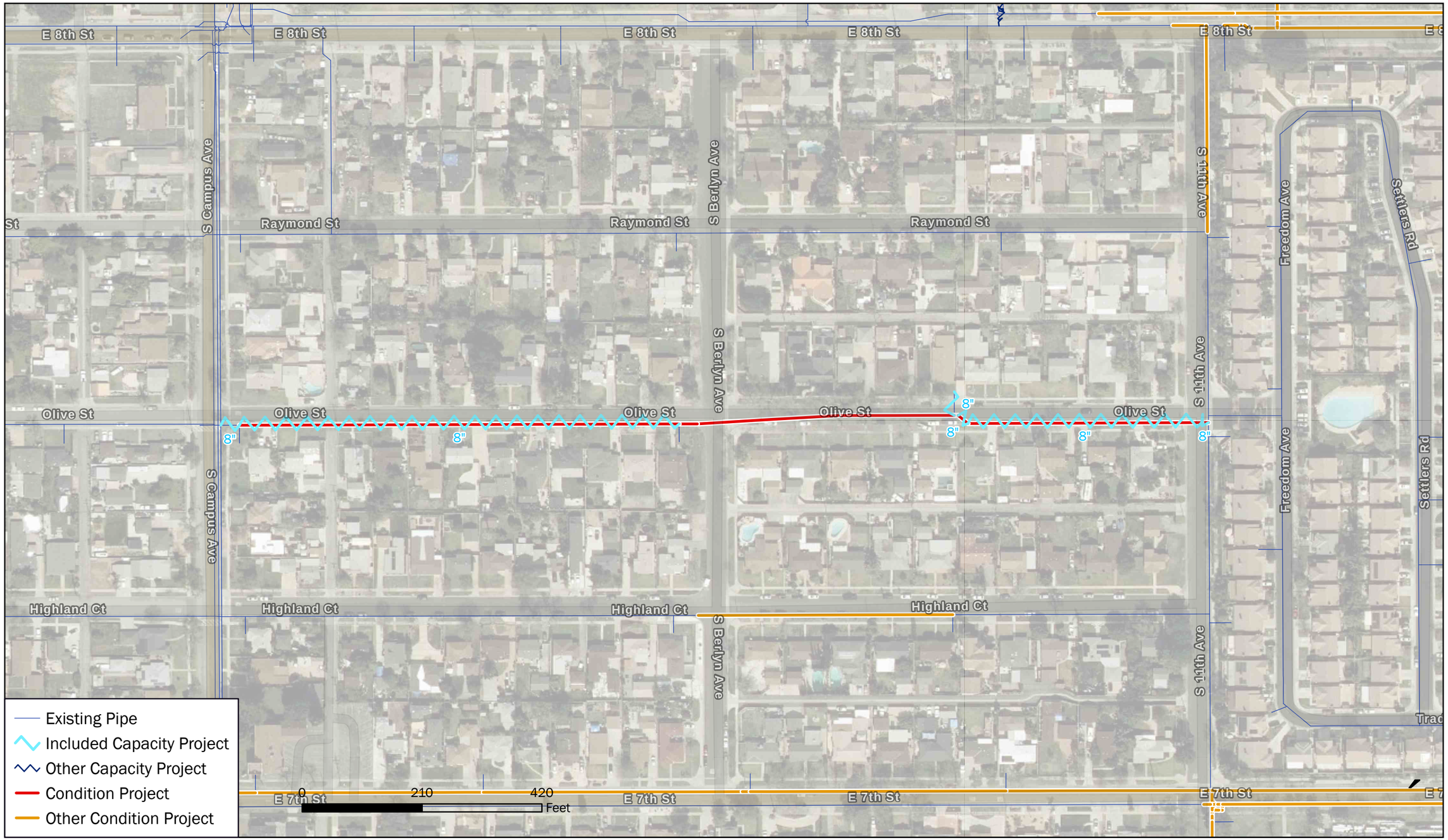


Figure 23. Cond-P23

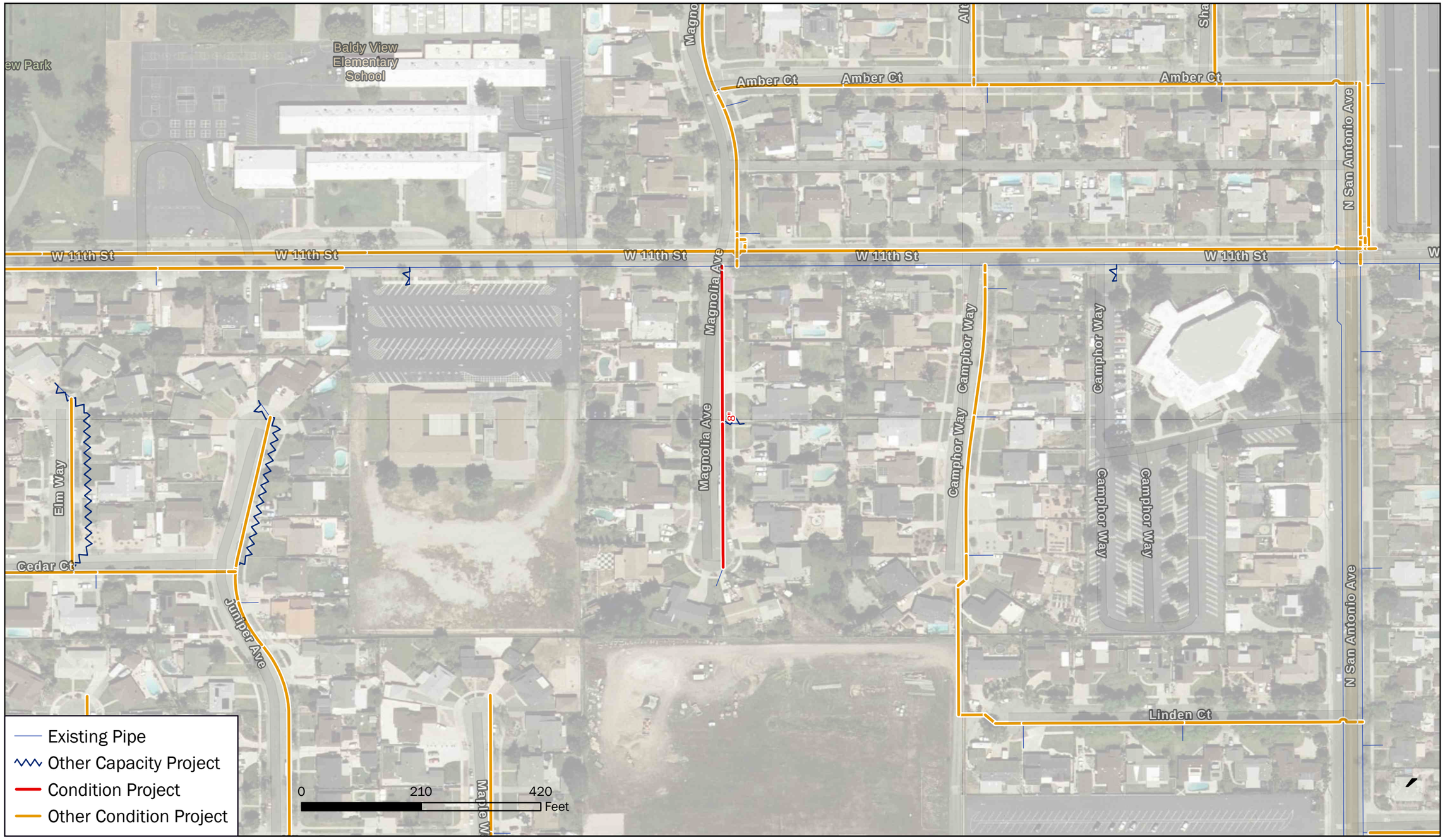


Figure 24. Cond-P24

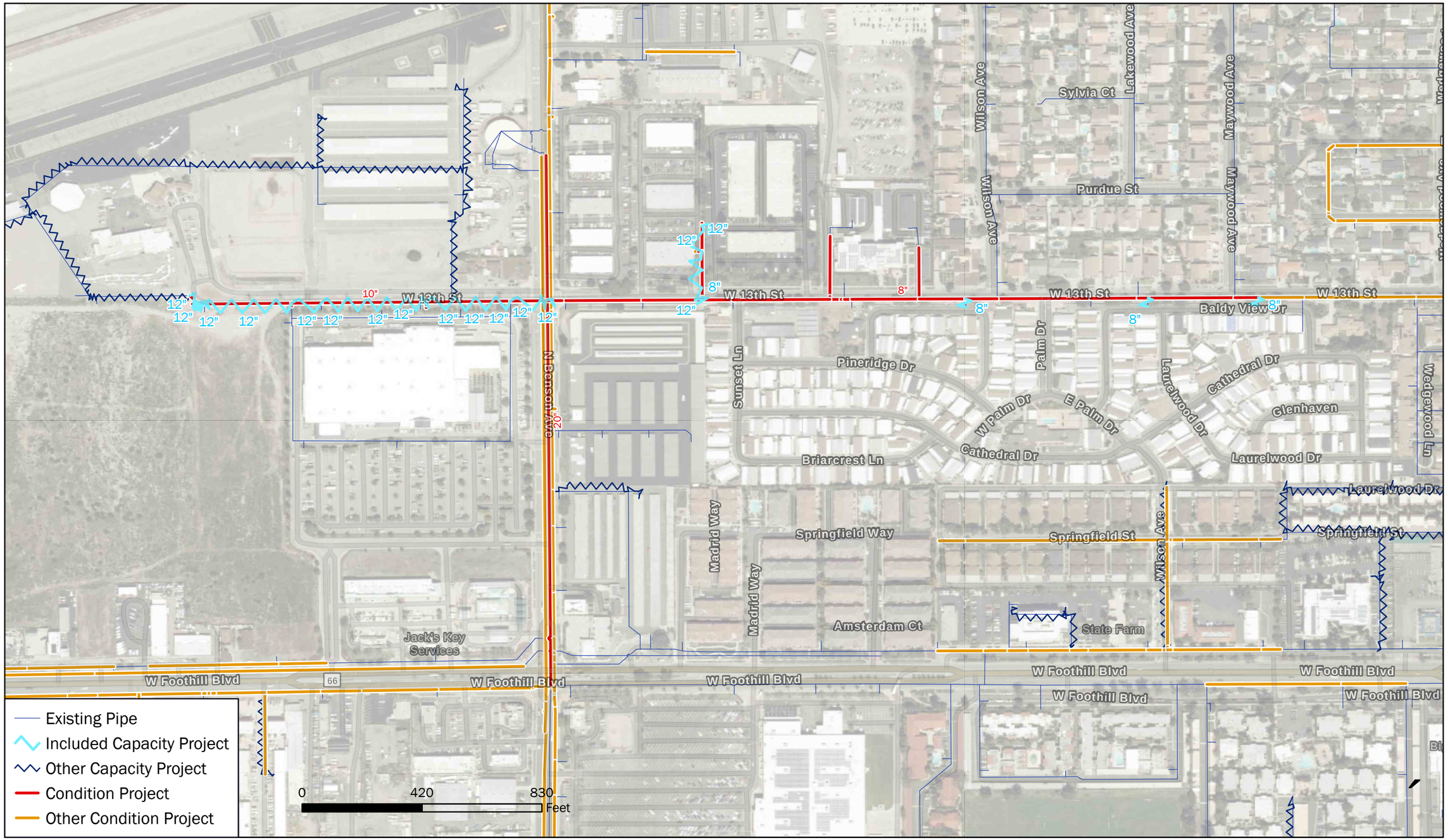


Figure 25. Cond-P25

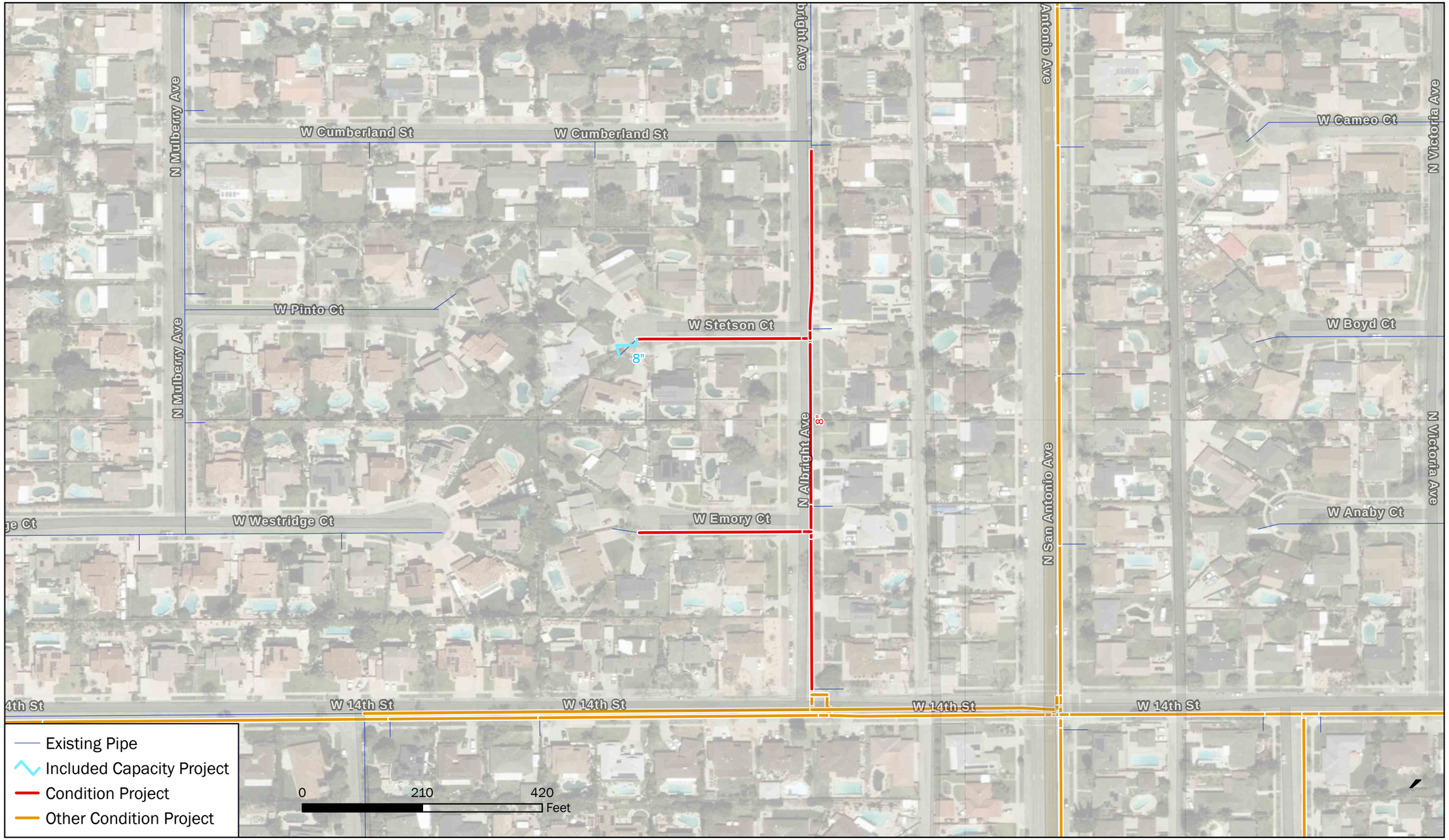


Figure 26. Cond-P26



Figure 27. Cond-P27

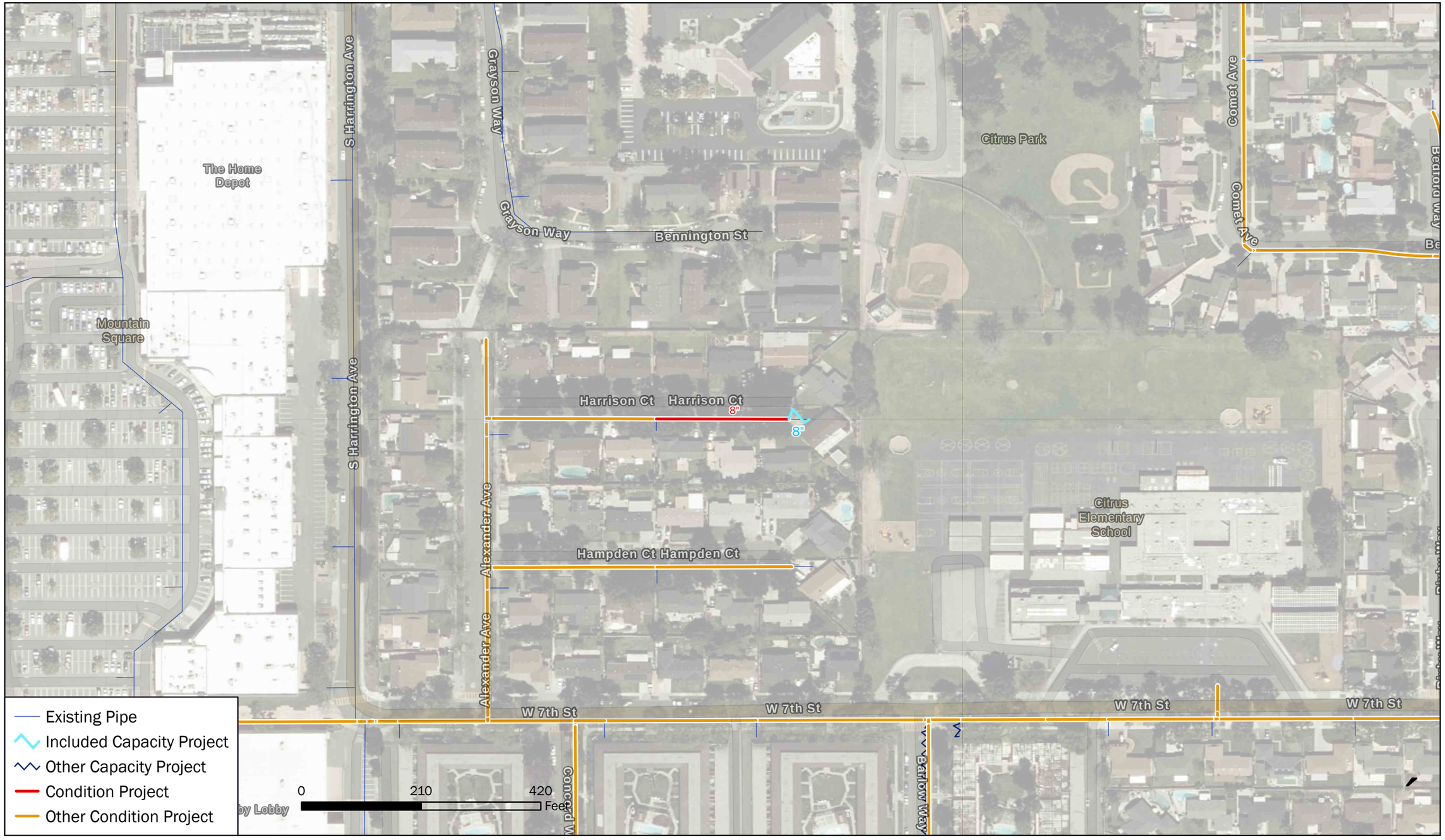


Figure 28. Cond-P28

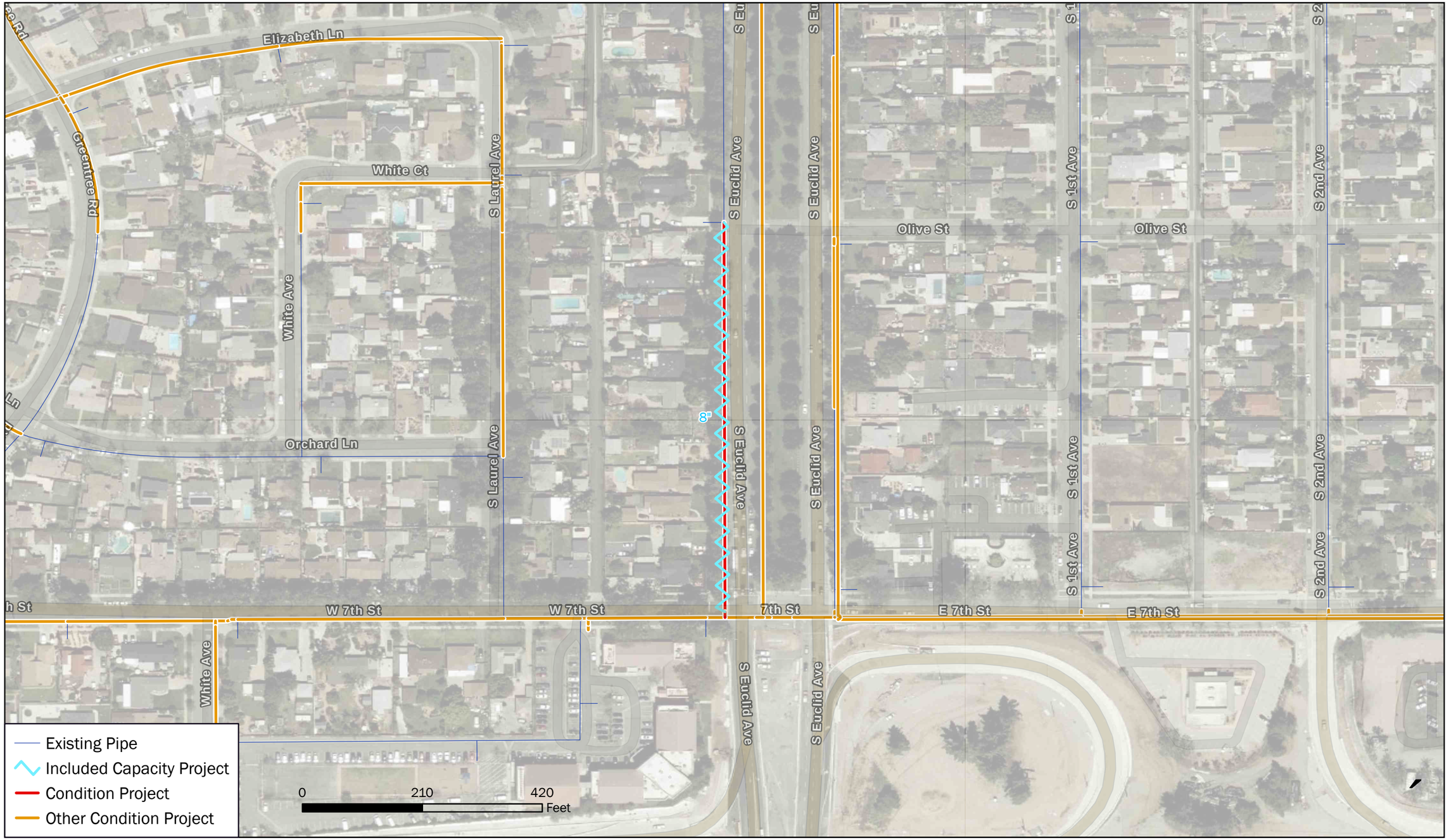


Figure 29. Cond-P29



Figure 30. Cond-P30

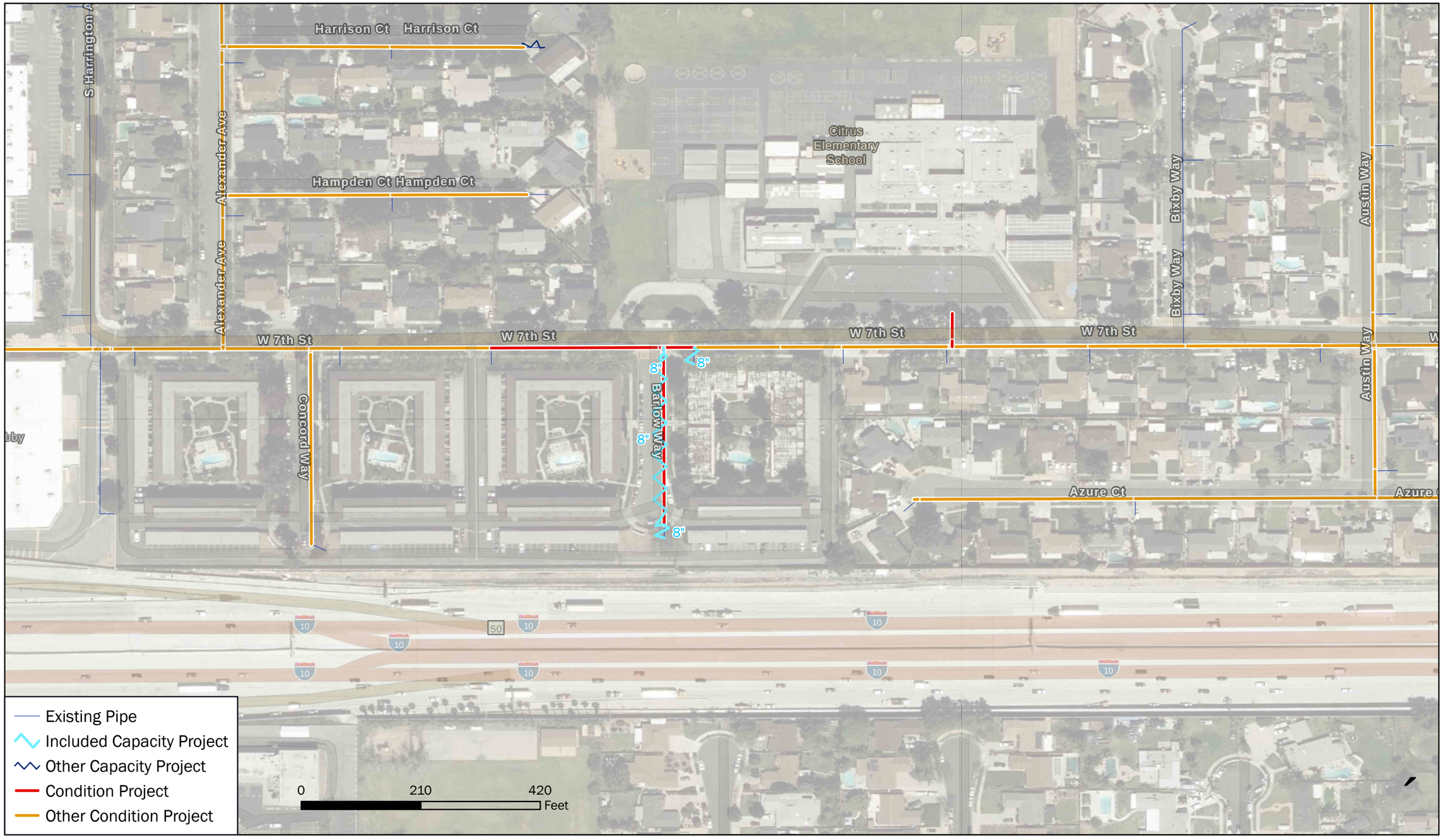


Figure 31. Cond-P31

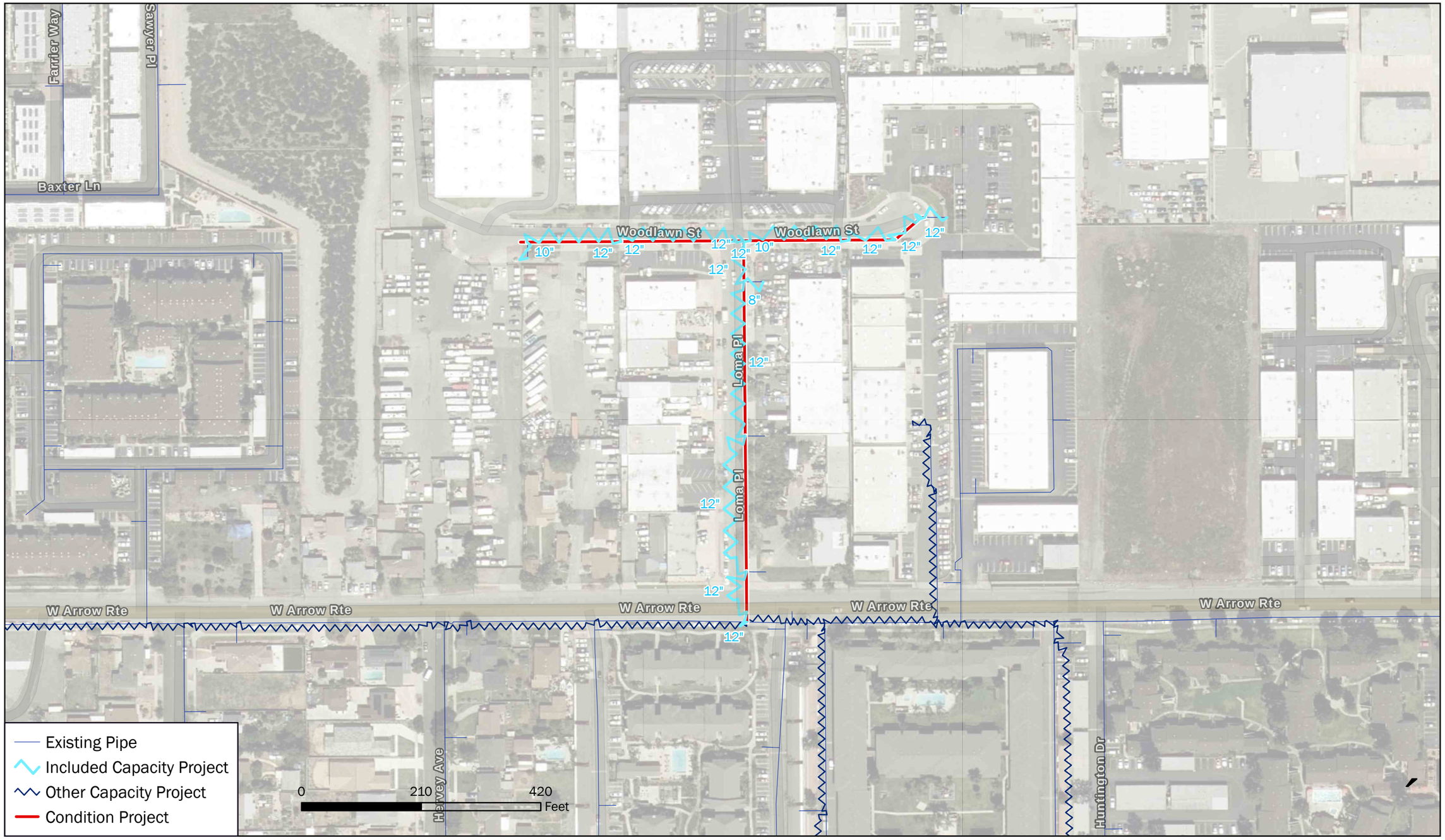


Figure 32. Cond-P32

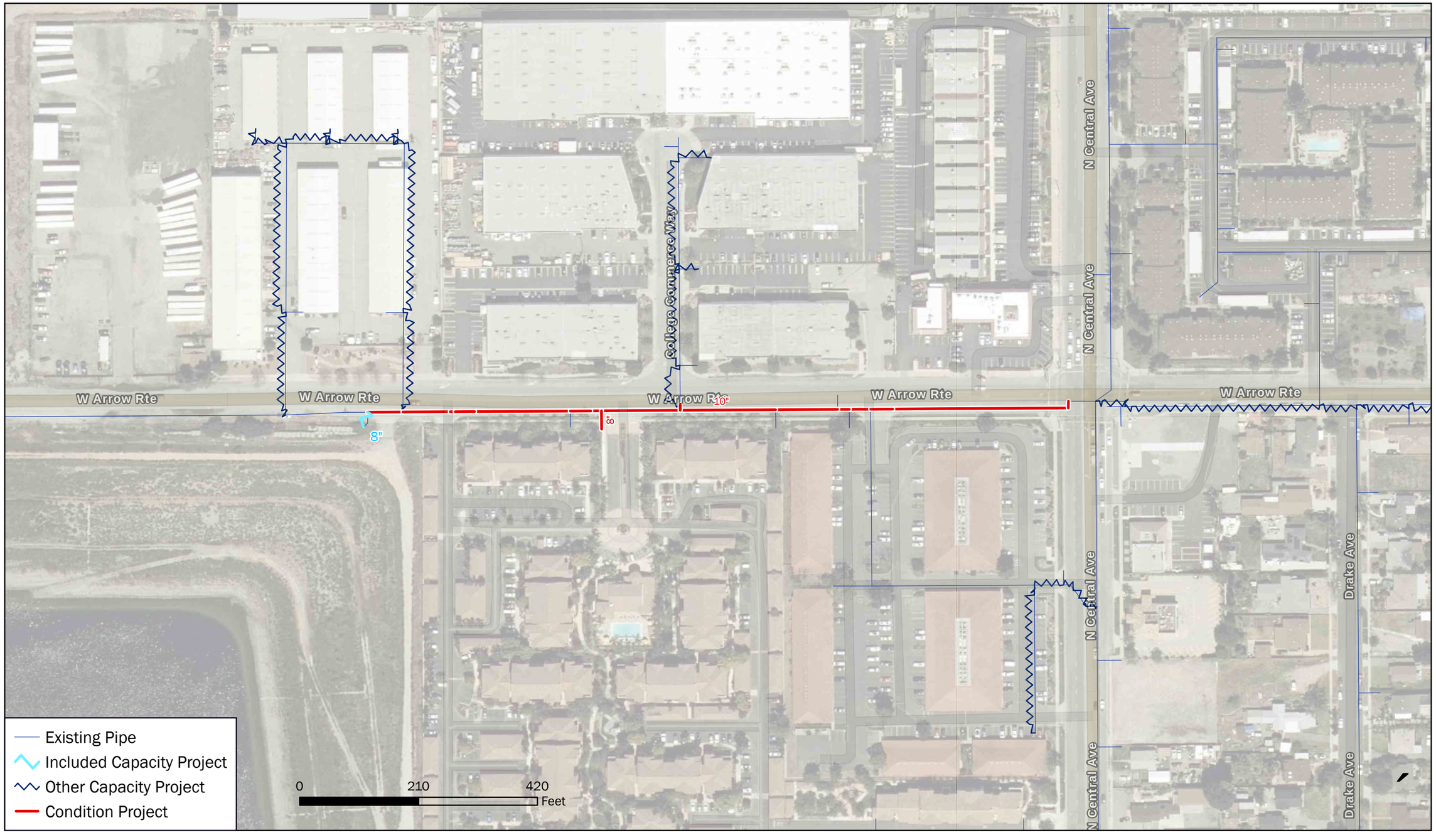


Figure 33. Cond-P33

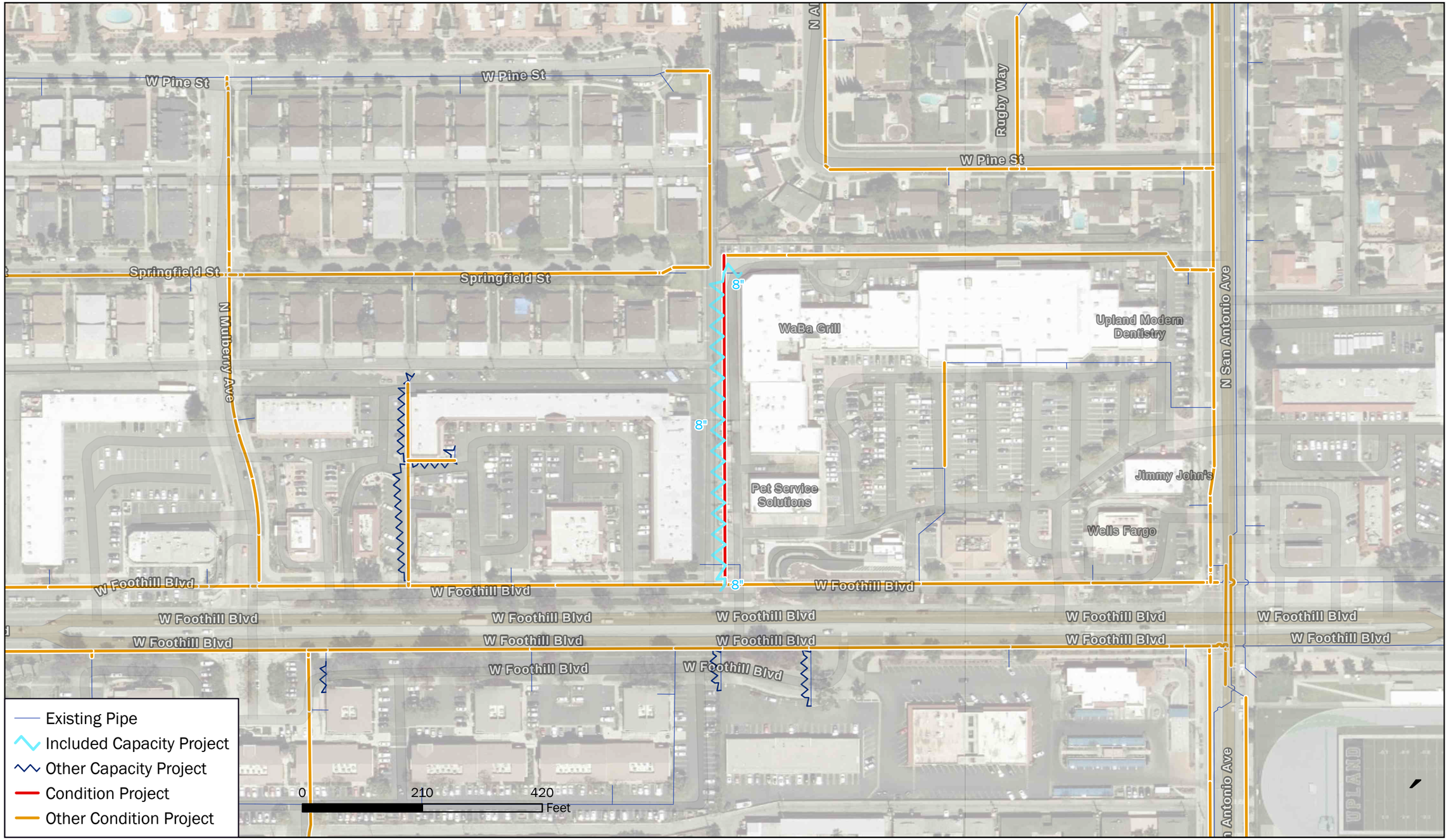


Figure 34. Cond-P34



Figure 35. Cond-P35

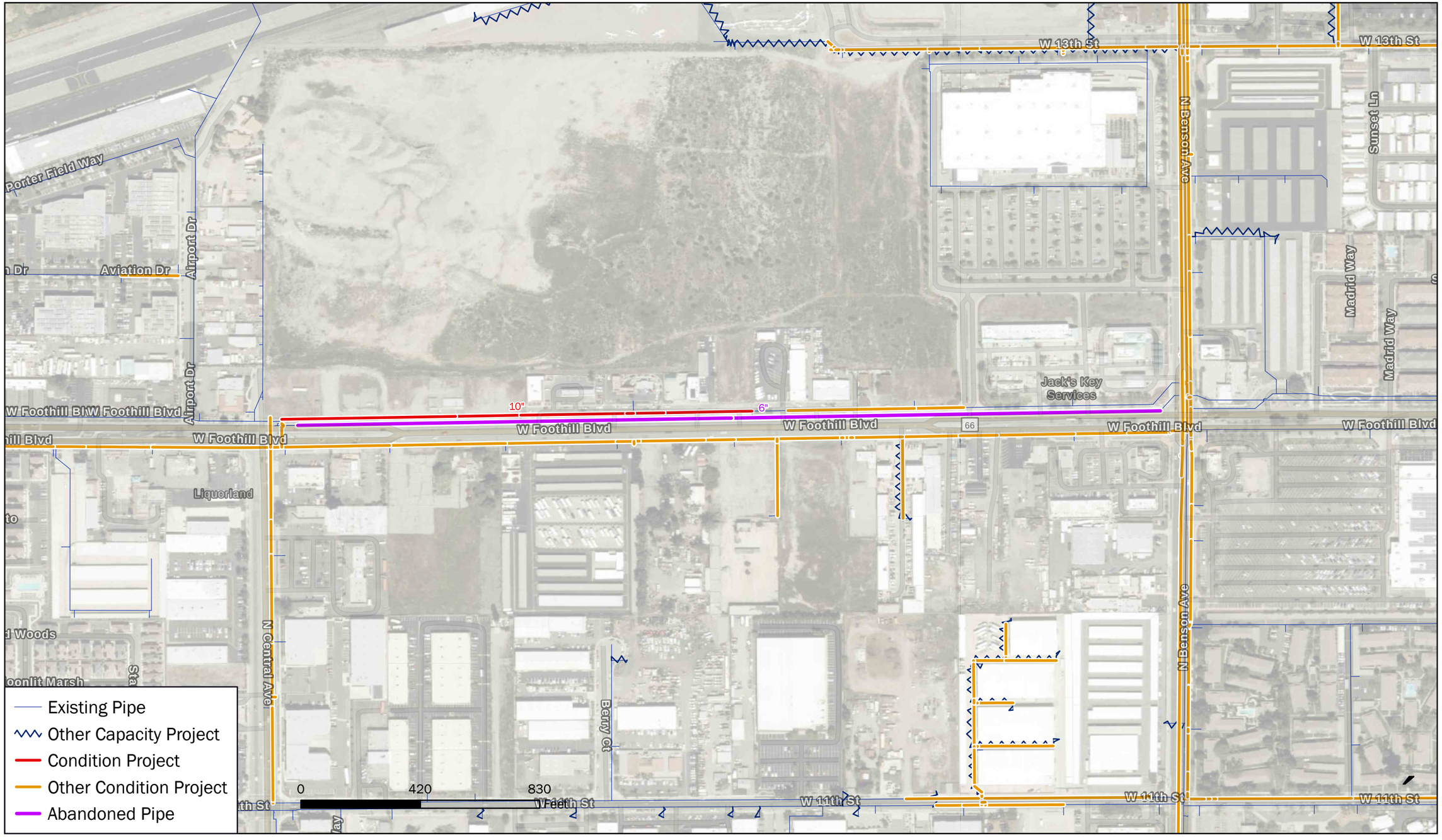


Figure 36. Cond-P36

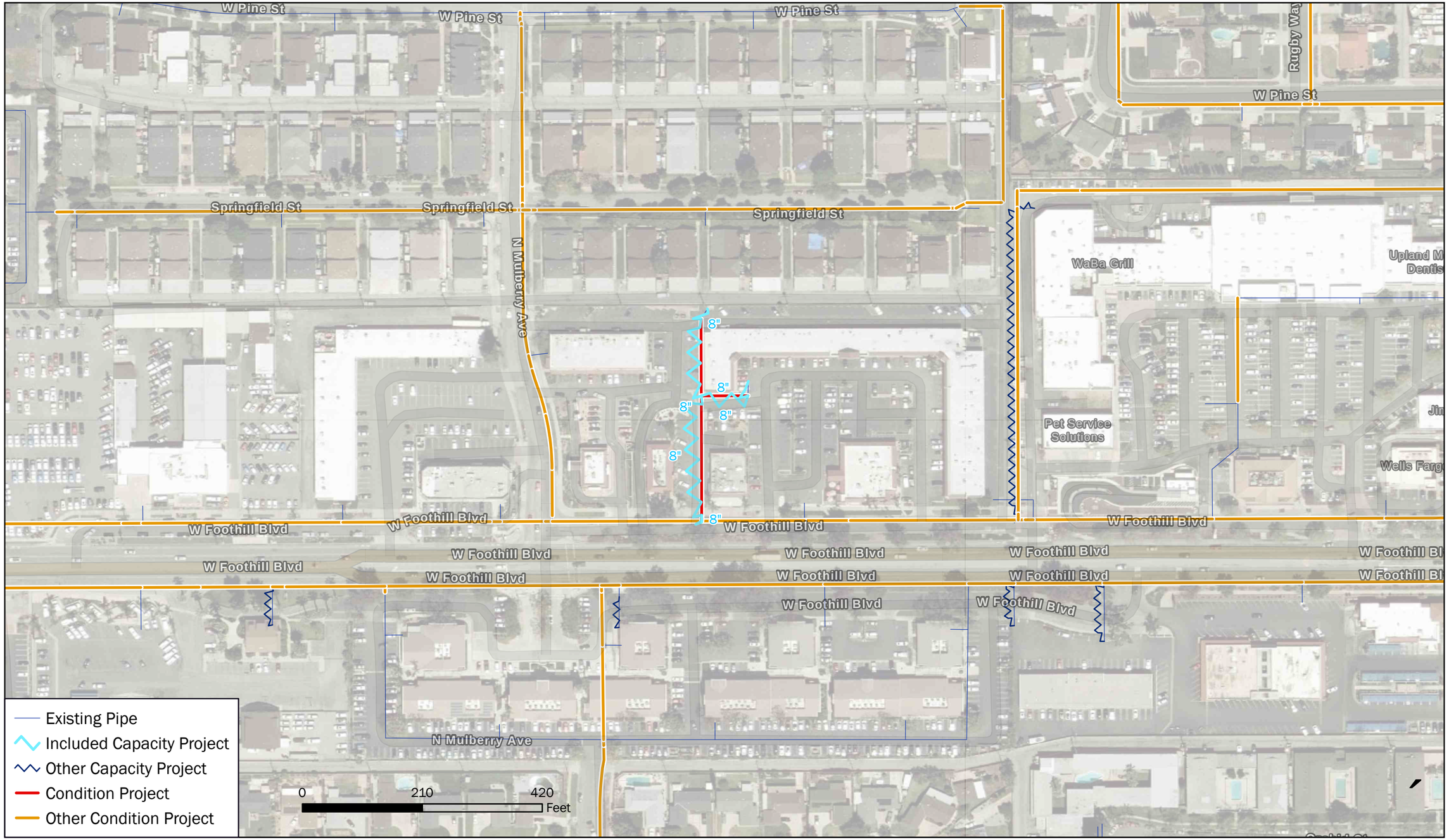


Figure 37. Cond-P37

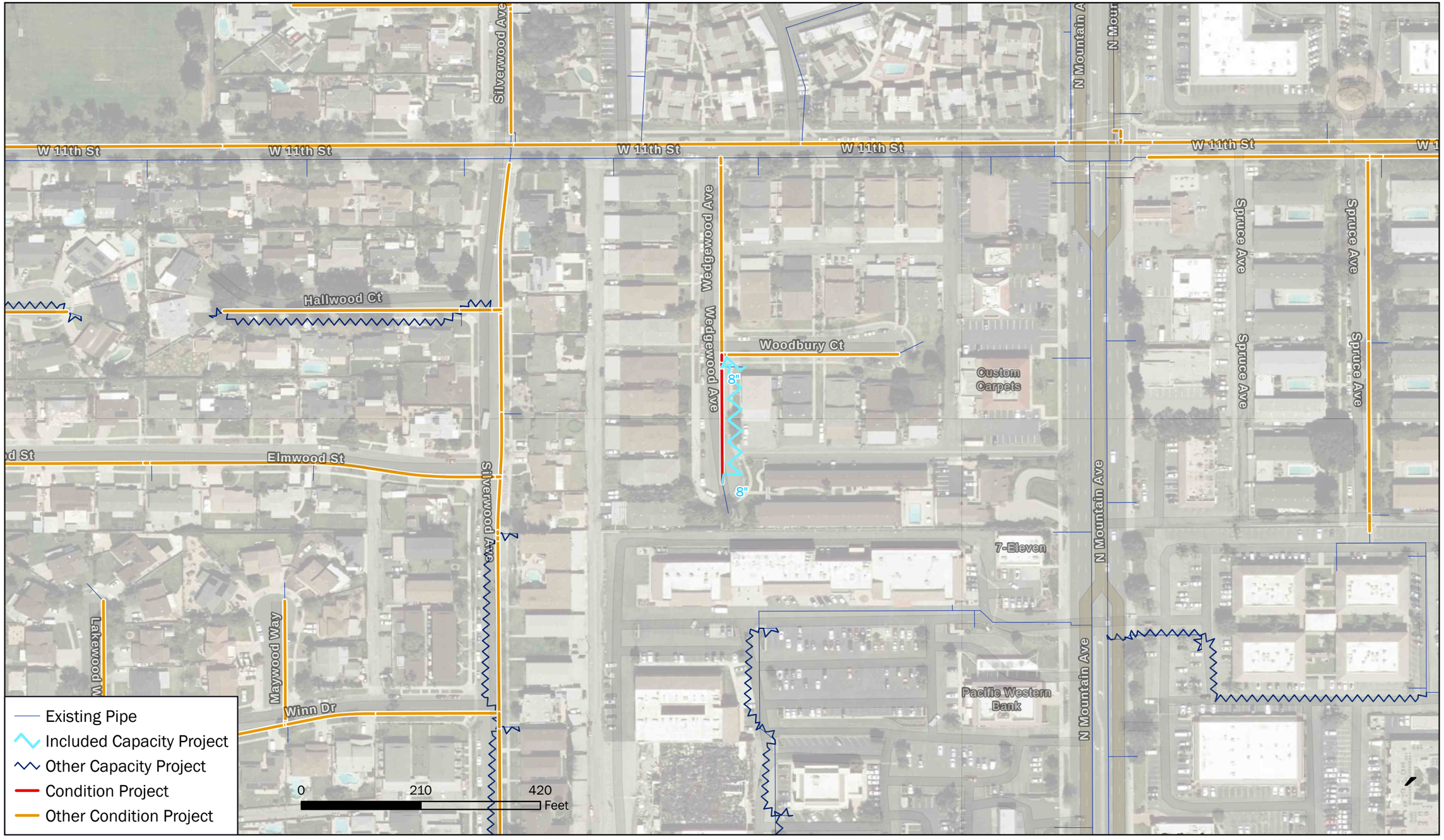
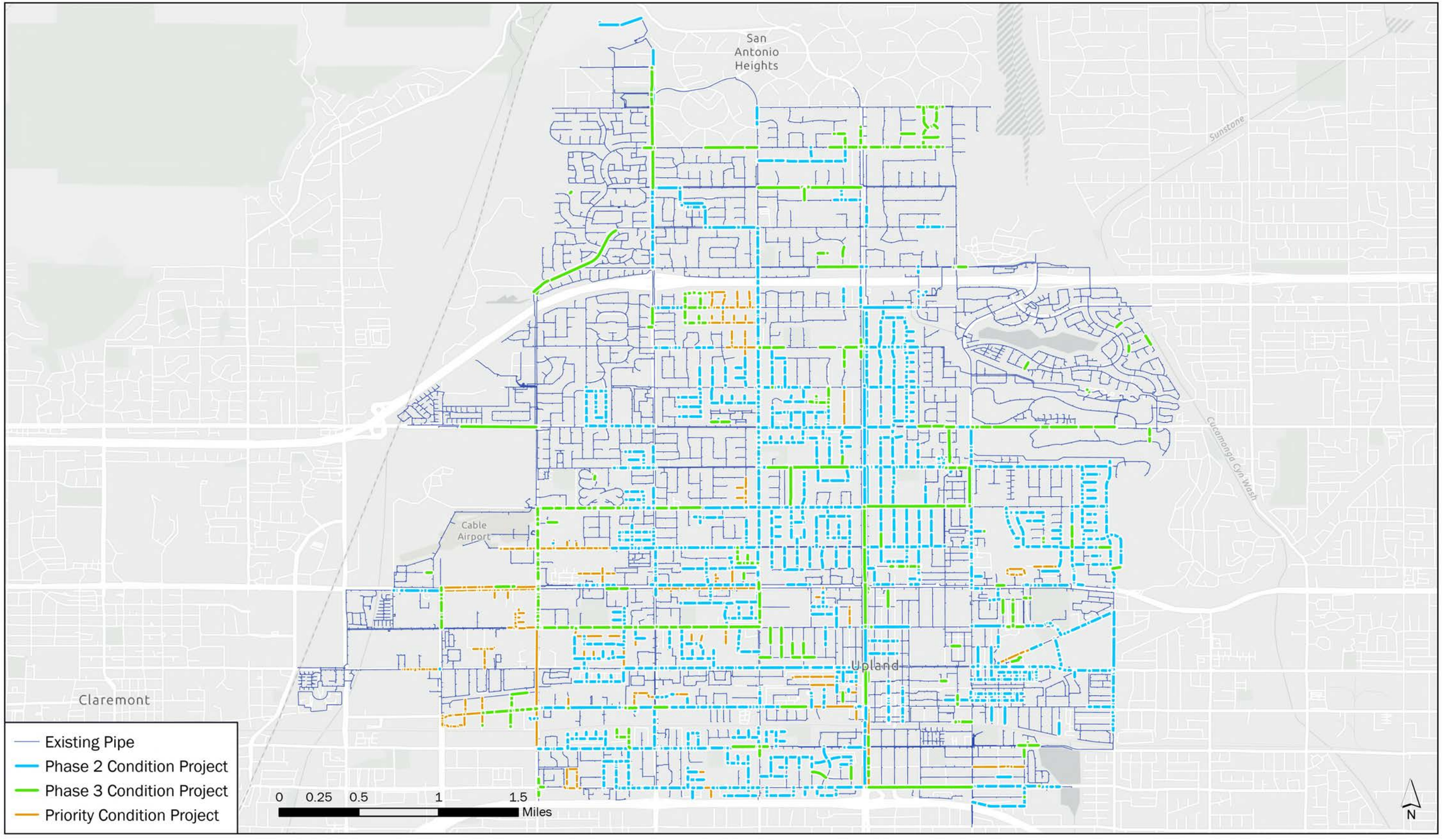


Figure 38. Cond-P38



Phase 2 and Phase 3 Condition Projects

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Project Identification: FF-1 through FF-10
Project Name: Fire Flow capacity improvement project FF-1 to FF-10
System Type: Potable
Project Type: Capacity
Project Size (LF): 18,240
Capital Cost: $ 20,028,000

Project Description:
These capacity improvement projects have been developed to address identified fire flow deficiencies. They have been prioritized based on the severity of the fire flow deficiency (e.g., available fire flow versus fire flow requirement), number of hydrants impacted, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Projects Cap-FF-1, 4, 5, and 7 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source. Projects Cap-FF-1 and 3 include new pipelines near railroads to complete pipe looping. If easements for these pipelines cannot be obtained, alternative projects can be developed (additional pipe upsizing).

Project	Project Element	Pipe Diameter (in)	Includes Condition Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cap-FF-1: North of Burlington Northern Railroad (from N San Antonio Ave west to parking lot west of 968 W 9th St), and parking lots (south of W 9th St)	Pipe	8			1,080	$ 701	$ 758,000	$ 985,400	2030
	Pipe	12			1,660	$ 911	$ 1,513,000	$ 1,966,900	2030
Cap-FF-2: W Foothill Blvd (from N Campus Ave west to N Redding Way), N Redding Way (from W Foothill Blvd to W 11th St), and N 4th Ave (from E Foothill Blvd south for about 600')	Pipe	8	Yes	Yes	1,730	$ 701	$ 1,213,000	$ 1,576,900	2028 / 2029
