FINAL

MARCH 2026

Florin County Water District

Water System Master Plan

AKEL
ENGINEERING GROUP, INC.

FLORIN COUNTY WATER DISTRICT

2026

WATER SYSTEM MASTER PLAN

REGISTERED PROFESSIONAL ENGINEER
ANTOINE A AKEL
C 041682
CIVIL
STATE OF CALIFORNIA
3/3/26

FINAL

March 2026

REGISTERED PROFESSIONAL ENGINEER
BRAD J KOOIMAN
C 82658
CIVIL
STATE OF CALIFORNIA
3/3/26

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Smart Planning Our Water Resources

March 3, 2026

Florin County Water District
7090 McComber Street
Sacramento, CA 95828

Attention: Edmond Leggette, General Manager

Subject: Water System Master Plan

Dear Edmond:

We are pleased to submit the Florin County Water District (FCWD) Water System Master Plan. The master plan summarizes FCWD's existing distribution system infrastructure and documents FCWD's acceptable design criteria and general plan growth assumptions.

The master plan documents the capacity evaluation of the existing system and lists facility improvements needed to meet the water demand needs of existing users, as well as the needs of general plan growth. Finally, the master plan includes a pipeline risk analysis, a capital improvement program, and a cost allocation analysis.

We extend our thanks to you and other FCWD staff whose courtesy and cooperation were valuable components in completing this study.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E., D. WRE
President

Enclosure: Water System Master Plan Report

7433 NORTH FIRST STREET, SUITE 103 • FRESNO, CALIFORNIA 93720 • (559) 436-0600 • FAX (559) 436-0622
www.akeleng.com

Acknowledgements

Florin County Water District Board Members

Judi Johnson, President Elect

James Parvis, Vice President

Victoria Redoble, Director

Edward Taylor, Director

Jason Andrews, Director

Management Personnel

Edmond Leggette, General Manager

Beau Kirby, Operations Manager

Dawn Leggette, Office Manager

Mia Lampkin, Office Supervisor

Florin County Water District
Water System Master Plan

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ABBREVIATIONS

WSMP	Water System Master plan
AACE International	Association for the Advancement of Cost Engineering
AC	Acre
ACP	Asbestos Cement Pipe
ADD	average day demand
Akel	Akel Engineering Group, Inc.
AMI	Advanced Metering Infrastructure
AWWA M-32	American Water Works Association Manual on Computer Modeling and Water Distribution System
Basin	South American Subbasin of the Central Valley
CCI	Construction Cost Index
CI	Cast Iron Pipe
CIP	Capital Improvement Program
cfs	cubic feet per second
CoSANA	Cosumnes–South American
DBP	Disinfection byproducts
DDW	Division of Drinking Water
DIP	Ductile Iron Pipe
DU	dwelling unit
ENR	Engineering News Record
EPA	Environmental Protection Agency
EPS	Extended Period Simulation
FCWD	Florin County Water District
ft	feet
fps	feet per Second
GAC	Granular Activated Carbon
GIS	Geographic Information Systems

ABBREVIATIONS

gpd	gallons per day
gpm	gallons per minute
GWR	Groundwater Rule
HAA5s	Haloacetic Acids
HGL	hydraulic grade line
hp	horsepower
HWL	high water level
in	inch
IX	Anion Exchange
LCR	Lead and Copper Rule
LCRR	Lead and Copper Rule revisions
LF	linear feet
MCL	Maximum Contaminant Levels
MDD	maximum day demand
MDMS	meter data management systems
MG	million gallons
mgd	million gallons per day
MMD	maximum month demand
NDGSA	Northern Delta Groundwater Sustainability Agency
NFPA	National Fire Protection Association
NOV	Notice of violation
NPDWR	National Primary Drinking Water Regulation
OEHHA	Office of Environmental Health Hazard Assessment
PFAs	per- and polyfluoroalkyl substances
PHD	peak hour demand
psi	pounds per square inch

ABBREVIATIONS

RO	Reverse Osmosis
ROW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SWRCB	State Water Resources Control Board
TCR	Total Coliform Rule
TT	treatment technique
TTHMs	Total Trihalomethanes

Florin County Water District
Water System Master Plan

UNIT CONVERSIONS

Volume Unit Calculations

To Convert From:	To:	Multiply by:
acre feet	gallons	325,851
acre feet	cubic feet	43,560
acre feet	million gallons	0.3259
cubic feet	gallons	7.481
cubic feet	acre feet	$2.296 * 10^{-5}$
cubic feet	million gallons	$7.481 * 10^{-6}$
gallons	cubic feet	0.1337
gallons	acre feet	$3.069 * 10^{-6}$
gallons	million gallons	$1 * 10^{-6}$
million gallons	gallons	1,000,000
million gallons	cubic feet	133,672
million gallons	acre feet	3.069

Florin County Water Distirct
Water System Master Plan

UNIT CONVERSIONS

Flow Rate Calculations

To Convert From:	To:	Multiply By:
ac-ft/yr	mgd	$8.93 * 10^{-4}$
ac-ft/yr	cfs	$1.381 * 10^{-3}$
ac-ft/yr	gpm	0.621
ac-ft/yr	gpd	892.7
cfs	mgd	0.646
cfs	gpm	448.8
cfs	ac-ft/yr	724
cfs	gpd	646,300
gpd	mgd	$1 * 10^{-6}$
gpd	cfs	$1.547 * 10^{-6}$
gpd	gpm	$6.944 * 10^{-4}$
gpd	ac-ft/yr	$1.12 * 10^{-3}$
gpm	mgd	$1.44 * 10^{-3}$
gpm	cfs	$2.228 * 10^{-3}$
gpm	ac-ft/yr	1.61
gpm	gpd	1,440
mgd	cfs	1.547
mgd	gpm	694.4
mgd	ac-ft/yr	1,120
mgd	gpd	1,000,000

EXECUTIVE SUMMARY

This executive summary presents a brief background of FCWD's water system, the need for this water system master plan, the proposed improvements intended to mitigate existing deficiencies, the risk analysis for the distribution mains, as well as improvements to provide adequate services to future developments. The capital improvement program is included at the end of this chapter.

ES.1 STUDY OBJECTIVES

This master plan provides FCWD with a tool for planning the domestic water infrastructure facilities. The objective of this master plan is to evaluate FCWD's domestic water distribution system and recommend capacity improvements necessary to service the needs of existing users and future developments. Should planning conditions change, and depending on their magnitude, adjustments to the master plan recommendations might be necessary.