	Pipe	12			6,460	$ 911	$ 5,886,000	$ 7,651,800	2028 / 2029
Cap-FF-3: North of Burlington Northern Railroad (from parking lot west of A & A Food Services Co to parking lot near Micas Pro Roofers), and parking lot near Upland Events and Banquet Center (south of W 9th St)	Pipe	8			1,400	$ 701	$ 982,000	$ 1,276,600	2031-40
Cap-FF-4: Parking lot (north of Arrow and 330' east of Loma Pl)	Pipe	12			350	$ 911	$ 319,000	$ 414,700	2029
Cap-FF-5: Parking lot west of Fire Station 161 (southwest of E Arrow Hwy and N 2nd Ave)	Pipe	8			150	$ 701	$ 106,000	$ 137,800	2029
Cap-FF-6: W 9th St (from Benson Ave to N Mountain Ave)	Pipe	12			3,330	$ 911	$ 3,034,000	$ 3,944,200	2031-40
Cap-FF-7: North of W 9th St and 1,300' west of Mountain Ave	Pipe	12			640	$ 911	$ 584,000	$ 759,200	2030
Cap-FF-8: San Antonio Pl (from N San Antonio Ave west to dead end)	Pipe	8			690	$ 701	$ 484,000	$ 629,200	2029
Cap-FF-9: Orchard Dr dead end (east via easement to pipe in Extra Space Storage)	Pipe	8			80	$ 701	$ 57,000	$ 74,100	2030
Cap-FF-10: W G St (from N Euclid Ave west to alley west of N Laurel Ave)	Pipe	8			670	$ 701	$ 470,000	$ 611,000	2029
Total					**18,240**		**$ 15,406,000**	**$ 20,028,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 20,028,000
Developer Cost	0%	$ -
Total	100%	$ 20,028,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

Project Identification: FF-11 through FF-20
Project Name: Fire Flow capacity improvement project FF-11 to FF-20
System Type: Potable
Project Type: Capacity
Project Size (LF): 10,430
Capital Cost: $ 10,775,000

Project Description:
These capacity improvement projects have been developed to address identified fire flow deficiencies. They have been prioritized based on the severity of the fire flow deficiency (e.g., available fire flow versus fire flow requirement), number of hydrants impacted, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Projects Cap-FF-11, 12, and 15 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source. Project Cap-FF-13 include new pipelines near railroads to complete pipe looping. If easements for these pipelines cannot be obtained, alternative projects can be developed (additional pipe upsizing).

Project	Project Element	Pipe Diameter (in)	Includes Condition Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cap-FF-11: Huntington Dr (from N Central Ave to N Loma Pl)	Pipe	12			1,240	$ 911	$ 1,130,000	$ 1,469,000	2031-40
Cap-FF-12: Alley by Marshalls (north of Palm Ave, west and north of building)	Pipe	8			630	$ 701	$ 442,000	$ 574,600	2030
Cap-FF-13: North of Burlington Northern Railroad (from N Campus Ave to N 10th Ave)	Pipe	8			1,380	$ 701	$ 968,000	$ 1,258,400	2031-40
Cap-FF-14: Howard Access Rd (east of N Benson Ave) and easement at end of Howard Access Rd (south to Fairwood Way)	Pipe	8			1,420	$ 701	$ 996,000	$ 1,294,800	2031-40
Cap-FF-15: Cable Airport (northern pipeline, west of N Benson Ave to west of airport buildings)	Pipe	12			3,380	$ 911	$ 3,080,000	$ 4,004,000	2031-40
Cap-FF-16: Cable Airport (northern pipeline, west of N Benson Ave)	Pipe	8			240	$ 701	$ 169,000	$ 219,700	2031-40
Cap-FF-17: Gilmore Dr (north of E 8th St)	Pipe	8			500	$ 701	$ 351,000	$ 456,300	2031-40
Cap-FF-18: Holiday Rock office parking lot (west of N Benson Ave)	Pipe	8			250	$ 701	$ 176,000	$ 228,800	2031-40
Cap-FF-19: McArthur Way (north of W 9th St for about 300')	Pipe	8			300	$ 701	$ 211,000	$ 274,300	2031-40
Cap-FF-20: E 24th St (from N Campus Ave east to dead end past Fox Ridge Way)	Pipe	8			1,090	$ 701	$ 765,000	$ 994,500	2031-40
Total					**10,430**		**$ 8,288,000**	**$ 10,775,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 10,775,000
Developer Cost	0%	$ -
Total	100%	$ 10,775,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

Project Identification: FF-21 through FF-26
Project Name: Fire Flow capacity improvement project FF-21 to FF-26
System Type: Potable
Project Type: Capacity
Project Size (LF): 10,100
Capital Cost: $ 10,993,000

Project Description:
These capacity improvement projects have been developed to address identified fire flow deficiencies. They have been prioritized based on the severity of the fire flow deficiency (e.g., available fire flow versus fire flow requirement), number of hydrants impacted, and potential optimization with capacity deficiency needs and/or street paving efforts. Pipe needs by project are summarized below with specific project locations provided in the project figures. Projects Cap-FF-21, 22, 23 and 25 include pipelines on private property. Ownership/responsbility for these pipelines are to be confirmed prior to project implementation to determine funding source.