This master plan includes the following elements:

- Summarize FCWD's existing domestic water system facilities.
- Document growth planning assumptions
- Establish the domestic water system performance criteria.
- Project future domestic water demands.
- Develop and calibrate the hydraulic water model.
- Evaluate the capacity adequacy of the distribution mains and supply wells to meet existing and projected demand requirements and fire flows.
- Complete a system-wide fire flow analysis.
- Perform a risk analysis
- Recommend a capital improvement program (CIP) with an opinion of probable costs
- Perform a capacity allocation between existing and future developments. Capacity allocation was identified for each known development and may be used for cost sharing.
- Evaluate the well water quality used to supply the water distribution system

- Develop a system wide preliminary advanced metering infrastructure plan.
- Prepare a Water System Master Plan.

ES.2 STUDY AREA

FCWD is located in Sacramento County south of the City of Sacramento and north of Elk Grove. FCWD's service area is about 2.5 square miles and services approximately 7,600 people. It is bound by the City of Sacramento Water to the north, by the Sacramento County Water District to the east, by Cal American Water Company to the south and both Cal American Water Company and Tokay Park Water Company to the west as shown on **Figure ES.1**.

ES.3 HYDRAULIC MODEL AND PERFORMANCE CRITERIA

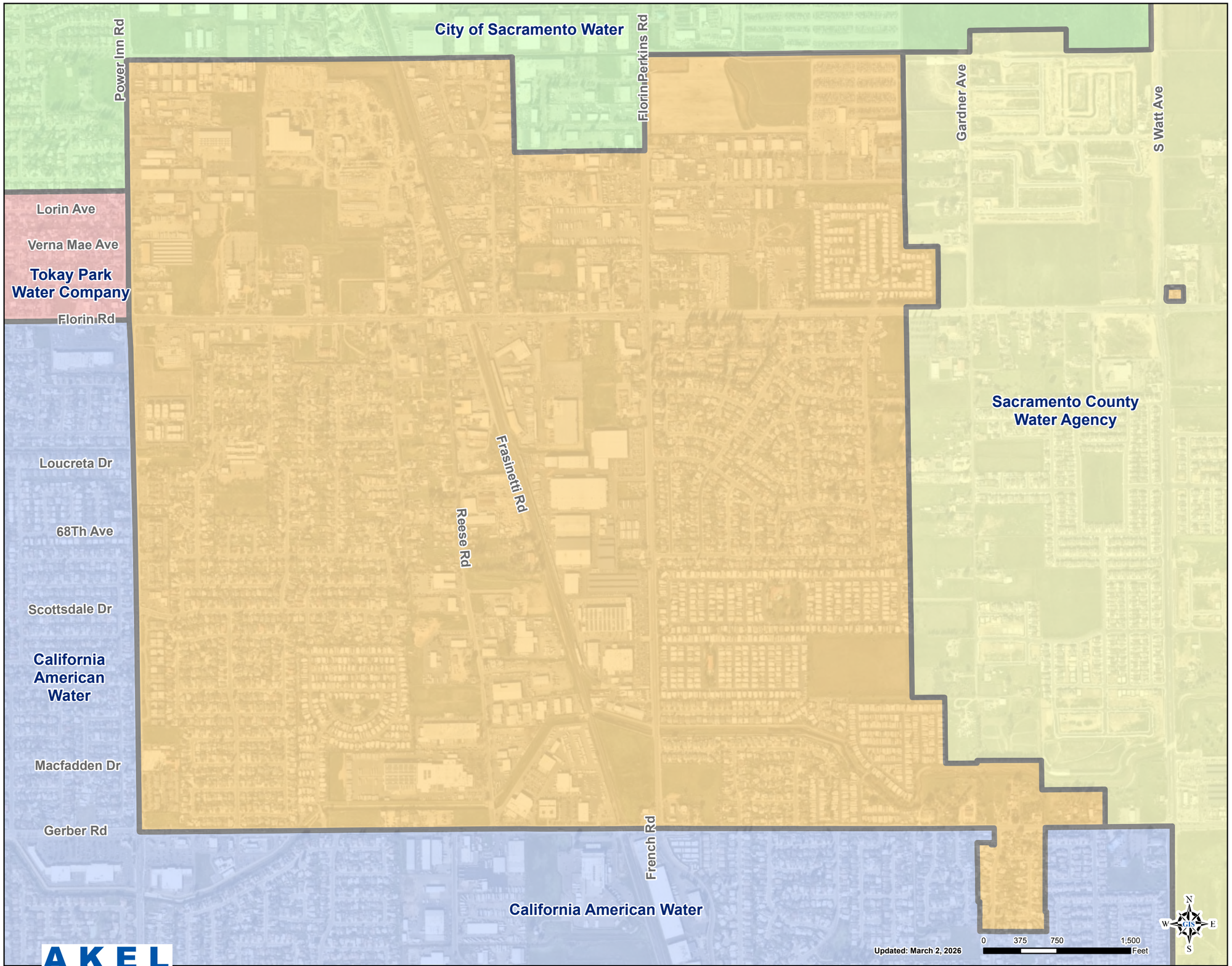
FCWD's existing domestic water distribution system was digitized in GIS shapefiles using several sources of data and various levels of quality control. The GIS files were developed from physical maps maintained by operations staff. Using the new GIS shapefiles of the system, the domestic water system hydraulic model was developed in InfoWater Pro by Autodesk. The hydraulic model was validated to field conditions using historical fire flow tests.

The criteria used for evaluating the capacity adequacy of the domestic water distribution system facilities (transmission mains, storage reservoirs, and supply) are based first on Title 22, Division 4, Chapter 16, Article 2, Section §64554 of the California Code of Regulations and secondly on a criteria survey of nearby water agencies and are discussed in the System Performance and Design Criteria chapter and summarized on **Table ES.1**.

ES.4 EXISTING WATER SYSTEM OVERVIEW

FCWD's water system consists of 32 miles of distribution mains which provide water to over 2,400 accounts. The existing domestic water distribution system is shown in **Figure ES.2**, and provides a general color coding for the distribution mains by pipe size and identifies the existing well locations. The system operates as a single pressure zone.

The FCWD water supply comes from 10 groundwater wells with a total capacity of approximately 5,000 gpm. There are 5 wells impacted by exceeding the PFOA MCL.