Project	Project Element	Pipe Diameter (in)	Includes Condition Improvement	Coordinate with Paving Project	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cap-FF-21: College Commerce Way (north of W Arrow Rte) and pipe around storage facility (north of W Arrow Rte, 350' west of College Commerce Way)	Pipe	8			150	$ 701	$ 106,000	$ 137,800	2031-40
	Pipe	12			1,770	$ 911	$ 1,613,000	$ 2,096,900	2031-40
Cap-FF-22: W 13th St (from N Benson Ave to Cable Airport) and southern piping at Cable Airport	Pipe	12			4,760	$ 911	$ 4,337,000	$ 5,638,100	2031-40
Cap-FF-23: Tesla parking lot (south of E 20th St, 700' west of Campus Ave)	Pipe	8			280	$ 701	$ 197,000	$ 256,100	2031-40
Cap-FF-24: Walkway north of Cascade Dr (north of San Bernardino Rd, 50' west of Cascade Dr)	Pipe	8			120	$ 701	$ 85,000	$ 110,500	2031-40
Cap-FF-25: Southeast of W Arrow Rte, 50' east of Loma Pl (around Dakota Creek Apartment Homes)	Pipe	8			1,960	$ 701	$ 1,374,000	$ 1,786,200	2031-40
Cap-FF-26: Corte Verde (south from W Arrow Hwy to Corte Caballo), Corte Hacienda (from Corte Rojo to about 250' east of Corte Verde), and Corte Rojo (from Corte Hacienda to Corte Santana)	Pipe	8			1,060	$ 701	$ 744,000	$ 967,200	2031-40
Total					**10,100**		**$ 8,456,000**	**$ 10,993,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 10,993,000
Developer Cost	0%	$ -
Total	100%	$ 10,993,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Projects may be coordinated with planned paving. Pipe projects are burdened with all paving costs.

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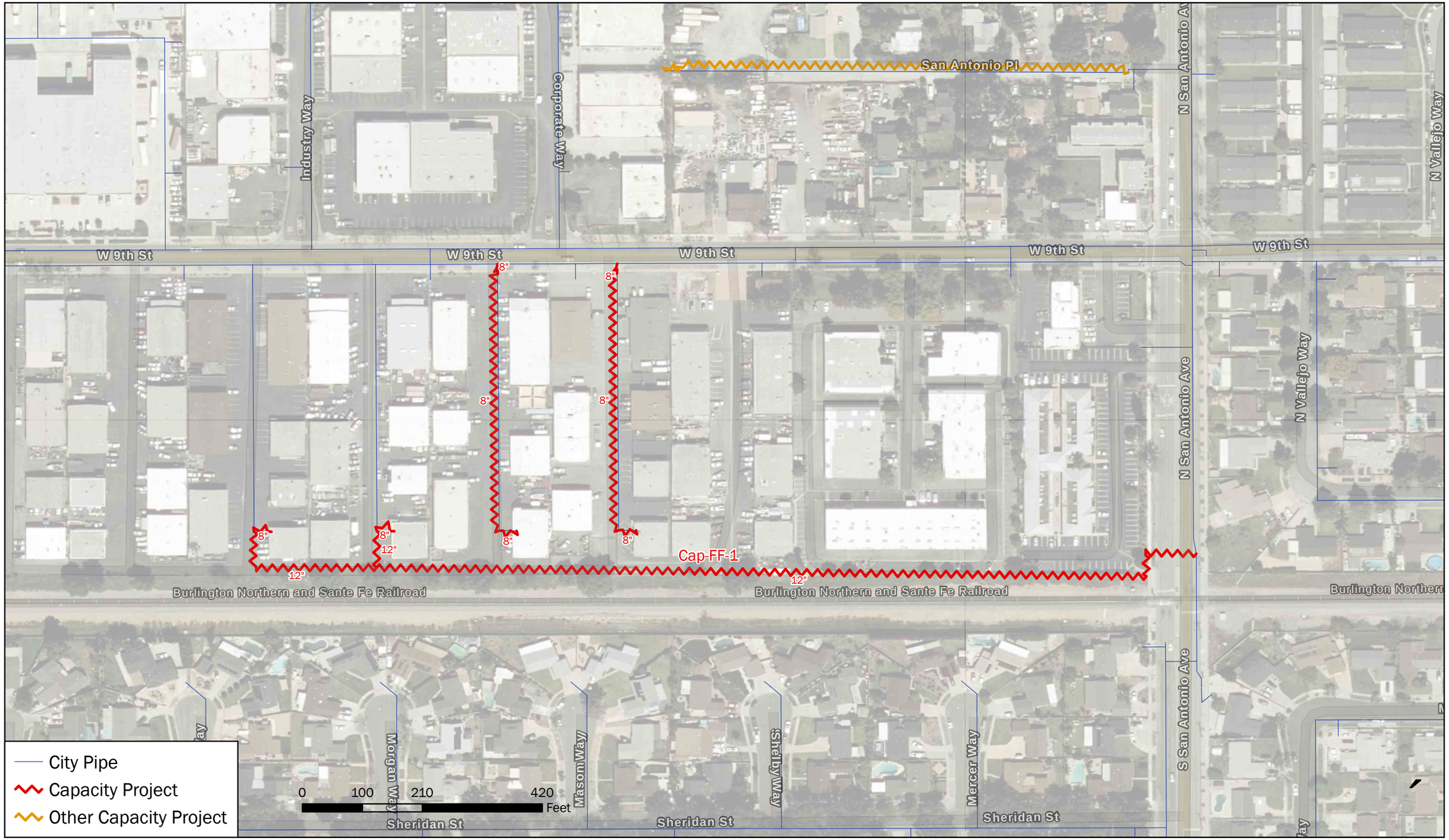