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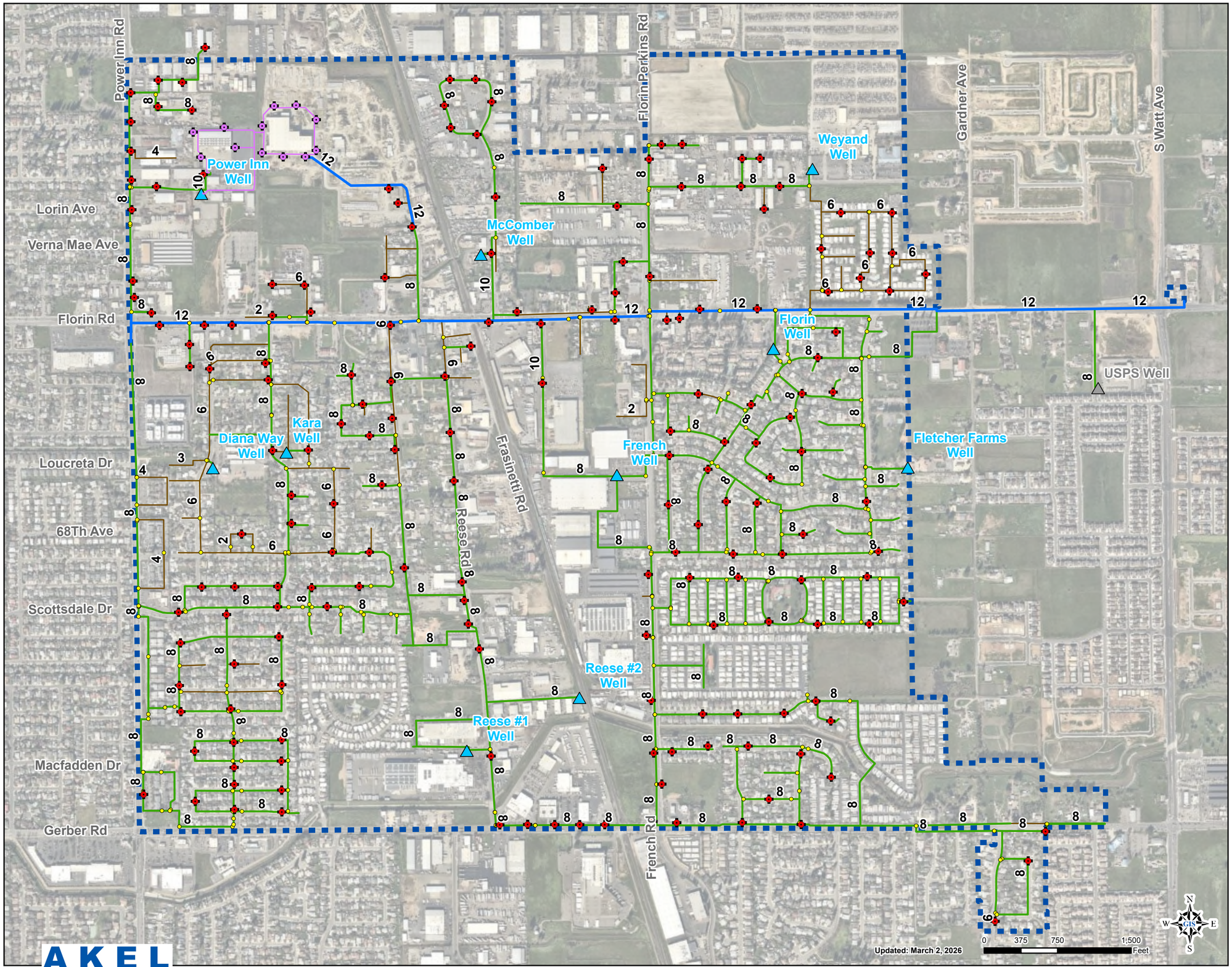
AKEL ENGINEERING GROUP, INC.

Legend

Water Purveyors

- Florin County Water District
- California American Water
- City of Sacramento Water
- Sacramento County Water Agency
- Tokay Park Water Company

Figure ES. 1
Service Area
Water System Master Plan
Florin County Water District



Legend

Existing System

- Wells
- Abandoned Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Private Systems

- Hydrant
- Pipes

Water Purveyors

- Florin County Water District

Figure ES. 2
Existing Water Distribution System
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT
INCORPORATED OCT. 19, 1959
CALIFORNIA

AKEL ENGINEERING GROUP, INC.

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Table ES.1 Planning and Design Criteria Summary

Water System Master Plan

Florin County Water District

Design Parameter	Criteria		
Supply	Well Firm Capacity = Larger of 1) Peak Hour Demands or 2) Maximum Day Demand + Fire Flow		
Storage	Total Required Storage = Operational + Fire + Emergency		
	Operational Storage	25% of Maximum Day Demand	
	Emergency Storage	25% of Maximum Day Demand	
	Fire Storage (Largest requirement)	3,000 gpm for 3 hours (0.54 MG)	
Pump Station	Pump Station capacity should meet the following:		
	Largest of Fire Flow or PHD - MDD		
Distribution Mains	Criteria for existing and future pipelines include :		
	Maximum Pipeline Velocity (during PHD): 5 ft/s (excluding fire flows)		
Service Pressures	Maximum Pressure	80 psi	
	Minimum Pressure (during Maximum Day)	40 psi	
	Minimum Pressure (during Peak Hour)	35 psi	
	Minimum Residual Pressure (during Fires)	20 psi	
Demand Peaking Factors	Maximum Month Demand	1.4 x Average Day Demand	
	Maximum Day Demand	1.6 x Average Day Demand	
	Peak Hour Demand	2.4 x Average Day Demand	
Fire Flows		(gpm)	(hours)
	Single Family Residential	1,500	2
	Commercial	2,000	3
	Industrial	3,000	3

PFOA Impacted Wells:

- Florin (ion exchange filtration in progress)
- Kara
- Reese #1
- Reese #2
- Diana (ion exchange filtration in progress)

ES.5 DOMESTIC WATER DEMANDS

The existing water demands used in this master plan were based on an analysis of the historical water production. The design average day demand is determined to be 2.1 million gallons per day (mgd).

The future water demands were projected based on the buildout of the vacant parcels and the planned land uses from the 2030 General Plan. Future demands were estimated using the unit factors for residential and non-residential land uses. The average day domestic water demands for the buildout are calculated at 2.6 MGD.