Figure 1. Cap-FF-1

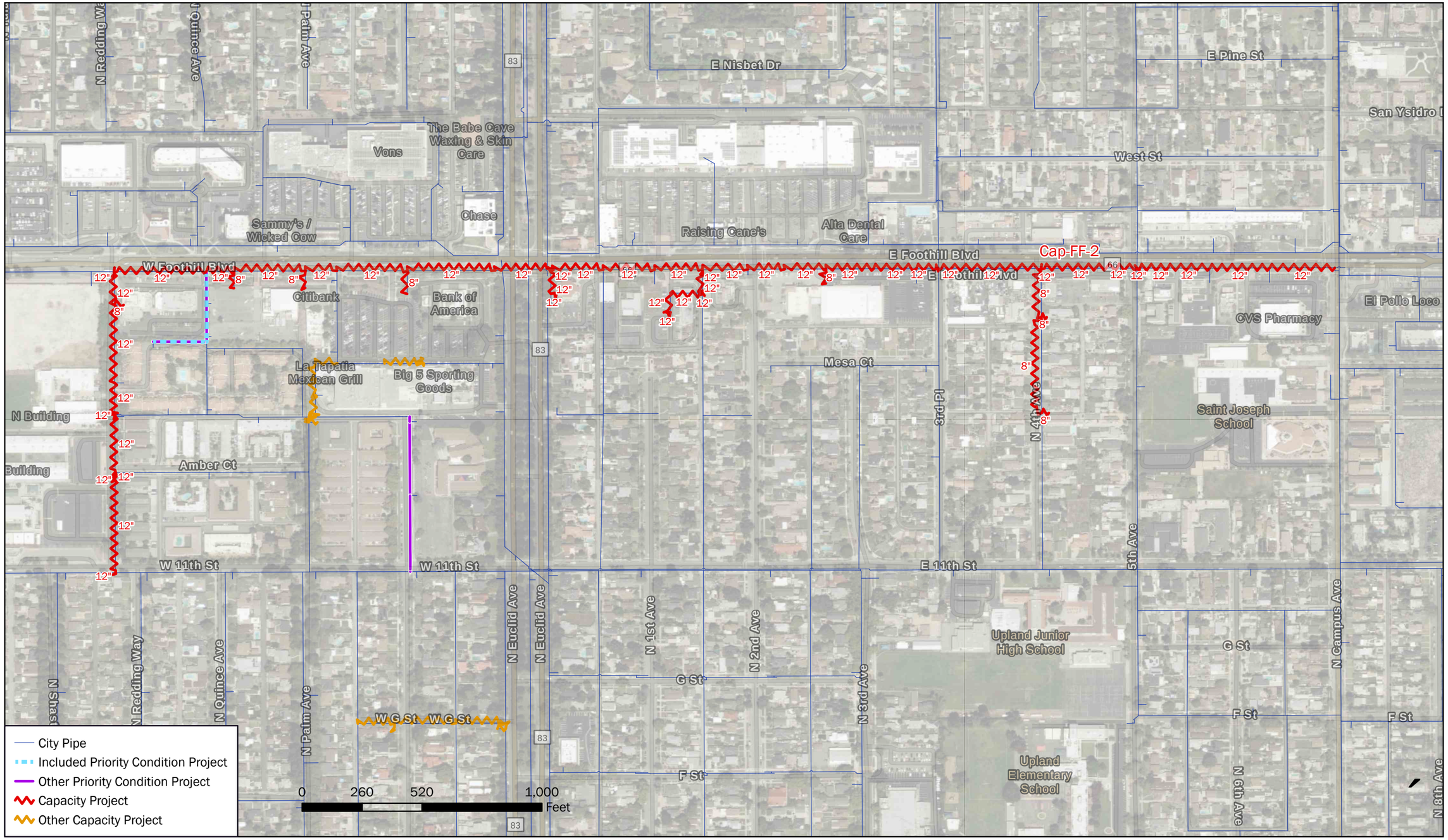


Figure 2. Cap-FF-2



Figure 3. Cap-FF-3

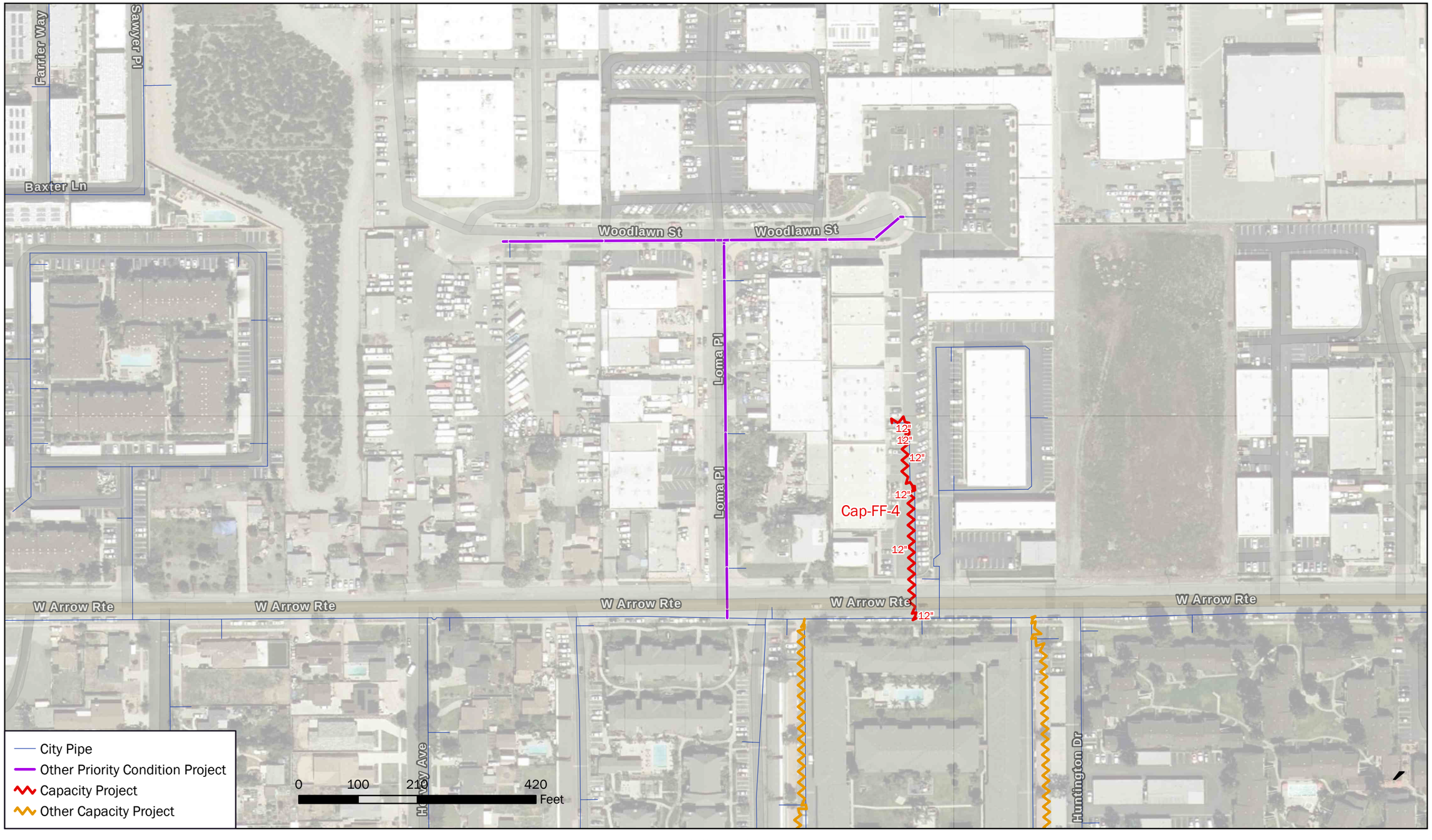


Figure 4. Cap-FF-4



Figure 5. Cap-FF-5

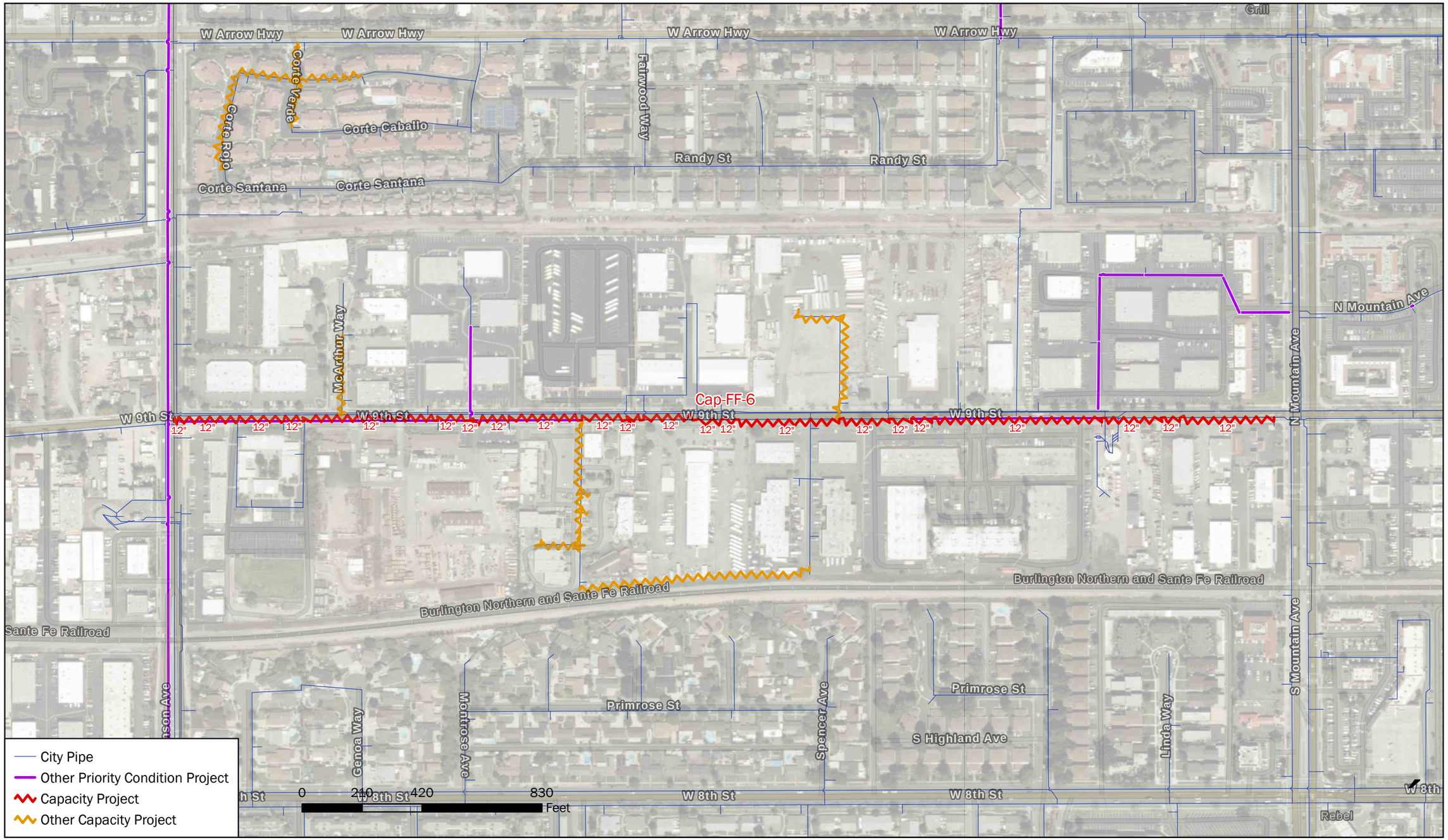


Figure 6. Cap-FF-6

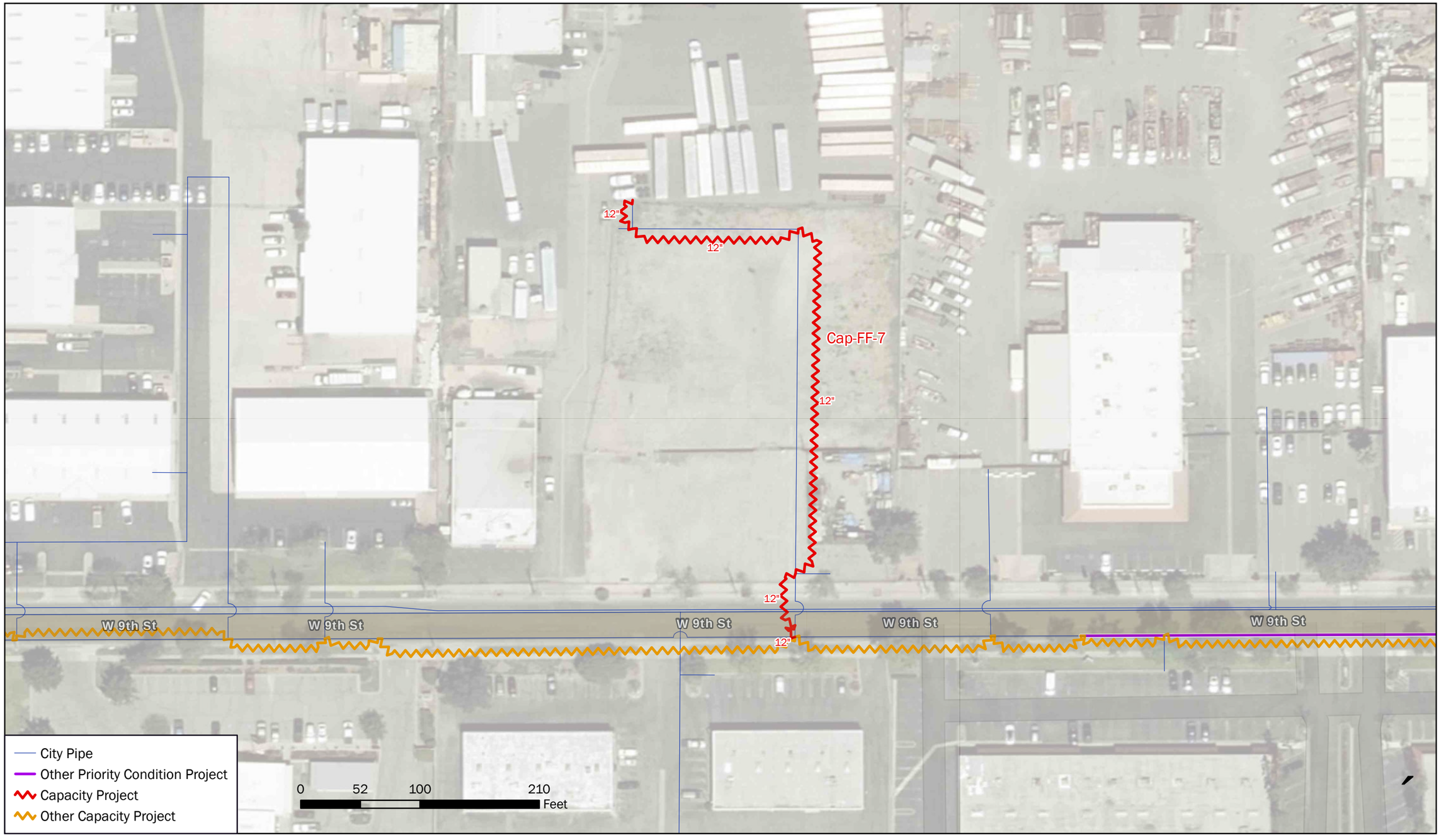


Figure 7. Cap-FF-7

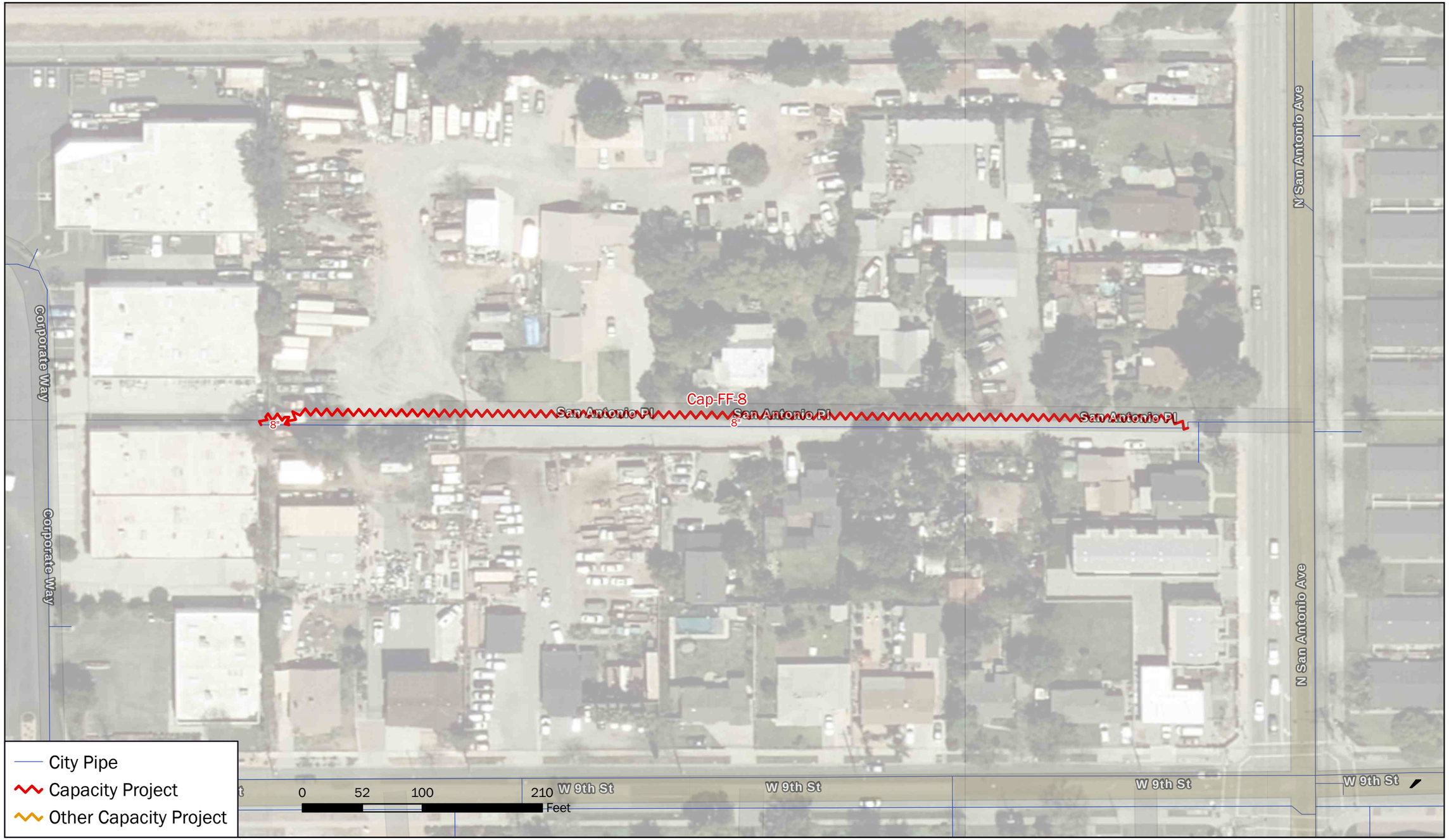


Figure 8. Cap-FF-8

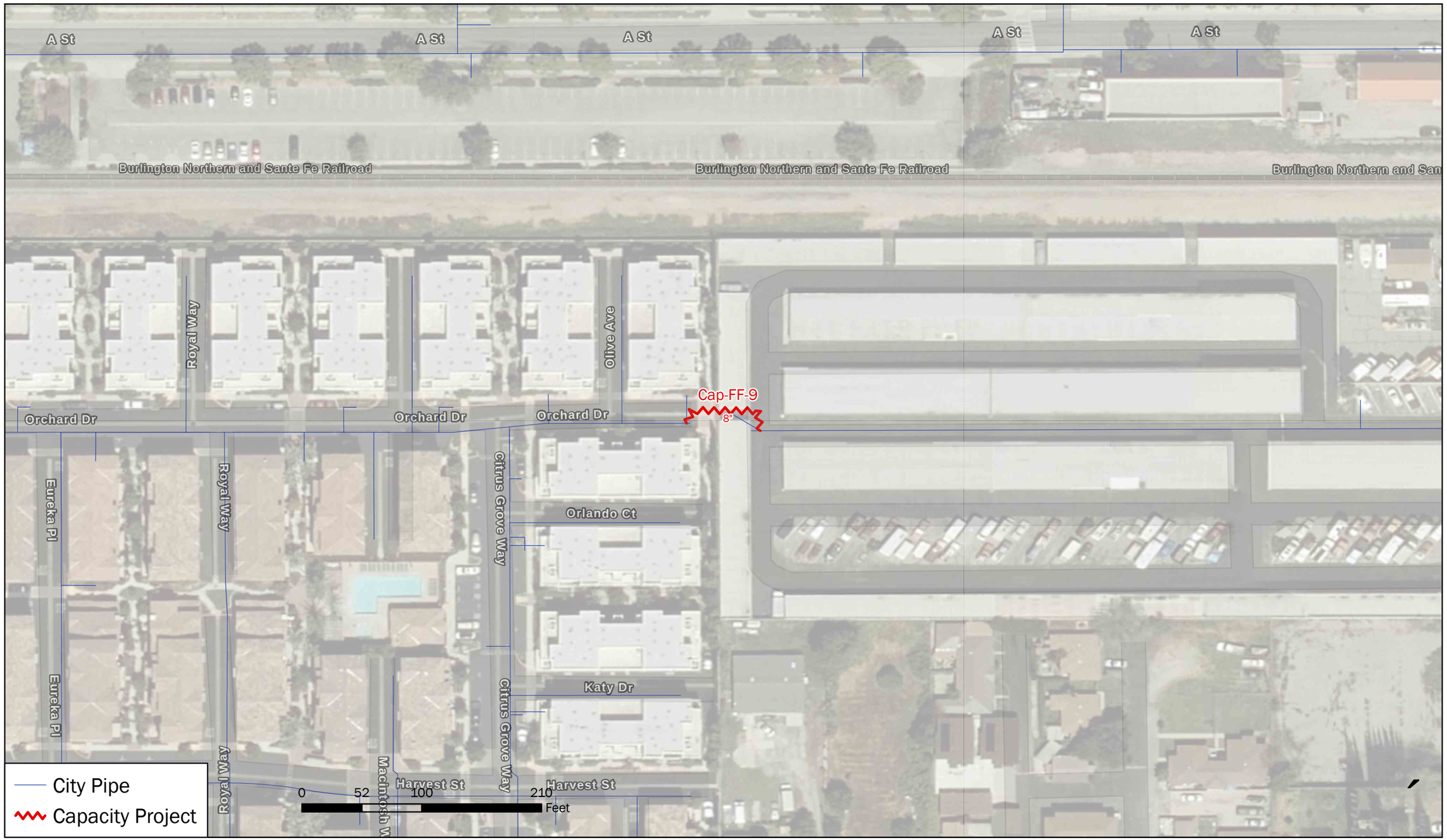


Figure 9. Cap-FF-9



Figure 10. Cap-FF-10

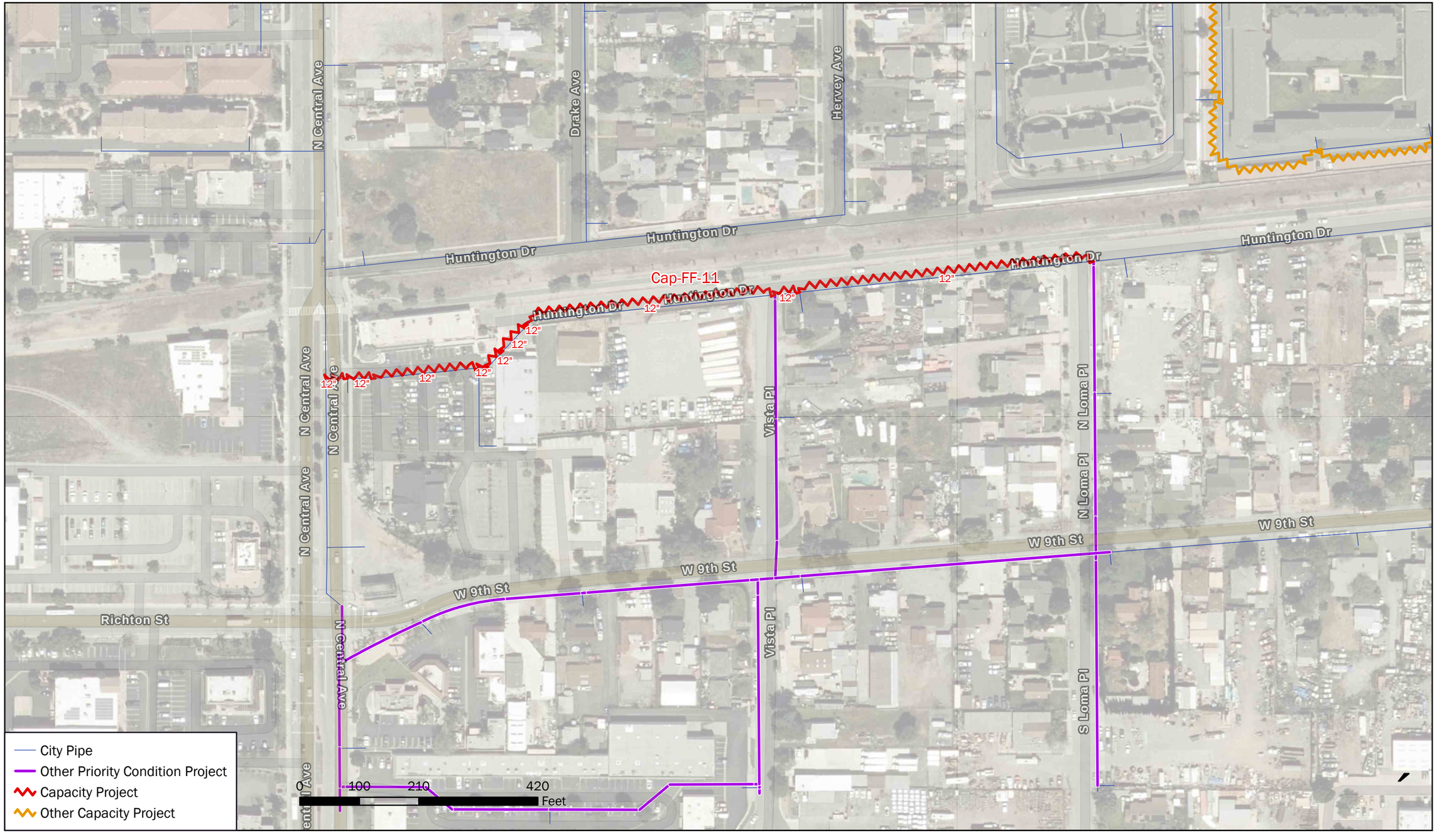


Figure 11. Cap-FF-11



Figure 12. Cap-FF-12



Figure 13. Cap-FF-13

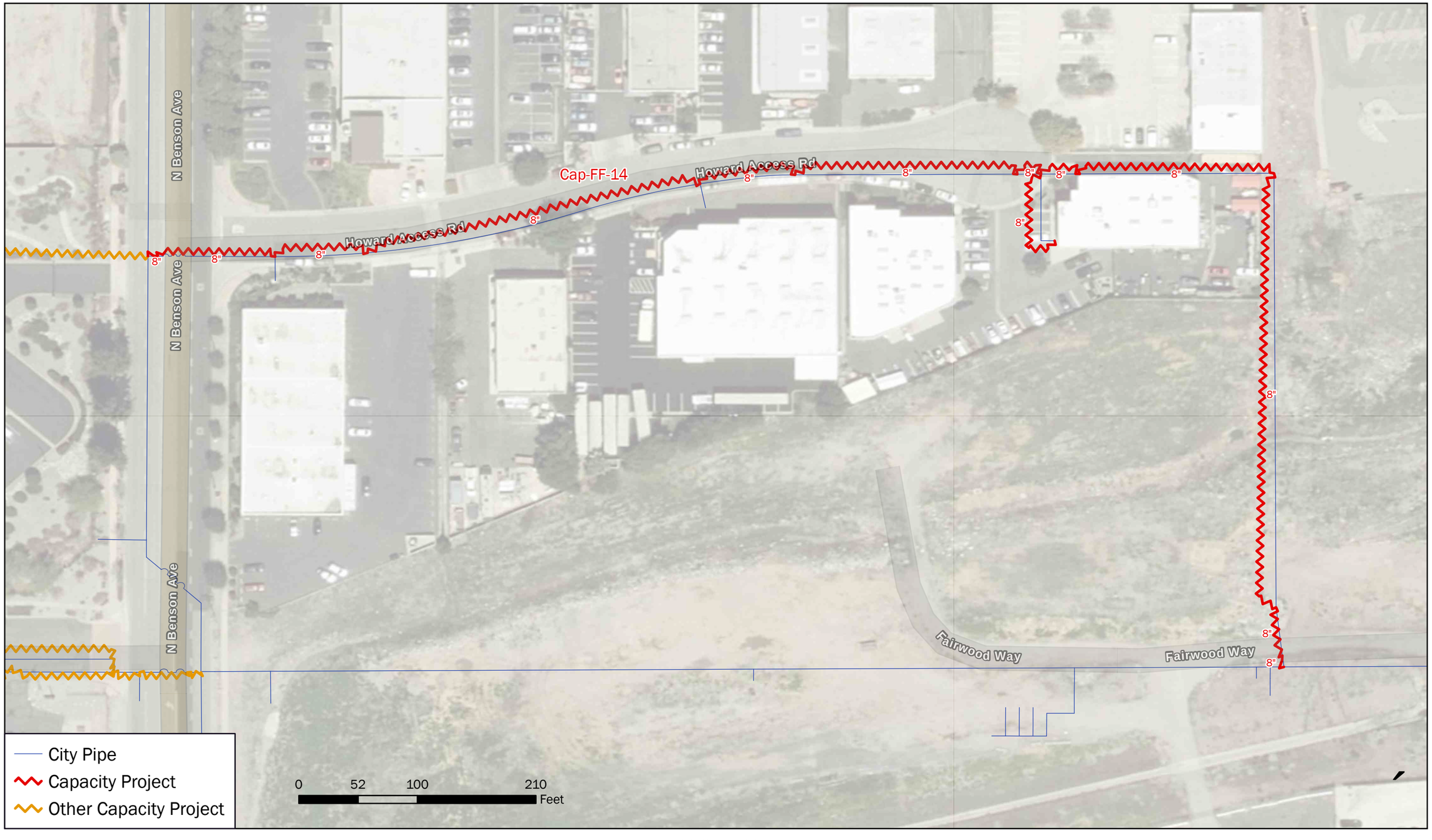


Figure 14. Cap-FF-14

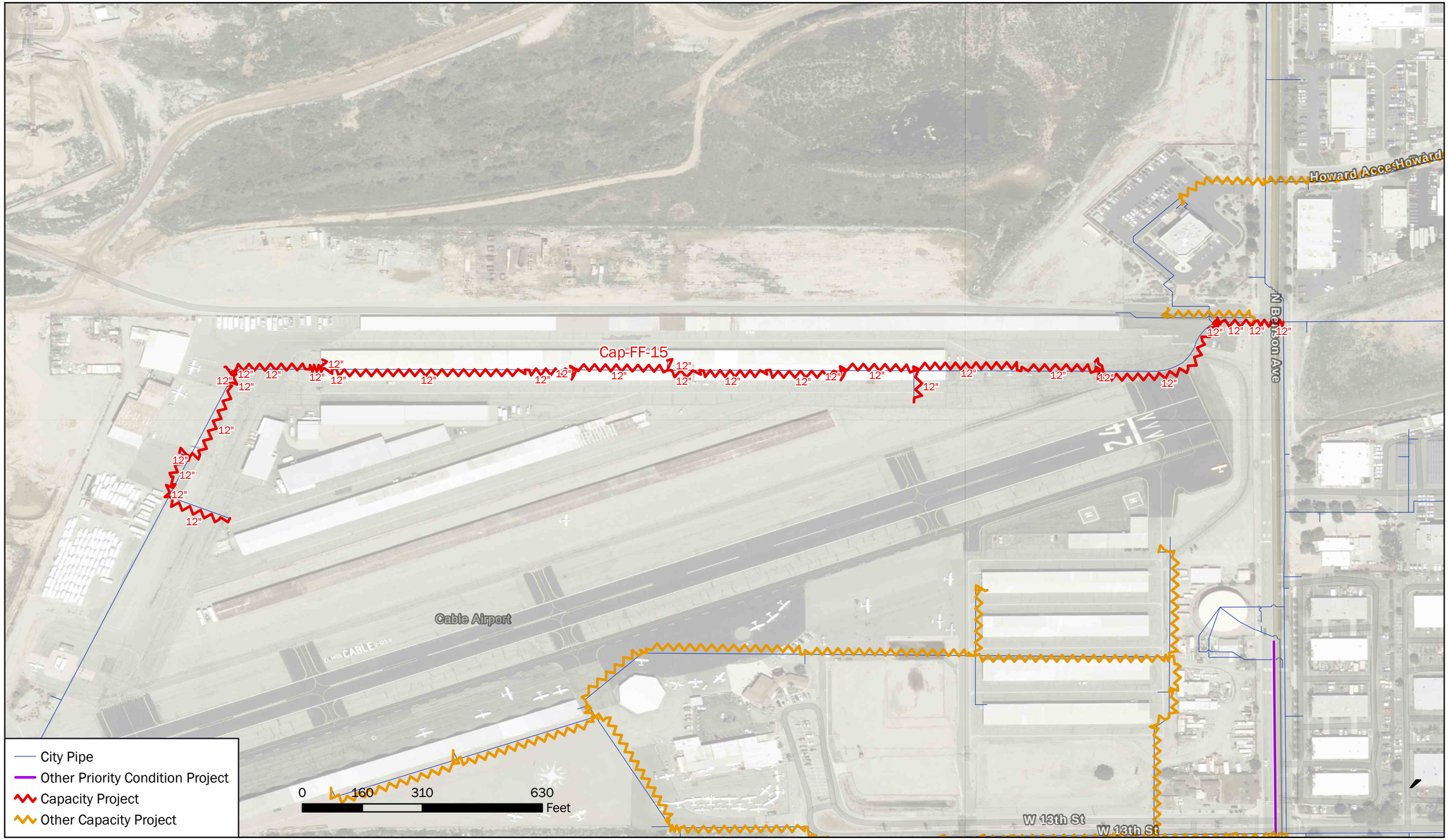


Figure 15. Cap-FF-15



Figure 16. Cap-FF-16



Figure 17. Cap-FF-17



Figure 18. Cap-FF-18



Figure 19. Cap-FF-19



Figure 20. Cap-FF-20

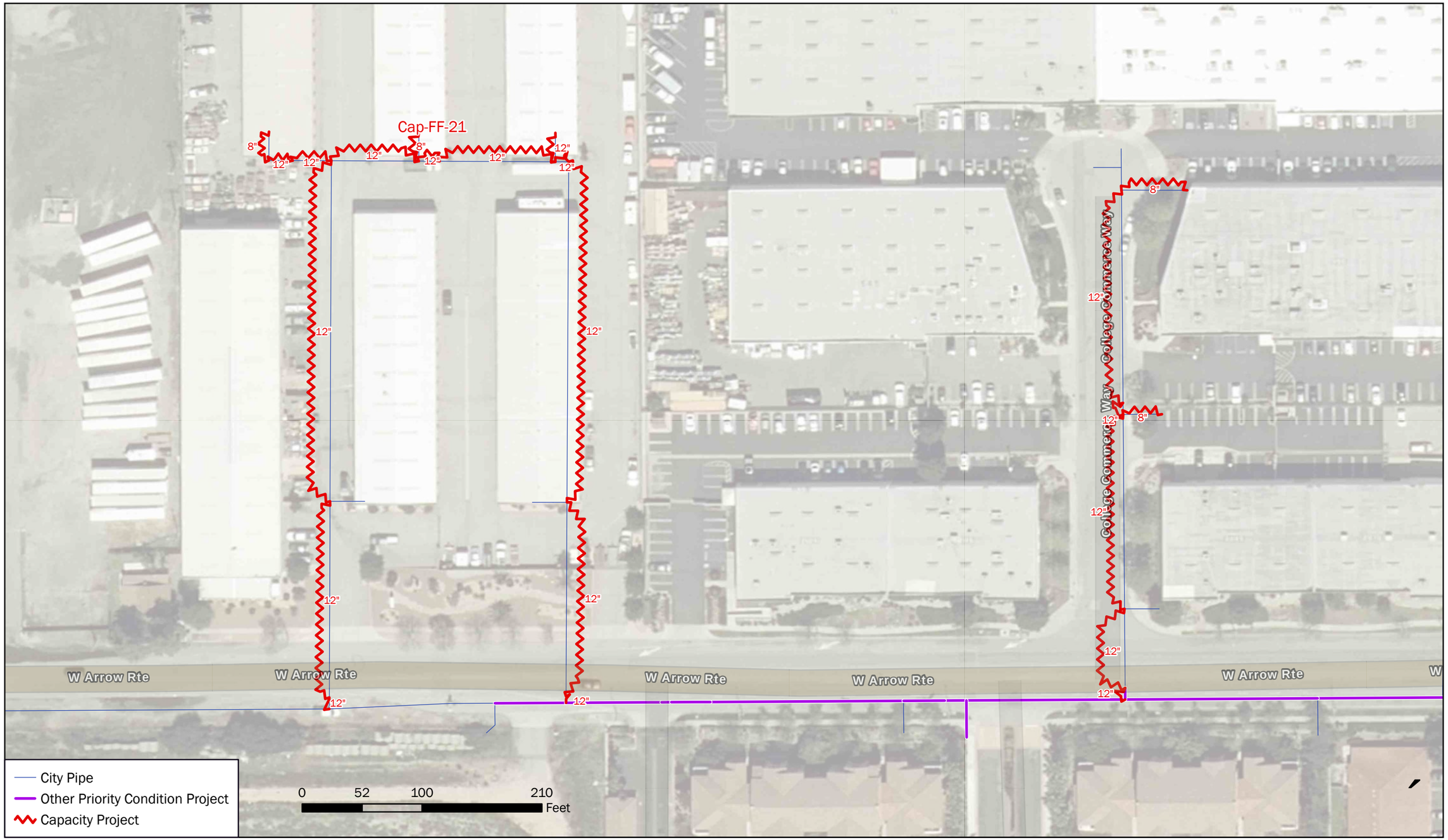


Figure 21. Cap-FF-21

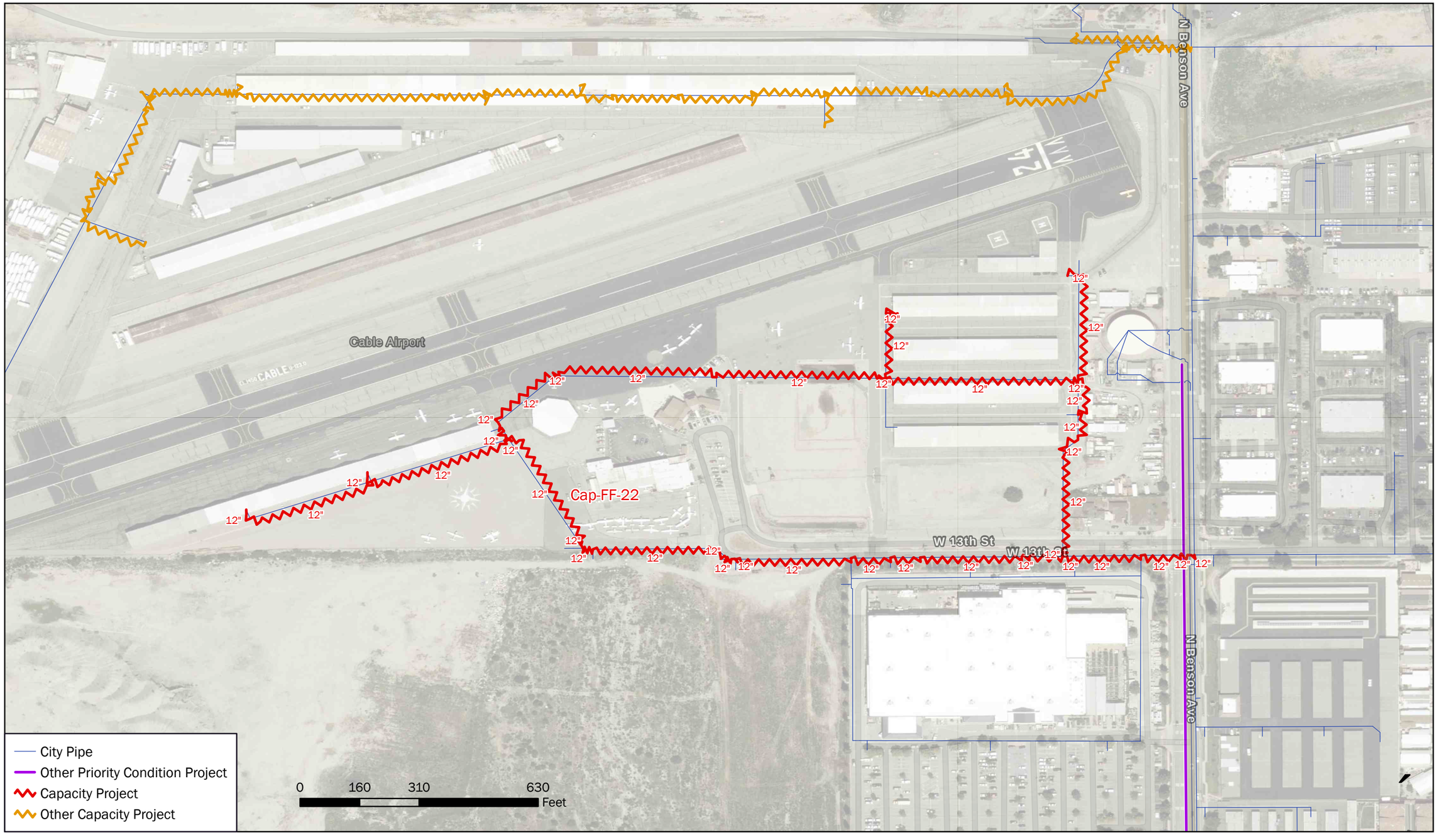


Figure 22. Cap-FF-22



Figure 23. Cap-FF-23



Figure 24. Cap-FF-24



Figure 25. Cap-FF-25

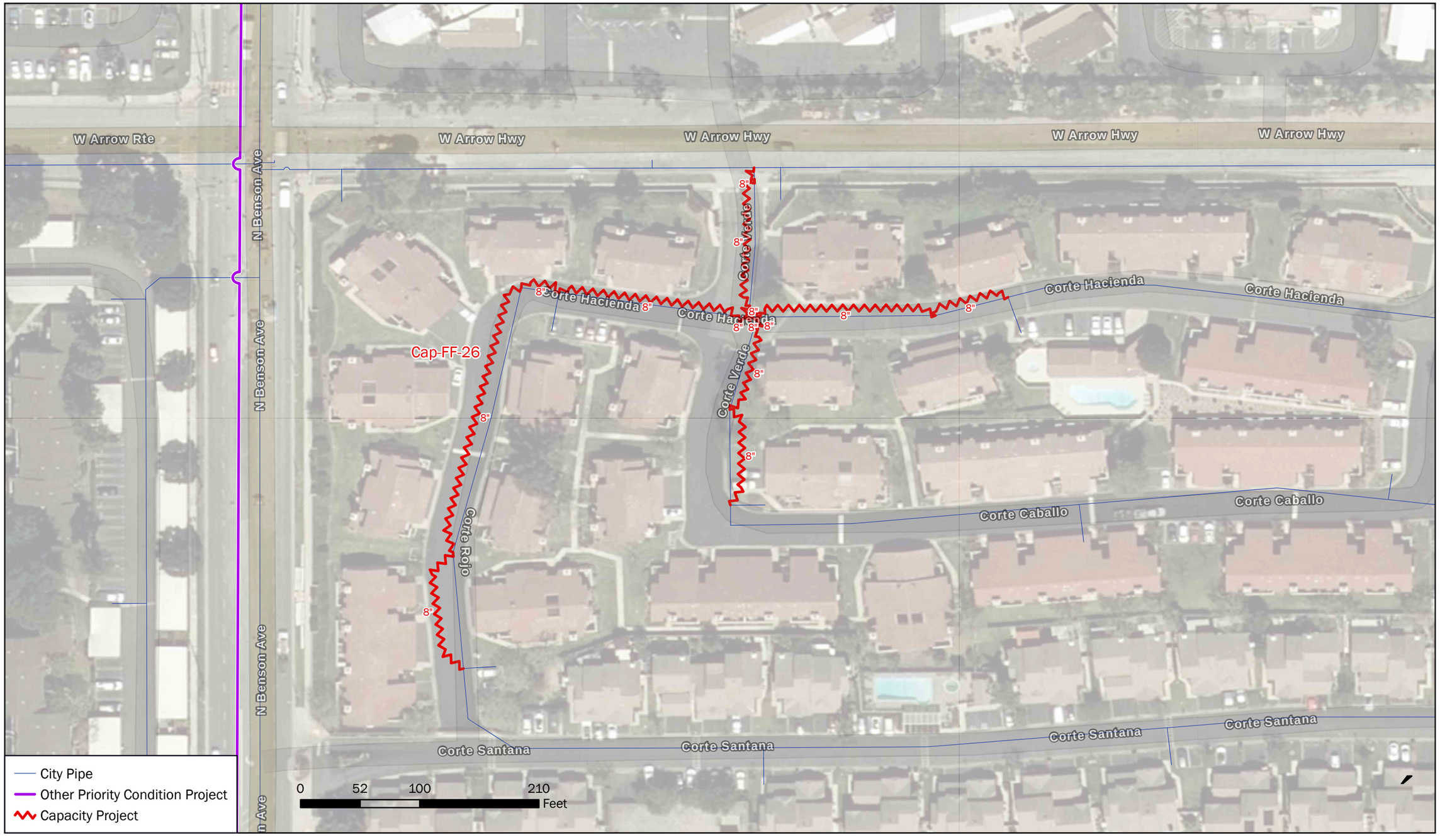


Figure 26. Cap-FF-26

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: FF Ph2 and Laterals
Project Name: Long-term Fire Flow Improvements
System Type: Potable
Phase: 2041 & Beyond
Project Type: Capacity
Project Size (LF): 19,930
Capital Cost: $ 18,992,000

Project Description:
This project captures all non-priority, fire flow-related capacity projects. These projects address fire flow deficiencies determined to be less critical than those elevated for priority implementation and those deficiencies caused solely by undersized hydrant laterals. Projects are organized by pressure zone and a systemwide hydrant lateral replacement plan. The hydrant lateral replacement plan specifically addresses fire flow deficiencies caused by undersized hydrant laterals, with no upsizing of distribution pipelines required. A more detailed replacement program may be developed to prioritize/optimize the lateral replacements and long-term fire flow improvement projects.

Project		Project Element	Pipe Diameter (in)	Includes Condition Improvement	Coordinate with Paving Project	Length (ft)	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
PZ1-FF Ph2	Pressure Zone 1, Phase 2 Fire Flow Improvements	Pipe	8			7,850	$ 701	$ 5,503,000	$ 7,153,900	2041 & Beyond
PZ2-FF Ph2	Pressure Zone 2, Phase 2 Fire Flow Improvements	Pipe	8			6,590	$ 701	$ 4,620,000	$ 6,006,000	2041 & Beyond
		Pipe	12			3,320	$ 911	$ 3,025,000	$ 3,932,500	2041 & Beyond
PZ3-FF Ph2	Pressure Zone 1, Phase 2 Fire Flow Improvements	Pipe	8			350	$ 701	$ 246,000	$ 319,800	2041 & Beyond
FF-Laterals	FF-Laterals: Hydrant lateral replacement program	Pipe	4			40	$ 561	$ 23,000	$ 29,900	2041 & Beyond
		Pipe	6			800	$ 631	$ 505,000	$ 656,500	2041 & Beyond
		Pipe	8			980	$ 701	$ 687,000	$ 893,100	2041 & Beyond
		Total				**19,930**		**$ 14,609,000**	**$ 18,992,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 18,992,000
Developer Cost	0%	$ -
Total	100%	$ 18,992,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.
-Lateral replacements may be coordinated with the paving plan when possible. Four laterals on the south side of Foothill Blvd (between N Mountain Ave and N San Antonio Ave) could be replaced during the planned Fall 2025 paving.

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: SmallDiam
Project Name: Small diameter pipeline replacement in alleys.
System Type: Potable

Phase: 2031-40
Project Type: Capacity
Project Size (LF): 910
Capital Cost: $ 831,000

Project Description:
The City has a number small diameter pipelines located in the alleyways between Campus and 11th and Arrow and 9th. These pipelines, primarily 2" and 3", galvanized steel, are of deteriorating condition and restrict service pressures to customers on these lines. City staff has identified the need to relocate service laterals to the larger pipelines in the main street and abandon the small diameter pipelines in the main streets, or potential replace the small diameter pipelines with larger mains (should there be sufficient space).