ES.6 WATER SYSTEM EVALUATION

The calibrated hydraulic model was used to evaluate the system performance and identify deficiencies in the system during peak hour demands and maximum day demands plus fire flow.

1.1.1 Distribution System Pipeline Evaluation

The hydraulic model was used to identify pipelines in FCWD's existing distribution that experience high velocity under peak hour demand conditions. Areas of high head loss or high velocity may be more susceptible to water main breaks and ruptures. FCWD water distribution system performed well during PHDs and no pipeline velocity deficiencies were identified.

1.1.2 Distribution System Pressure Evaluation

The hydraulic model was also used to determine if the existing domestic water distribution system meets the minimum pressure requirements outlined in the FCWD's System Performance and Design Criteria chapter. During PHD the minimum pressure requirement is 35 psi. FCWD operates the water system to maintain system pressures between 50 and 80 psi. The minimum pressure observed during PHDs was 50 psi, well above the criteria of 35 psi.

1.1.3 Fire Flow Evaluation

The fire flow analysis consisted of using the MDD in the hydraulic model and applying hypothetical fire flows. The magnitude and duration of each fire flow were based on the governing land use type within proximity to the fire location.

Using the existing MDD as the base system demand, the model computes the available fire flow at 20 psi. The model will also calculate the residual psi at the required fire flow. The hydrant junctions that are unable to meet the existing fire flow criteria (maintaining the minimum of 20 psi under MDD plus fire flow requirement) are identified as deficient.

The hydraulic model indicates that FCWD's existing distribution system has some areas of pipelines that do not loop and industrial corridors that do not meet the fire flow criteria. The model shows that approximately sixty-four percent (64%) of hydrants can meet the FCWD's fire flow criteria, while thirty-six percent (36%) of the hydrants cannot maintain a residual pressure of 20 psi under MDD plus required fire flow demand.

1.1.4 Water Supply Evaluation

The total well capacity is 5,000 gpm with a firm capacity of 4,350 gpm, however due to water quality issues the current total capacity is reduced to 3,300 gpm and the firm capacity to 2,650 gpm. The existing maximum day and peak hour demands are 2,333 gpm and 3,500 gpm respectively which result with a current capacity deficiency of 850 gpm during peak hours and 2,683 gpm during MDD+FF. If the wells are at full capacity, the deficiency is mitigated during PHD.

1.1.5 Recommended Water System Improvements

This study identified specific improvements to mitigate the existing fire flow deficiencies. These improvements consist of replacing old and ill-conditioned watermains, upsizing several segments of distribution mains or looping connectivity to enhance the pressures and meet the fire flow requirements.

The recommended water supply improvements to mitigate the existing supply deficiencies are summarized as follows:

- PFAs treatment at wells Reese #1, Reese #2, Kara, and Florin to bring the wells back online due to exceeding the PFOA maximum containment level (MCL).
- Drilling deeper at the following wells: Florin, Fletcher, and French to increase capacity in order to mitigate the existing supply deficiency.

The recommended water supply improvements to mitigate impending water quality concerns are to add PFAs treatment to each remaining well in the system. The following wells will require PFAs treatment as needed based on water quality testing.

- Fletcher, French, McComber, Weyand, Power Inn

The recommended water supply improvements for future users/demands are as follows:

- Re-Drill the USPS well and include PFAs treatment to meet future demands (future deficiency = 676 gpm)

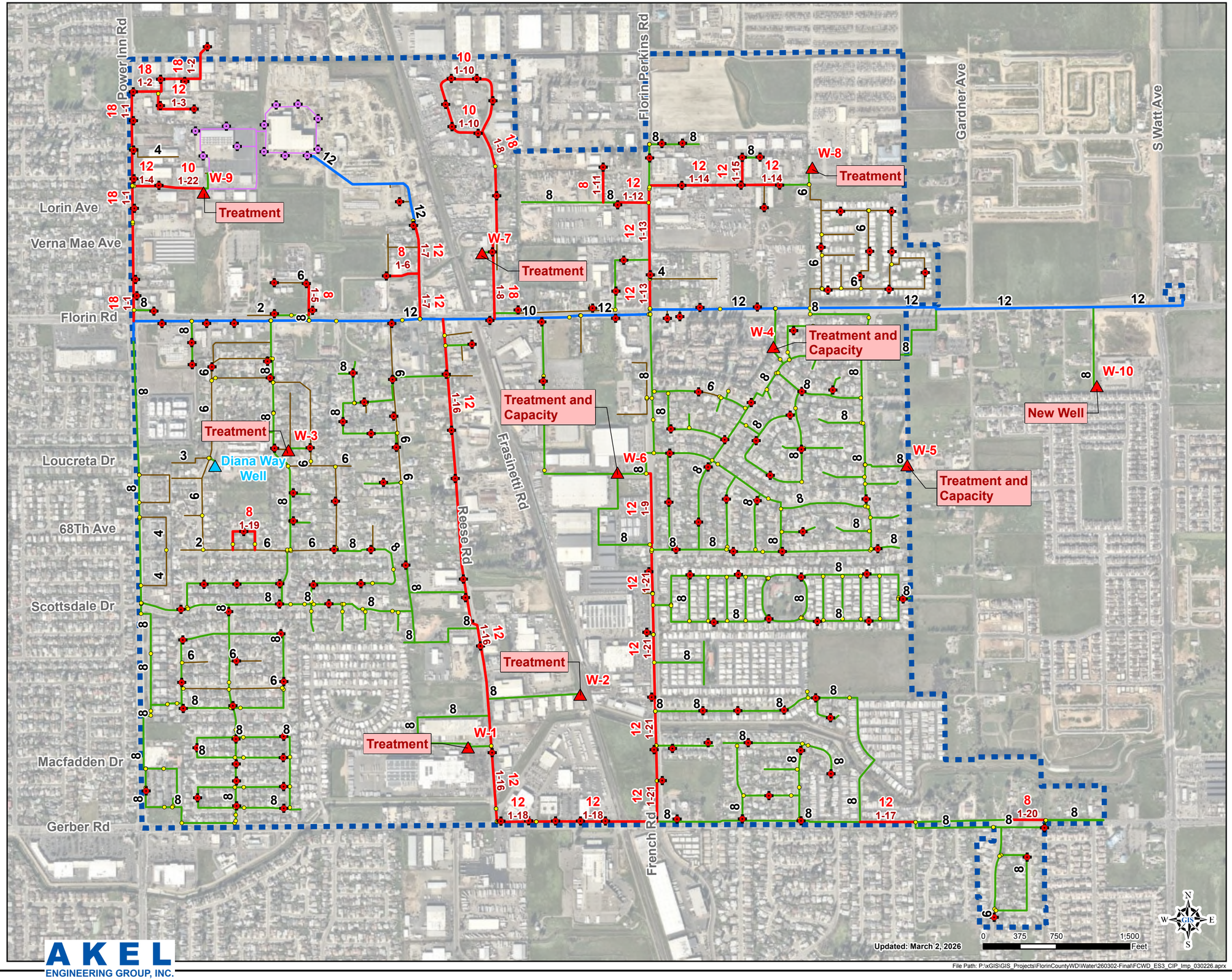
The recommended water system improvements for fire flows and supply enhancements are documented on **Figure ES.3**.

ES.7 RISK ANALYSIS

The purpose of the risk evaluation is to identify pipelines in the water distribution system with the largest risk and highest criticality based on their likelihood of failure (LOF) and the consequence of failure (COF). This risk analysis will be used to develop improvement recommendations so the system can maintain levels of service desired by FCWD and expected by the customers. This evaluation will aid FCWD staff in justifying capital improvement budgets and assist FCWD in changing from a reactive repair strategy to a proactive renewal and replacement strategy by identifying high risk/high criticality pipelines.

The Risk Assessment Scoring and Action Matrix (**Figure ES.4**) illustrates how assets are classified in the Extreme rating category (red) or High rating category (orange) by combining their LOF and COF scores and documents the recommended renewal actions. **Figure ES.5** illustrates the overall risk with the total pipeline length and the percent of system pipeline for each risk ranking.

The industry recommended goal of pipeline annual R&R budgets is at 1.0% of system pipeline length for 100-year pipeline replacement cycle. The suggested pipeline replacement budget $600,000 per year.



Legend

System Improvements

- Wells
- Fire Flow Improvements

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Private Systems

- Hydrant
- Pipes

Water Purveyors

- Florin County Water District

Figure ES. 3
Recommended CIP Improvements
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT INCORPORATED OCT. 19, 1999 CALIFORNIA

AKEL ENGINEERING GROUP, INC.

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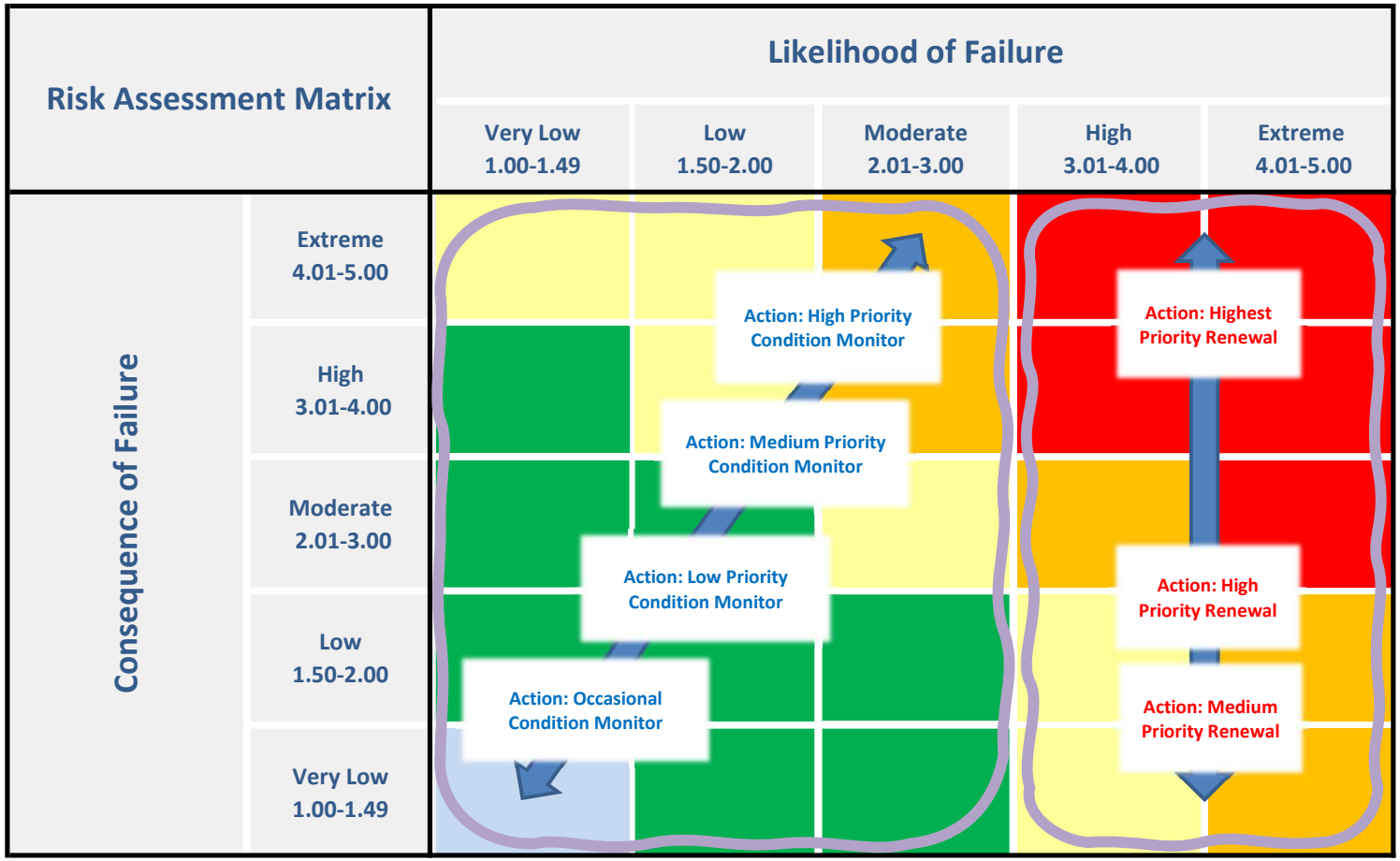