Project Element		Existing Diameter (in)	Proposed Size/ Diameter (in)	Replace/ New	Length (ft) / Number	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
SmallDiam	Pipe	1	8	Replace	0	$ 701	$ -	$ -	2031-40
SmallDiam	Pipe	1.5	8	Replace	0	$ 701	$ -	$ -	2031-40
SmallDiam	Pipe	2	8	Replace	97	$ 701	$ 69,000	$ 89,700	2031-40
SmallDiam	Pipe	2.5	8	Replace	0	$ 701	$ -	$ -	2031-40
SmallDiam	Pipe	3	8	Replace	812	$ 701	$ 570,000	$ 741,000	2031-40
SmallDiam	Pipe	3.5	8	Replace	0	$ 701	$ -	$ -	2031-40
SmallDiam	Pipe	4	8	Replace	0	$ 701	$ -	$ -	2031-40
	Total				**910**		**$ 639,000**	**$ 831,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 831,000
Developer Cost	0%	$ -
Total	100%	$ 831,000

Notes:
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Assumes open cut construction.
-Assumes all new pipes are 8" diameter minimum. Exception for hydrant laterals.

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Cond-T1, T2, T3, T4
Project Name: Category 1 Tank Projects
System Type: Potable
Phase: 2031-40
Project Type: Condition
Capital Cost: $ 5,089,000

Project Description:

Per Harper & Associates:
The first three reservoirs in this category are in overall good condition but have issues on the roof that should not be postponed. If the issues for each reservoir are addressed, the complete rehabilitation of the reservoir can be performed after reservoirs in worse condition are rehabilitated. The reservoirs in this category are also in another category for when they need to be rehabilitated.
Per City staff:
Since the completion of the Harper & Associates report, it was determined that the work needed at Reservoir 16 is much more extensive. Improvements include a new roof, concrete and steel repairs, and new drainage. The construction cost for the work is estimated to be $3M.

Project Element		Existing Size (MG)	Construction Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-T1	Reservoir 2	5	Steel	Rehabilitation	n/a	$ 217,400	$ 282,600	2027
Cond-T2	Reservoir 10	1.5	Steel	Rehabilitation	n/a	$ 225,200	$ 292,800	2031-40
Cond-T3	Reservoir 4	0.2	Concrete	Rehabilitation	n/a	$ 472,000	$ 613,600	2030
Cond-T4	Reservoir 16	10	Concrete	Rehabilitation	n/a	$ 3,000,000	$ 3,900,000	2029
	Total					**$ 3,915,000**	**$ 5,089,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 5,089,000
Developer Cost	0%	$ -
Total	100%	$ 5,089,000

Notes:
See Harper & Associates *Prioritization of Twelve Potable Water Storage Reservoirs* Report (2024) for additional project and cost details. Harper & Associate costs were designated as the estimated construction costs, with a 30% additional markup added to generate the capital improvement cost.

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification:	Cond-T5, T6, T7, T8	**Phase:**	2031-40
Project Name:	Category 2 Tank Projects	**Project Type:**	Condition
System Type:	Potable	**Capital Cost:**	$ 9,293,000

Project Description:

Per Harper & Associates:

The four reservoirs in this category are in poor condition and should be rehabilitated as soon as possible. The coating in Reservoir No. 14 and No. 7 is older and in worse overall condition than Reservoir No. 12 and No. 13. However, there is more significant corrosion and metal loss on the structural members and connections in Reservoir No. 12 and No. 13 and if not rehabilitated soon, there is potential for failure occurring at these connections.

Project Element		Existing Size (MG)	Construction Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-T5	Reservoir 12	4	Steel	Rehabilitation	n/a	$ 3,418,900	$ 4,444,600	2029
Cond-T6	Reservoir 13	5.4	Steel	Rehabilitation	n/a	$ 3,165,200	$ 3,165,200	2030
Cond-T7	Reservoir 14	0.2	Steel	Rehabilitation	n/a	$ 387,000	$ 387,000	2031-40
Cond-T8	Reservoir 7	1.5	Steel	Rehabilitation	n/a	$ 1,295,600	$ 1,295,600	2031-40
	Total					**$ 8,267,000**	**$ 9,293,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 9,293,000
Developer Cost	0%	$ -
Total	100%	$ 9,293,000

Notes:

See Harper & Associates *Prioritization of Twelve Potable Water Storage Reservoirs* Report (2024) for additional project and cost details. Harper & Associate costs were designated as the estimated construction costs, with a 30% additional markup added to generate the capital improvement cost.