LEGEND

Risk Color Coding

Extreme	*High*	*Moderate*	*Low*	*Very Low*

Renewal Actions Levels

Highest Priority	*High Priority*	*Medium Priority*

Condition Monitoring Levels

High Priority	*Medium Priority*	*Low Priority*	*Occasional*

March 3, 2026

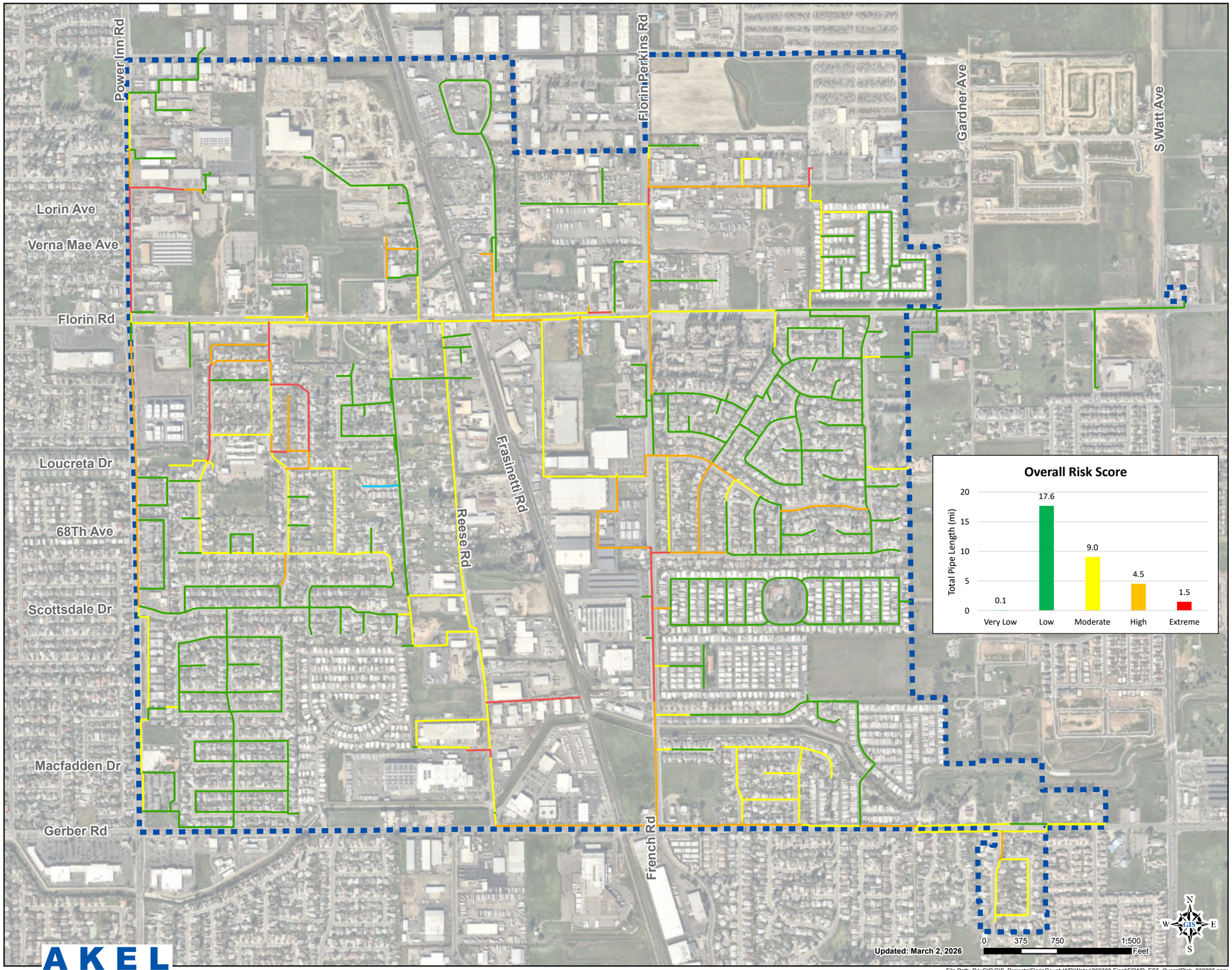
Figure ES.4

Risk Assessment Scoring and Action Plan

Water System Master Plan

Florin County Water District

AKEL ENGINEERING GROUP, INC.



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Overall Risk

- Very Low (0.1 Miles, 0.2%)
- Low (17.6 Miles, 53.9%)
- Moderate (9.0 Miles, 27.6%)
- High (4.5 Miles, 13.7%)
- Extreme (1.5 Miles, 4.6%)

Water Purveyors

- Florin County Water District

Figure ES. 5
Risk Analysis
Water System Master Plan
Florin County Water District

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ES.8 WATER QUALITY CONSIDERATIONS

Groundwater supplying the Diana Way, Fletcher Farms, Florin Road, French Road, Reese, Power Inn, McComber, and Kara wells is drawn from the South American Subbasin of the Central Valley, an alluvial aquifer system influenced by decades of agricultural and urban land use. Basin-scale monitoring summarized in the Basin Annual Report for Water Year 2024–2025 shows areas of degraded groundwater quality, primarily related to elevated nitrate and increasing specific conductance (a proxy for salinity/TDS) in portions of the basin. Although most public-supply wells continue to meet primary drinking water standards, the regional data indicate that nitrate concentrations in some areas approach or exceed the 10 mg/L (as N) MCL, and that salinity is trending upward in corridors influenced by irrigated agriculture and return flows.

In addition to nitrate and salinity, the regional monitoring record documents localized exceedances of naturally occurring metals, including arsenic, iron, and manganese, in both shallow and intermediate-depth wells (NDGSA, 2024). Manganese is of particular interest because it is regulated in California by a 50 ug/L secondary MCL for aesthetic concerns (discoloration and staining), and the State Water Board has also established a 500 ug/L health-based notification level due to potential neurotoxic effects at high exposure levels (SWRCB, 2025).

In FCWD the production wells are located within an urbanized setting that overlies this broader groundwater regime. Potential contributors to nitrate and salinity include historic and ongoing irrigated agriculture, landscape irrigation return flows, and legacy septic systems in the surrounding area, while urban land uses introduce additional risks from sewer collection systems, stormwater infiltration, auto-related facilities, and small industrial or commercial operations. In response, the water system continues to monitor for nitrate, salinity, metals (including manganese), and volatile organic compounds and to create a plan for wellhead treatment where necessary to ensure that water entering the distribution system meets all applicable primary and secondary drinking water standards.

ES.9 ADVANCED METERING INFRASTRUCTURE

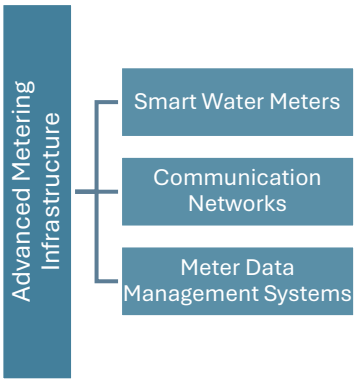
FCWD is planning on implementing a system-wide advanced metering infrastructure (AMI) technology. AMI technology allows water meters to be read remotely. With this capability of offering near real-time data, AMI enables customers and staff to view up-to-date water usage at any time during the billing cycle.

FCWD has approximately 2,405 metered and non-metered accounts. Approximately 300 non-residential accounts are metered, while the residential accounts do not currently have

a meter. The purpose of the Advanced Metering Project is to install meters for all residential accounts, as well as replace the existing non-residential meters.

What is AMI?

Advanced Metering Infrastructure is a system that consists of smart water meters, communication networks, and meter data management systems.



- The smart water meters collect consumption data from customers
- The communication networks provide two-way link between the smart meters and the utility
- The meter data management systems (MDMS) collect, store and process the data.

Readings are typically performed at 15-minute intervals, depending on the specific meter model and transmitted to the computer system one or more times per day. Once the data reaches the MDMS, data is stored and available to be extracted for further analysis or billings to clients.

ES.10 CAPITAL IMPROVEMENT PROGRAM

The Capital Improvement Program (CIP) listed on **Table ES.2** provides a summary of the recommended domestic water system improvements to mitigate existing capacity deficiencies and for accommodating anticipated future growth. The cost estimates presented in the CIP were prepared for general master planning purposes and, where relevant, for further project evaluation. Final costs of a project will depend on several factors including the final project scope, costs of labor and material, and market conditions during construction.

In the absence of bid tabulations, the estimated construction cost includes a **30 percent** contingency allowance to account for unforeseen events and unknown field conditions. In the absence of bid tabulations, the project related costs were estimated by applying an additional **30 percent** to the estimated construction costs.

The costs in this Water System Master Plan were calculated using a 20-FCWD national average ENR CCI of 13,928, reflecting a date of September of 2025. In total, the capacity improvements include approximately 5 miles of distribution system improvements for fire flows and 10 well treatment/enhancement projects with an approximate cost totaling over $30.9 million.

In addition, the Risk Assessment improvements include 15 additional improvement projects; approximately 2.4 miles of distribution main improvements and renewal actions with a cost totaling over $4.2 million as documented on **Table ES.2**.

In total, the CIP includes fire flow improvements, risk improvements, supply treatment/capacity improvements, AMI Implementation, and future planning reports, with a total cost of over $37.9 million.

Table ES.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Itemized Cost Estimate												Improvement Priority		CIP and R&R Improvement Overlap	% Benefit		Cost Sharing	
Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs						Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority		Existing Users	Future Users	Existing Users ($)	Future Users ($)
				Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)										
Existing Deficiencies / Fire Flow Improvements																			
1-1	Pipe	Power Inn Rd	From approx. 450 ft s/o 53rd Ave to Florin Rd	8/12	Replace	18	2,360	330	778,981	778,981	1,012,676	1,320,000	Fire Flow Deficiency	A - Moderate	Yes, RR-1.1	100%	0%	1,320,000	0
1-2	Pipe	Power Inn Rd / ROW	From approx. 380 ft s/o Junipero St to Junipero St	8	Replace	18	1,200	330	396,092	396,092	514,920	670,000	Fire Flow Deficiency	C - Very Low	Yes RR-1.2	100%	0%	670,000	0
1-3	Pipe	Alley b/w Junipero St and Florin Rd	From approx. 290 ft e/o Power Inn Rd to approx. 650 ft e/o Power Inn Rd	8	Replace	12	550	268	147,406	147,406	191,628	250,000	Fire Flow Deficiency	A - Moderate	-	100%	0%	250,000	0
1-4	Pipe	Public Parking Lot e/o Power Inn Rd	From Power Inn Rd to approx. 270 ft e/o Power Inn Rd	8	Replace	12	280	268	75,043	75,043	97,556	130,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	130,000	0
1-5	Pipe	Bacchini Ave	From Florin Rd to approx. 15 ft s/o Augusta Way	6	Replace	8	320	197	63,194	63,194	82,152	110,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	110,000	0
1-6	Pipe	Alley n/o Florin Rd	From Mc Curdy Ln to Tokay Ave	6	Replace	8	320	197	63,194	63,194	82,152	110,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	110,000	0
1-7	Pipe	Tokay Ave	From approx. 970 ft n/o Florin Rd to Florin Rd	8	Replace	12	970	268	259,971	259,971	337,962	440,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	440,000	0
1-8	Pipe	McComber St	From Florin Rd to approx. 1,915 ft n/o Florin Rd	8/10	Replace	18	1,980	330	653,552	653,552	849,618	1,100,000	Fire Flow Deficiency	B - Low	-	100%	0%	1,100,000	0
1-9	Pipe	French Rd	From approx. 180 ft s/o Elaine Dr to approx. 55 ft n/o Danridge Dr	-	New	12	790	268	211,729	211,729	275,247	360,000	Fire Flow Deficiency	A - Moderate	-	100%	0%	360,000	0
1-10	Pipe	McComber St Loop	Loop between Florin Rd and Rovana Circle	8	Replace	10	1,860	223	415,417	415,417	540,042	700,000	Fire Flow Deficiency	B - Low	-	100%	0%	700,000	0
1-11	Pipe	Alley b/w McComber St and Florin Perkins Rd	From approx. 420 ft s/o Specialty Circle to approx. 1,130 ft n/o Florin Rd	6	Replace	8	370	197	73,068	73,068	94,989	120,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	120,000	0
1-12	Pipe	Alley b/w Specialty Circle and Florin Rd	From approx. 320 ft w/o Florin Perkins Rd to Florin Perkins Rd	8	Replace	12	330	268	88,444	88,444	114,977	150,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	150,000	0
1-13	Pipe	Florin Perkins Rd	From Weyand Ave to Florin Rd	8	Replace	12	1,240	268	332,334	332,334	432,034	560,000	Fire Flow Deficiency	B - Low	Yes, RR-3.1	100%	0%	560,000	0
1-14	Pipe	Weyand Ave	From Florin Perkins Rd to approx. 1,350 ft e/o Florin Perkins Rd	8	Replace	12	1,350	268	361,815	361,815	470,360	610,000	Fire Flow Deficiency	B - Low	Yes, RR-3.2	100%	0%	610,000	0
1-15	Pipe	Alley b/w Gardner Ave and Florin Perkins Rd	From Weyand Ave to approx. 280 ft n/o Weyand Ave	8	Replace	12	280	268	75,043	75,043	97,556	130,000	Fire Flow Deficiency	C - Very Low	Yes, RR-3.3	100%	0%	130,000	0
1-16	Pipe	Reese Rd	From Florin Rd to Gerber Rd	6/8	Replace	12	5,230	268	1,401,698	1,401,698	1,822,208	2,370,000	Fire Flow Deficiency	A - Moderate	Yes, RR-4.3	100%	0%	2,370,000	0
1-17	Pipe	Gerber Rd	From Millbrook Cr to Lakewood Rd	8	Replace	12	570	268	152,766	152,766	198,596	260,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	260,000	0
1-18	Pipe	Gerber Rd	From Reese Rd to French Rd	8	Replace	12	1,650	268	442,218	442,218	574,884	750,000	Fire Flow Deficiency	B - Low	-	100%	0%	750,000	0
1-19	Pipe	Tommy Circle	Loop b/w Diana Way and Kara Drive	2	Replace	8	610	197	120,464	120,464	156,603	200,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	200,000	0
1-20	Pipe	Gerber Rd	From approx. 100 feet e/o Southbreeze Dr to approx. 500 ft w/o Tamarindo Bay Dr	2	Replace	8	370	197	73,068	73,068	94,989	120,000	Fire Flow Deficiency	B - Low	-	100%	0%	120,000	0
1-21	Pipe	French Rd	From approx. 55 ft n/o Danridge Dr to Gerber Rd	8	Replace	12	2,860	268	766,512	766,512	996,465	1,300,000	Fire Flow Deficiency	A - Moderate	Yes, RR-2.1	100%	0%	1,300,000	0
1-22	Pipe	Public Parking Lot e/o Power Inn Rd	From approx. 270 ft e/o Power Inn Rd to Power Inn Well	8	Replace	10	460	223	102,738	102,738	133,559	170,000	Fire Flow Deficiency	C - Very Low	Yes, RR-1.2	100%	0%	170,000	0
									Subtotal - Existing Deficiencies			**11,930,000**						**11,930,000**	**0**
Supply Wells																			
W-1	Treatment	Reese #1 Well	PFAs Treatment for the Reese #1 Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-2	Treatment	Reese #2 Well	PFAs Treatment for the Reese #2 Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-3	Treatment	Kara Well	PFAs Treatment for the Kara Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-4	Treatment + Capacity	Florin Well	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	PFOA MCL exceeded	Highest		100%	0%	2,200,000	0
W-5	Treatment + Capacity	Fletcher	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	Existing Capacity Deficiency	High		100%	0%	2,200,000	0
W-6	Treatment + Capacity	French	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	Existing Capacity Deficiency	High		100%	0%	2,200,000	0
W-7	Treatment	Mc Comber	PFAs Treatment for the Mc Comber Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0
W-8	Treatment	Weyand	PFAs Treatment for the Weyand Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0