City of Upland
Water and Recycled Water Master Plan

CAPITAL IMPROVEMENT PLAN

Project Identification: Cond-T9, T10, T11, T12
Project Name: Category 3 Tank Projects
System Type: Potable
Phase: 2031-40
Project Type: Condition
Capital Cost: $ 633,000

Project Description:

Per Harper & Associates:
The four reservoirs in this category are all concrete reservoirs. They all have work that needs to be done, but it is not as critical as the work needed for the steel reservoirs in Category No. 2. Also, the costs associated with the recommended repairs are substantially less than rehabilitation of the steel reservoir. Based on the funds available, the City could elect to include one or two of the concrete reservoir projects in the same year that a steel reservoir rehabilitation project is being accomplished.

Project Element		Existing Size (MG)	Construction Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-T9	Reservoir 3	4.3	Concrete	Rehabilitation	n/a	$ 176,400	$ 229,300	2031-40
Cond-T10	Reservoir 13A	5.6	Concrete	Rehabilitation	n/a	$ 137,100	$ 137,100	2031-40
Cond-T11	Reservoir 12A	5.0	Concrete	Rehabilitation	n/a	$ 144,100	$ 144,100	2031-40
Cond-T12	Reservoir 4	0.2	Concrete	Rehabilitation	n/a	$ 122,000	$ 122,000	2031-40
	Total					**$ 580,000**	**$ 633,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 633,000
Developer Cost	0%	$ -
Total	100%	$ 633,000

Notes:
See Harper & Associates *Prioritization of Twelve Potable Water Storage Reservoirs* Report (2024) for additional project and cost details. Harper & Associate costs were designated as the estimated construction costs, with a 30% additional markup added to generate the capital improvement cost.

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

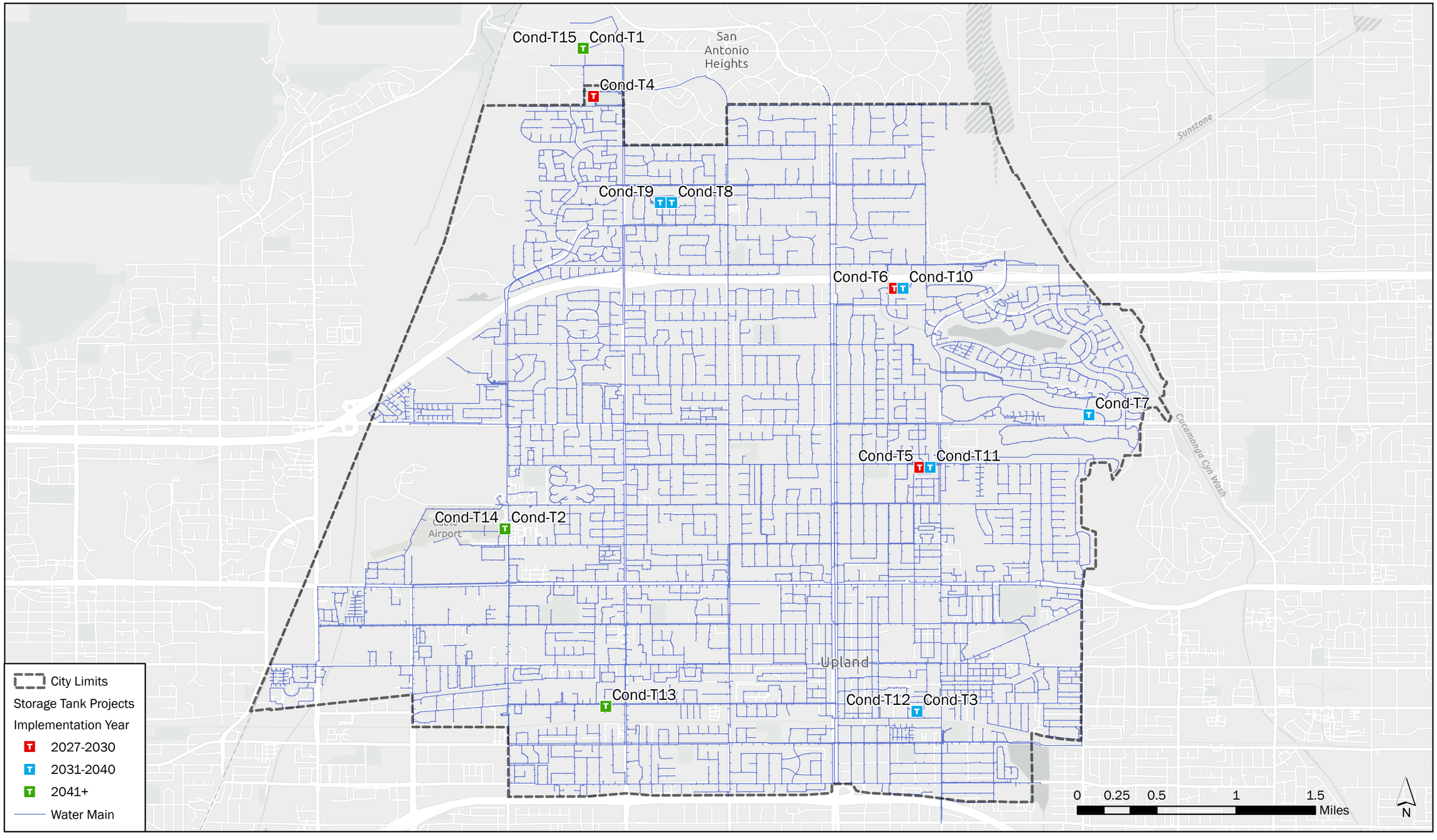
Project Identification: Cond-T13, T14, T15
Project Name: Category 4 Tank Projects
System Type: Potable
Phase: 2031-40
Project Type: Condition
Capital Cost: $ 4,066,000

Project Description:
Per Harper & Associates:
The three reservoirs in this category are in overall good condition at this time, except for the repairs recommended for Reservoir No. 14 and No. 2 in Category No. 1. After the repairs are completed, these three reservoirs should be inspected again in the next 2-3 years to monitor the corrosion rate on the roof and structural members. The prioritization should be updated based on the findings from the inspections. The City could install a galvanic (sacrificial anode) cathodic protection system within the reservoirs to protect the surfaces below the water level from corrosion and pitting until they are rehabilitated.

Project Element		Existing Size (MG)	Construction Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-T13	Reservoir 11	0.2	Concrete	Rehabilitation	n/a	$ 337,400	$ 438,600	2041 & Beyond
Cond-T14	Reservoir 10	1.5	Concrete	Rehabilitation	n/a	$ 1,313,200	$ 1,313,200	2041 & Beyond
Cond-T15	Reservoir 2	5.0	Concrete	Rehabilitation	n/a	$ 2,314,000	$ 2,314,000	2041 & Beyond
	Total					**$ 3,965,000**	**$ 4,066,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 4,066,000
Developer Cost	0%	$ -
Total	100%	$ 4,066,000

Notes:
See Harper & Associates *Prioritization of Twelve Potable Water Storage Reservoirs* Report (2024) for additional project and cost details. Harper & Associate costs were designated as the estimated construction costs, with a 30% additional markup added to generate the capital improvement cost.



CIP Reservoir Projects

Brown AND Caldwell

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City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Cond-BP1 through Cond-BP5
Project Name: Condition-Related Booster Pump Projects
System Type: Potable
Phase: 2031-40
Project Type: Condition
Capital Cost: $ 5,234,000

Project Description:
Booster pump condition-related projects were identified based on the assessment performed by Southern California Edison (2023) and observations/notes provided by City staff.

Project Element	Existing Size (HP)	Pump Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-BP1: Plant 2, Booster 3	50	Vertical Turbine	Replace	n/a	$ 255,000	$ 331,000	2028
Cond-BP2: Plant 3, Booster 1 and 2	125	Vertical Turbine	Replace	n/a	$ 1,128,000	$ 1,466,000	2031-40
Cond-BP3: Plant 12 Boosters and Electrical Panel	100	Vertical Turbine	Replace	n/a	$ 1,376,000	$ 1,789,000	2028
Cond-BP4: Upland Foothills Booster 2	40	Vertical Turbine	Replace	n/a	$ 688,000	$ 895,000	2031-40
Cond-BP5: 15th St Transfer	200	Vertical Turbine	Replace	n/a	$ 579,000	$ 753,000	2031-40
Total					**$ 4,026,000**	**$ 5,234,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 5,234,000
Developer Cost	0%	$ -
Total	100%	$ 5,234,000

Notes:
-See following pages for a breakdown of the costs by project.
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Cost estimates developed based on available documentation and site photos. Additional site review is recommended to further refine the cost estimates.

Boster Pump Condition Projects

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Detail Capital Costs

Component/Item		Quantity	Units	Unit Cost	Bare Cost	Capital Cost
Cond-BP1	**Plant 2 - Booster 3**					
	Demolition of Existing Turbine Booster Pump (50 HP)	1	ea	7,000	$7,000	$16,820
	Demolition of Existing Pad (5'x5'x1')	25	sf	100	$2,500	$6,007
	Removal/Reistall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Turbine Booster Pump (50HP)	1	ea	89,989	$89,989	$216,234
	Minor Electrical Repair (30% of Pump Cost)	1	ls	26,997	$26,997	$64,870
	Subtotal				$137,958	$331,498
Cond-BP2	**Plant 3 - Booster 1 / 2 / 3**					
	Demolition of Existing Turbine Booster Pumps (125 HP) (no existing Pump 3)	2	ea	10,000	$20,000	$48,058
	Demolition of Existing Pad (5'x5'x1') (no existing Pump 3 pad)	50	sf	100	$5,000	$12,014
	Removal/Reistall Pipe and Valving	3	ea	10,000	$30,000	$72,087
	Form/Pour New Pad	1.5	cy	7,500	$11,250	$27,033
	Furnish/Install New Turbine Booster Pumps (125 HP)	3	ea	139,483	$418,449	$1,005,488
	Minor Electrical Repair (30% of Pump Cost)	3	ls	41,845	$125,535	$301,646
	Subtotal				$610,234	$1,466,325
Cond-BP3	**Plant 12 - Booster 1 / 2 / 3**					
	Demolition of Existing Turbine Booster Pumps (100 HP)	3	ea	10,000	$30,000	$72,087
	Removal/Reinstall Pipe and Valving	3	ea	10,000	$30,000	$72,087
	Refurbish Turbine Booster Pumps (100 HP)	3	ea	100,000	$300,000	$720,867
	Minor Electrical Repair (30% of Pump Cost)	3.0	ls	30,000	$90,000	$216,260
	Demolition of existing electrical panel	1.0	ls	16,282	$16,282	$39,123
	Distribution Equipment (based on electrical vendor estimate)	1.0	ls	273,505	$273,505	$657,202
	Grounding (based on electrical vendor estimate)	1.0	ls	4,814	$4,814	$11,567
	Subtotal				$744,600	$1,789,192
Cond-BP4	**Upland Foothills Booster 2**					
	VCP - 8" Drainage Pipe	470	lf	182	$85,540	$205,543
	Traffic Control	470	lf	8	$3,680	$8,843
	Trench Ashalt Demo	470	lf	60	$28,200	$67,761
	Trench Asphalt Replace	470	lf	235	$110,450	$265,399
	Mill/Overlay 2-inch	1,880	sf	3.62	$6,806	$16,353
	Demolition of Existing Turbine Booster Pump (40 HP)	1	ea	7,000	$7,000	$16,820
	Demolition of Existing Pad (5'x5'x1')	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Turbine Booster Pump (40HP)	1	ea	89,989	$89,989	$216,234
	Minor Electrical Repair (30% of Pump Cost)	1	ls	26,997	$26,997	$64,870
	Subtotal				$372,634	$895,398

Cond-BP5	15th St Transfer Station					
	Service Pump (200HP)	1	ls	50,000	$50,000	$120,144
	Upgrade Cooling System Inside Vault	1	ls	20,000	$20,000	$48,058
	Move Service Laterals (allowance to move service laterals off of 16" transmission line to distribution line.)	1	ls	200,000	$200,000	$480,578
	Demolition of existing electrical panel	1	ls	5,866	$5,866	$14,095
	Distribution Equipment (based on electrical vendor estimate)	1	ls	31,603	$31,603	$75,939
	Grounding (based on electrical vendor estimate)	1	ls	5,797	$5,797	$13,929
	Subtotal				$313,266	$752,742

Other notes:
Assumes no contaminated or culturally sensitive materials are encountered.
Does not include land or easement acquisition costs.
Does not include permitting costs.

Subtotal				$2,178,692	
Construction Markups					
Material Sales Tax (assume 50% of cost is materials)	7.75	%		$84,424	
Subtotal				$2,263,116	
Contractor Overhead and Profit	15	%		$339,467	
Subtotal				$2,602,583	
Contractor General Conditions	15	%		$390,388	
Subtotal				$2,992,971	
Undesigned/Undeveloped Detail Contingency	30	%		$897,891	
Subtotal				$3,890,862	
Bonds and Insurance	3.5	%		$136,180	
Subtotal				$4,027,042	
Other Markups					
Scope Contingency/Risk Allowance	0	%		$0	
Subtotal				$4,027,042	
Soft Costs	30	%		$1,208,113	
TOTAL CAPITAL COST				**$5,235,155**	**$5,235,155**

Class 5 Estimate, Low Range	-50%	$2,617,578
Class 5 Estimate, High Range	100%	$10,470,310

City of Upland
Water and Recycled Water Master Plan

CAPITAL IMPROVEMENT PLAN

Project Identification: Cond-WP1 through Cond-WP5
Project Name: Condition-Related Well Pump Projects
System Type: Potable
Phase: 2031-40
Project Type: Condition
Capital Cost: $ 1,695,000

Project Description:
Well pump condition-related projects were identified based on the assessment performed by Southern California Edison (2023) and observations/notes provided by City staff.

Project Element	Existing Size (HP)	Pump Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Cond-WP1: Lemon Heights 4, Well Pump	150	Vertical Turbine	Replace	n/a	$ 289,000	$ 376,000	2031-40
Cond-WP2: Mountain View 4, Well Pump	25	Submersible	Replace	n/a	$ 95,000	$ 123,000	2028
Cond-WP3: Upland Foothills, Well Pump	40	Submersible	Replace	n/a	$ 133,000	$ 173,000	2031-40
Cond-WP4: Well 20, Well Pump	50	Submersible	Replace	n/a	$ 161,000	$ 209,000	2027
Cond-WP5: Plant 10, Well 3, Well Pump	60	Submersible	Replace	n/a	$ 626,000	$ 814,000	2031-40
Total					**$ 1,304,000**	**$ 1,695,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 1,695,000
Developer Cost	0%	$ -
Total	100%	$ 1,695,000

Notes:
-See following pages for a breakdown of the costs by project.
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Cost estimates developed based on available documentation and site photos. Additional site review is recommended to further refine cost estimate.
-City has identified Cond-WP4 (Well 20) as a high priority project.

Well Pump Condition Projects

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Detail Capital Costs

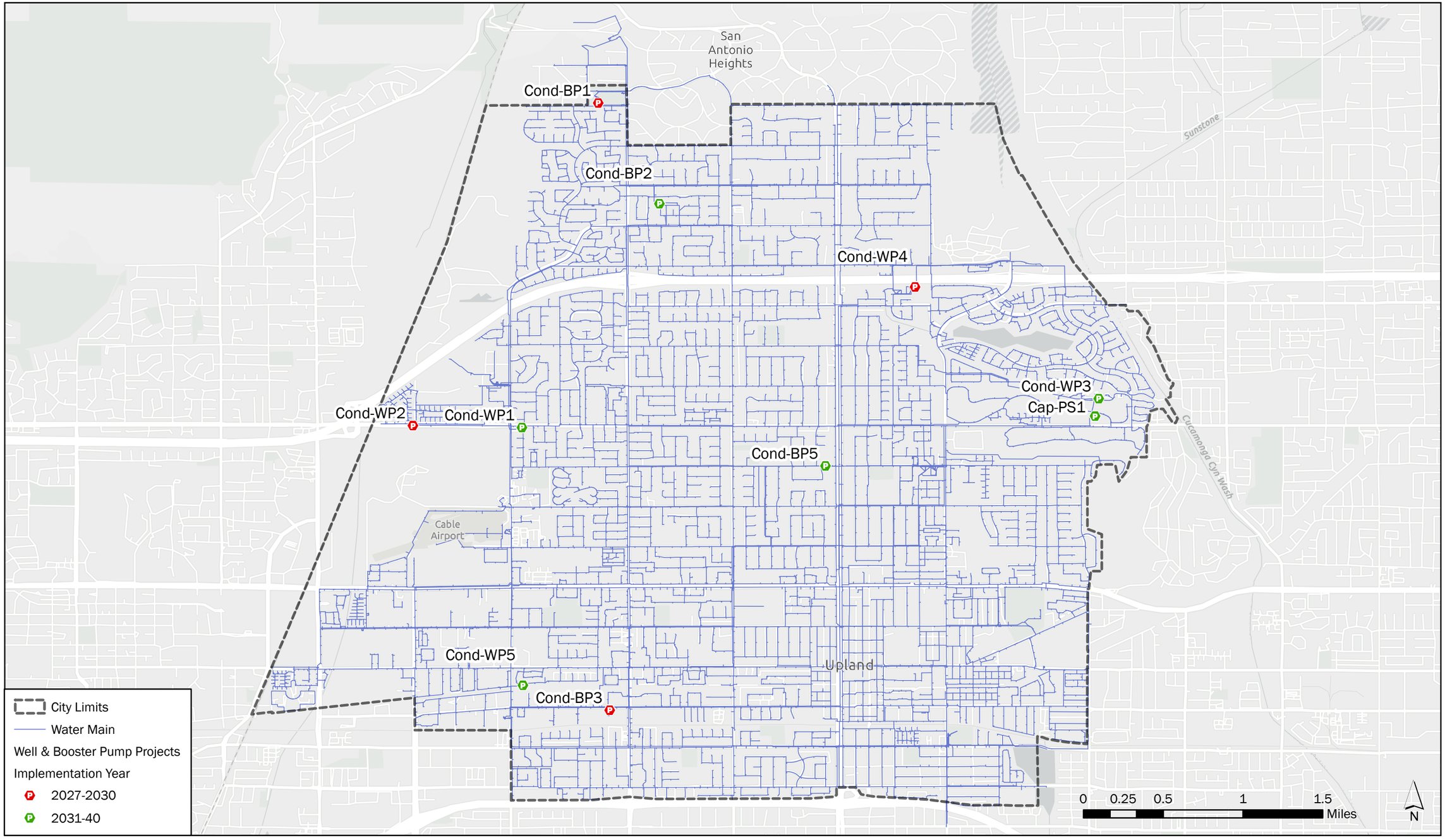
Component/Item		Quantity	Units	Unit Cost	Bare Cost	Capital Cost
Cond-WP1	**Lemon Heights 4 (LH 4)**					
	Demolition of Existing Vertical Turbine Well Pump (150HP)	1	ea	10,000	$10,000	$24,029
	Demolition of Existing Pad (5'x5'x1')	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	10,000	$10,000	$24,029
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Vertical Turbine Well Pump (150HP)	1	ea	139,483	$88,797	$213,369
	Minor Electrical Repair (30% of Pump Cost)	1	ls	41,845	$41,845	$100,549
	Subtotal				$156,614	$376,327
Cond-WP2	**Mountain View 4 (MV 4)**					
	Demolition of Existing Submersible Well Pump (25 HP)	1	ea	5,000	$5,000	$12,014
	Demolition of Existing Pad (5'x5'x1')	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Submersible Well Pump (25HP)	1	ea	24,670	$24,670	$59,279
	Minor Electrical Repair (30% of Pump Cost)	1	ls	7,401	$7,401	$17,784
	Subtotal				$51,043	$122,651
Cond-WP3	**Upland Foothills Well (UF3)**					
	Demolition of Existing Submersible Well Pump (40 HP)	1	ea	6,000	$6,000	$14,417
	Demolition of Existing Pad (5'x5'*6")	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Submersible Well Pump (40 HP)	1	ea	40,000	$40,000	$96,116
	Minor Electrical Repair (30% of Pump Cost)	1	ls	12,000	$12,000	$28,835
	Subtotal				$71,972	$172,941
Cond-WP4	**Well 20 (CW20)**					
	Demolition of Existing Submersible Well Pump (50 HP)	1	ea	8,000	$8,000	$19,223
	Demolition of Existing Pad (5'x5'*6")	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Submersible Well Pump (50 HP)	1	ea	50,000	$50,000	$120,144
	Minor Electrical Repair (30% of Pump Cost)	1	ls	15,000	$15,000	$36,043
	Subtotal				$86,972	$208,985

Cond-WP5	Well 3 (Plant 10)					
	Demolition of Existing Submersible Well Pump (60 HP)	1	ea	12,000	$12,000	$28,835
	Demolition of Existing Pad (5'x5'*6")	25	sf	100	$2,500	$6,007
	Removal/Reinstall Pipe and Valving	1	ea	8,000	$8,000	$19,223
	Form/Pour New Pad	0.5	cy	7,500	$3,472	$8,343
	Furnish/Install New Submersible Well Pump (60 HP)	1	ea	60,000	$60,000	$144,173
	Minor Electrical Repair (30% of Pump Cost)	1	ls	18,000	$18,000	$43,252
	VCP - 8" Drainage Pipe	470	lf	182	$85,540	$205,543
	Traffic Control	470	lf	8	$3,680	$8,843
	Trench Ashalt Demo	470	lf	60	$28,200	$67,761
	Trench Asphalt Replace	470	lf	235	$110,450	$265,399
	Mill/Overlay 2-inch	1,880	sf	3.62	$6,806	$16,353
	Subtotal				$338,648	$813,733

Other notes:
Assumes no contaminated or culturally sensitive materials are encountered.
Does not include land or easement acquisition costs.
Does not include permitting costs.

	Subtotal			$705,249	
Construction Markups					
	Material Sales Tax (assume 50% of cost is materials)	7.75	%	$27,328	
	Subtotal			$732,578	
	Contractor Overhead and Profit	15	%	$109,887	
	Subtotal			$842,465	
	Contractor General Conditions	15	%	$126,370	
	Subtotal			$968,834	
	Undesigned/Undeveloped Detail Contingency	30	%	$290,650	
	Subtotal			$1,259,485	
	Bonds and Insurance	3.5	%	$44,082	
	Subtotal			$1,303,566	
Other Markups					
	Scope Contingency/Risk Allowance	0	%	$0	
	Subtotal			$1,303,566	
	Soft Costs	30	%	$391,070	
TOTAL CAPITAL COST				**$1,694,636**	**$1,694,636**

Class 5 Estimate, Low Range	-50%	$847,318
Class 5 Estimate, High Range	100%	$3,389,273



CIP Well and Booster Pump Projects

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City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Gen1 through Gen4
Project Name: Backup Generators
System Type: Potable
Phase: 2031-40
Project Type: Reliability
Capital Cost: $ 816,000

Project Description:
New backup generator projects identified by City staff to provide additional system reliability.
New generators at Plants 2 and 6 have already been approved in the budget and are not included for future CIP planning.

Project Element	Generator Size (kW)	Project Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Gen1: Plant 10 (Well 3), New Generator	200	Backup Generator	New	n/a	$ 314,000	$ 408,000	2025
Gen2: Plant 11 (Well 8), New Generator	200	Backup Generator	New	n/a	$ 314,000	$ 408,000	2025
	Total				**$ 628,000**	**$ 816,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 816,000
Developer Cost	0%	$ -
Total	100%	$ 816,000

Notes:
-See following pages for a breakdown of the costs by project.
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Cost estimates developed based on available documentation and site photos. Additional site review is recommended to further refine cost estimate.

Backup Generator Project Costs

Detail Capital Costs

Component/Item		Quantity	Units	Unit Cost	Bare Cost[1]	Capital Cost[2]
Gen1	**Plant 10 / Well 3 - New Generator**					
	Generator (200 kW)	1	ls	241,337	$241,337	$407,900
	Subtotal				$241,337	$407,900
Gen2	**Plant 11 / Well 8 - New Generator**					
	Generator (200 kW)	1	ls	241,337	$241,337	$407,900
	Subtotal				$241,337	$407,900

Note: Cost based on City of Upland Bid Pricing for Water Plant #2 to Furnish and Install 200kW Kohler Generator with 400A Automatic Transfer Switch, Concrete Foundation, all conduits and wiring and all other appurtenenances. Assumes City of Upland will contract work directly with Electrical Subcontractor, not through a General Contractor.

[1] Bare costs include direct construction costs (labor, materials, labor, and equipment). Costs are based on City of Upland bid pricing for Plant 2 generator (through electrical subcontractor)

[2] Capital costs are equal to 169% of the Bare cost. This factor is based on the compounding markup, detailed below. Given that the bare costs are based on recent City bids, the markup includes undeveloped project contingency and soft costs (engineering, project management, legal).

Other notes:
Assumes no contaminated or culturally sensitive materials are encountered.
Does not include land or easement acquisition costs.
Does not include permitting costs.

	Subtotal			$482,674	
Construction Markups					
	Material Sales Tax (assume 50% of cost is materials)		%	$0	
	Subtotal			$482,674	
	Contractor Overhead and Profit		%	$0	
	Subtotal			$482,674	
	Contractor General Conditions		%	$0	
	Subtotal			$482,674	
	Undesigned/Undeveloped Detail Contingency	30	%	$144,800	
	Subtotal			$627,474	
	Bonds and Insurance		%	$0	
	Subtotal			$627,474	
Other Markups					
	Scope Contingency/Risk Allowance	0	%	$0	
	Subtotal			$627,500	
	Soft Costs	30	%	$188,300	
TOTAL CAPITAL COST		**69.00**	**%**	**$815,800**	**$815,800**

Class 5 Estimate, Low Range	-50%	$407,900
Class 5 Estimate, High Range	100%	$1,631,600

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Site1 through Site4
Project Name: Beautification of City sites
System Type: Potable
Phase: 2031-40
Project Type: Other
Capital Cost: $ 2,966,000

Project Description:
Site security projects identified by City staff.

Project Element	Project Size (SF)	Project Type	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Site1: Plant 11	10,000	Site Security	n/a	$ 387,000	$ 503,000	2031-40
Site2: Plant 3 North Side	7,000	Site Security	n/a	$ 1,128,000	$ 1,467,000	2031-40
Site3: City Well 17	10,000	Site Security	n/a	$ 588,000	$ 765,000	2031-40
Site4: Plant 14	10,000	Site Security	n/a	$ 178,000	$ 231,000	2031-40
Total				**$ 2,281,000**	**$ 2,966,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 2,966,000
Developer Cost	0%	$ -
Total	100%	$ 2,966,000

Notes:
-See following pages for a breakdown of the costs by project.
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Cost estimates developed based on available documentation and site photos. Additional site review is recommended to further refine cost estimate.

Site Project Costs

Detail Capital Costs

Component/Item		Quantity	Units	Unit Cost	Bare Cost[1]	Capital Cost[2]
Site1	**Plant 11 - Site Improvements**					
	Clear & Grub; Dispose of Rocky Material Offsite (<3" Deep)	18,570	sf	1	$18,570	$44,622
	Rototill then Spread 3" Conditioned Topsoil w/ Skidsteer	18,570	sf	1	$18,570	$44,622
	Lay 6 mil Polyethylene Film	18,570	sf	0.50	$9,285	$22,311
	Plant Ground cover plants 12" On-Center (assumes 25% of site area)	4,640	sf	10	$46,400	$111,494
	Hand Spread 2" Deep Wood Chips	18,570	sf	1	$18,570	$44,622
	Decrative Security Fence	750	lf	100	$75,000	$180,217
	Irrigation Allowance (assumes 25% of site area)	4,640	sf	1.5	$6,960	$16,724
	Site Lighting	2	ea	8,000.0	$16,000	$38,446
	Subtotal				$209,355	$503,057
Site2	**Plant 3 North Side - Site Improvements**					
	Clear & Grub; Dispose of Rocky Material Offsite (<3" Deep)	56,240	sf	1	$56,240	$135,138
	Rototill then Spread 3" Conditioned Topsoil w/ Skidsteer	56,240	sf	1	$56,240	$135,138
	Lay 6 mil Polyethylene Film	56,240	sf	0.50	$28,120	$67,569
	Plant Ground cover plants 12" On-Center	14,060	sf	10	$140,600	$337,846
	Hand Spread 2" Deep Wood Chips	56,240	sf	1	$56,240	$135,138
	Decrative Security Fence	2,360	lf	100	$236,000	$567,082
	Irrigation Allowance	14,060	sf	1.5	$21,090	$50,677
	Site Lighting	2	ea	8,000.0	$16,000	$38,446
	Subtotal				$610,530	$1,467,036
Site3	**City Well 17 Site - Site Improvements**					
	Clear & Grub; Dispose of Rocky Material Offsite (<3" Deep)	30,510	sf	1	$30,510	$73,312
	Rototill then Spread 3" Conditioned Topsoil w/ Skidsteer	30,510	sf	1	$30,510	$73,312
	Lay 6 mil Polyethylene Film	30,510	sf	0.50	$15,255	$36,656
	Plant Ground cover plants 12" On-Center	7,630	sf	10	$76,300	$183,340
	Hand Spread 2" Deep Wood Chips	30,510	sf	1	$30,510	$73,312
	Decrative Security Fence	1,080	lf	100	$108,000	$259,512
	Irrigation Allowance	7,630	sf	1.5	$11,445	$27,501
	Site Lighting	2	ea	8,000.0	$16,000	$38,446
	Subtotal				$318,530	$765,392
Site4	**Plant 14 - Site Improvements**					
	Clear & Grub; Dispose of Rocky Material Offsite (<3" Deep)	5,210	sf	1	$5,210	$12,519
	Rototill then Spread 3" Conditioned Topsoil w/ Skidsteer	5,210	sf	1	$5,210	$12,519
	Lay 6 mil Polyethylene Film	5,210	sf	0.50	$2,605	$6,260
	Plant Ground cover plants 12" On-Center	1,300	sf	10	$13,000	$31,238
	Hand Spread 2" Deep Wood Chips	5,210	sf	1	$5,210	$12,519
	Decrative Security Fence	470	lf	100	$47,000	$112,936
	Irrigation Allowance	1,300	sf	1.5	$1,950	$4,686
	Site Lighting	2	ea	8,000.0	$16,000	$38,446
	Subtotal				$96,185	$231,122

[1] Bare costs include direct construction costs (labor, materials, labor, and equipment).

[2] Capital costs are equal to 240% of the Bare cost. This factor is based on the compounding markup, detailed below, including materials sales tax, contractor overhead and profit, bonds and insurance, contingency to cover additional details not considered at this stage in the project development, and soft costs (engineering, project management, legal).

Other notes:
Assumes no contaminated or culturally sensitive materials are encountered.
Does not include land or easement acquisition costs.
Does not include permitting costs.

	Subtotal		$1,234,600	
Construction Markups				
	Material Sales Tax (assume 50% of cost is materials)	7.75 %	$47,841	
	Subtotal		$1,282,441	
	Contractor Overhead and Profit	15 %	$192,366	
	Subtotal		$1,474,807	
	Contractor General Conditions	15 %	$221,221	
	Subtotal		$1,696,028	
	Undesigned/Undeveloped Detail Contingency	30 %	$508,808	
	Subtotal		$2,204,836	
	Bonds and Insurance	3.5 %	$77,169	
	Subtotal		$2,282,006	
Other Markups				
	Scope Contingency/Risk Allowance	0 %	$0	
	Subtotal		$2,282,006	
	Soft Costs	30 %	$684,602	
TOTAL CAPITAL COST			**$2,966,607**	**$2,966,607**

Class 5 Estimate, Low Range	-50%	$1,483,304	
Class 5 Estimate, High Range	100%	$5,933,214	

City of Upland
Water and Recycled Water Master Plan
CAPITAL IMPROVEMENT PLAN

Project Identification: Valve1 and 2, Electrical1, Sound1
Project Name: Other projects
System Type: Potable
Phase: 2031-40
Project Type: Reliability
Capital Cost: $ 1,135,000

Project Description:
Other projects identified by City staff include upgrading Cla-Vals at Plant 5 and the Van Drop Line, upgrading the electrical panel at West End 3 and 4, and replacing the sounding line at Well 15.

Project Element		Project Size	Project Type	Replace/ New	Unit Cost ($/Unit)	Estimated Construction Cost	Capital Improvement Cost 130%	Project Schedule
Valve1	Plant 5 Cla-Val upgrade	16-in	Valving	Replace	n/a	$ 102,000	$ 132,000	2028
Valve2	Van Drop Line: install Cla-Val	16-in	Valving	New	n/a	$ 274,000	$ 356,000	2027
Electrical1	West End 3/4 electrical panel upgrade	600A	Electrical	Replace	n/a	$ 350,000	$ 455,000	2028
Sound1	Well 15 sounding line replacement	n/a	Well equipment	Rehabilitation	n/a	$ 148,000	$ 192,000	2030
	Total					**$ 874,000**	**$ 1,135,000**	

Reimbursement Category	Percent	Cost
City Cost	100%	$ 1,135,000
Developer Cost	0%	$ -
Total	100%	$ 1,135,000

Notes:
-See following pages for a breakdown of the costs by project.
-All cost estimates have been prepared at a Class 5 level (in 2025 dollars)
-Cost estimates developed based on available documentation and site photos. Additional site review is recommended to further refine the cost estimates.
-City has identified Valve2 (Van Drop Line) as a high priority project.

Well Pump Condition Projects

DRAFT

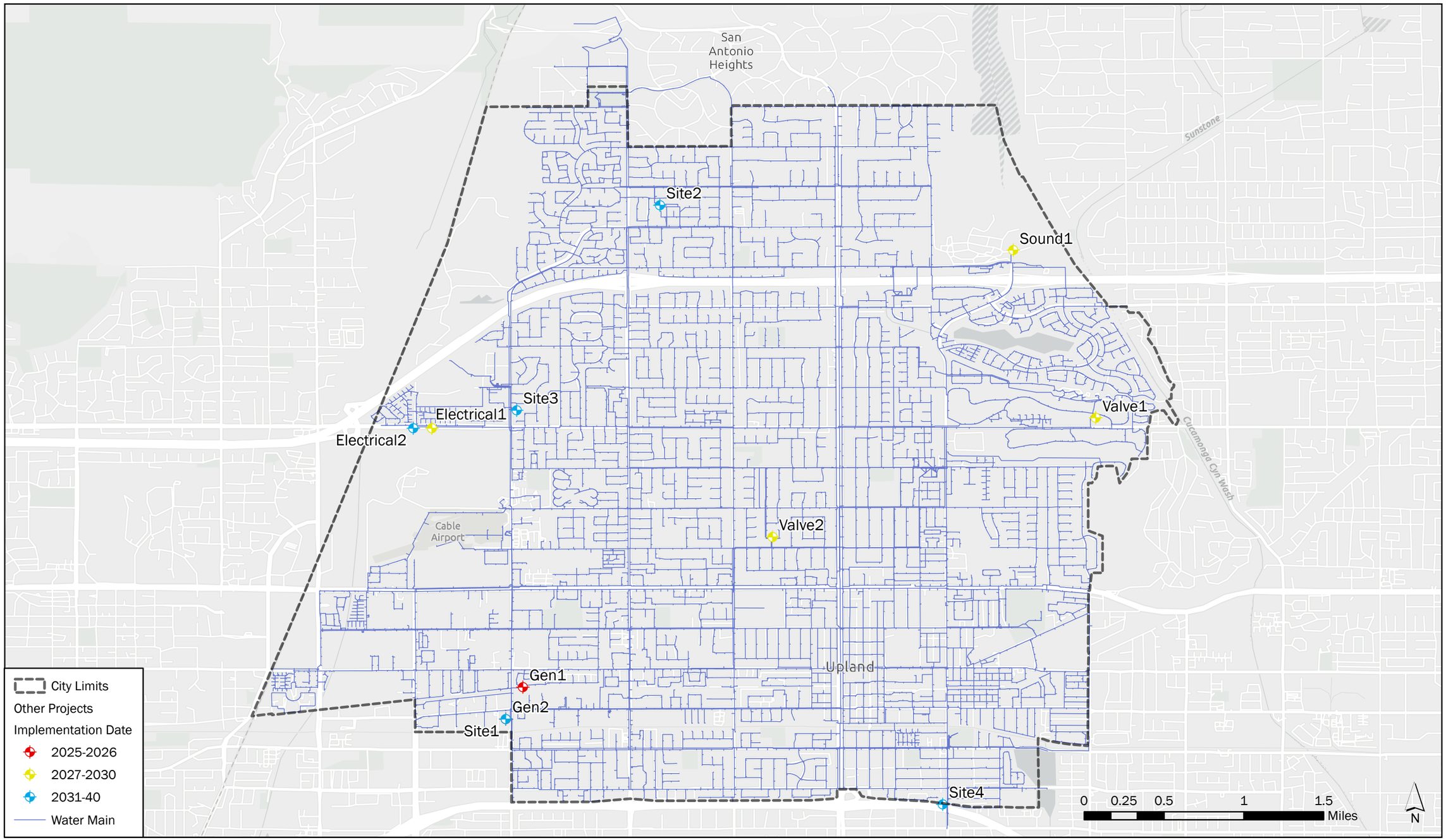
Detail Capital Costs

Component/Item		Quantity	Units	Unit Cost	Bare Cost	Capital Cost
Valve1	**Plant 5 - Cal-Val upgrade**					
	New 16" Cla-Val	1	ea	45,000	$45,000	$108,130
	Removal/Reinstall Pipe and Valving	1	ea	10,000	$10,000	$24,029
	Subtotal				$55,000	$132,159
Valve2	**Van Drop Line - Cla-Val**					
	New 16" Cla-Val	1	ea	45,000	$45,000	$108,130
	Removal/Reinstall Pipe and Valving Allowance	1	ea	10,000	$10,000	$24,029
	16" Pipe Removal/Installation	100	lf	500	$50,000	$120,144
	New Vault Installation	1.0	ea	10,000	$10,000	$24,029
	Trench Ashalt Demo	100	lf	60	$6,000	$14,417
	Trench Asphalt Replace	100	lf	235	$23,500	$56,468
	Mill/Overlay 2-inch	1,000	sf	3.62	$3,620	$8,698
	Subtotal				$148,120	$355,916
Electrical1	**West End 3/4 - Electrical Panel**					
	Demolition	1	ls	17,135	$17,135	$41,173
	Distribution Equipment (based on electrical vendor estimate)	1	ls	167,925	$167,925	$403,505
	Grounding	1	ls	4,349	$4,349	$10,450
	Subtotal				$189,409	$455,128
Sound1	**Well 15 - Sounding Line**					
	Remove/Reinstall well	1	ls	50,000	$50,000	$120,144
	Supply & Install of New Sounding Line	1,000	lf	30	$30,000	$72,087
	Subtotal				$80,000	$192,231

Other notes:
Assumes no contaminated or culturally sensitive materials are encountered.
Does not include land or easement acquisition costs.
Does not include permitting costs.

	Subtotal				$472,529	

Construction Markups				
Material Sales Tax (assume 50% of cost is materials)	7.75 %		$18,310	
Subtotal			$490,839	
Contractor Overhead and Profit	15 %		$73,626	
Subtotal			$564,465	
Contractor General Conditions	15 %		$84,670	
Subtotal			$649,135	
Undesigned/Undeveloped Detail Contingency	30 %		$194,740	
Subtotal			$843,875	
Bonds and Insurance	3.5 %		$29,536	
Subtotal			$873,411	
Other Markups				
Scope Contingency/Risk Allowance	0 %		$0	
Subtotal			$873,411	
Soft Costs	30 %		$262,023	
TOTAL CAPITAL COST			**$1,135,434**	**$1,135,434**
Class 5 Estimate, Low Range		-50%	$567,717	
Class 5 Estimate, High Range		100%	$2,270,868	



CIP Other Projects

Brown AND Caldwell

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