Table ES.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Itemized Cost Estimate												Improvement Priority		CIP and R&R Improvement Overlap	% Benefit		Cost Sharing	
Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs						Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority		Existing Users	Future Users	Existing Users ($)	Future Users ($)
				Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)										
W-9	Treatment	Power Inn	PFAs Treatment for the Power Inn Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0
W-10	Well	USPS Well	Re-Drill the USPS Well and include PFAs Treatment							2,500,000	3,250,000	4,230,000	Future Supply Requirement	Future		0%	100%	0	4,230,000
											Subtotal - Wells	**18,930,000**					**14,700,000**	**4,230,000**
Renewal and Replacement Budgets (10-Year Horizon)																			
RR-1	**5-Year Pipeline Renewal and Replacement Program with an annual budget of $600,000 / year (2026-2030)**																		
1.1	Pipe	Power Inn Rd	From 100 ft s/o Cantina Ct to Florin Rd	8	Replace	18	1,280	330	422,498	422,498	549,248	710,000	Business Risk	Highest	Yes, FF 1-1	100%	0%	710,000	0
1.2	Pipe	Perpendicular to Power Inn Rd	From Power Inn Rd to Vend Mart (VOS)	8	Replace	12	560	268	150,086	150,086	195,112	250,000	Business Risk	Highest	Yes, FF 1-4 & 1-22	100%	0%	250,000	0
2.1	Pipe	French Rd	From 50 n/o Danridge Dr to 140 ft n/o German Dr	8	Replace	12	1,590	268	426,138	426,138	553,979	720,000	Business Risk	Highest	Yes, 1-21	100%	0%	720,000	0
3.1	Pipe	Florin Perkins Rd	From 250 ft n/o Weyand Ave to 200 ft s/o Weyand Ave	8	Replace	12	460	268	123,285	123,285	160,271	210,000	Business Risk	Highest	Yes, 1-13	100%	0%	210,000	0
3.2	Pipe	Weyand Ave	From Florin Perkins Rd to 1,640 ft e/o Florin Perkins Rd	8	Replace	12	1,650	268	442,218	442,218	574,884	750,000	Business Risk	High	Yes, 1-14	100%	0%	750,000	0
3.3	Pipe	Alley adjacent to Weyand Ave	950 ft from Florin Perkins Rd	8	Replace	12	470	268	125,965	125,965	163,755	210,000	Business Risk	Medium	Yes, 1-15	100%	0%	210,000	0
3.4	Pipe	Alley adjacent to Weyand Ave	1,180 ft from Florin Perkins Rd	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Business Risk	Medium	-	100%	0%	80,000	0
3.5	Pipe	Alley adjacent to Weyand Ave	1,640 ft from Florin Perkins Rd	8	Replace	8	220	197	43,446	43,446	56,480	70,000	Business Risk	Highest	-	100%	0%	70,000	0
4.1	Pipe	Alley adjacent to Reese Rd	From Reese Rd to railroad, 1,260 ft n/o Gerber Rd	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Business Risk	Highest	-	100%	0%	320,000	0
4.2	Pipe	Alley adjacent to Reese Rd	From Reese Rd to parking lot fence, 780 ft n/o Gerber Rd	8	Replace	8	240	197	47,396	47,396	61,614	80,000	Business Risk	Highest	-	100%	0%	80,000	0
4.3	Pipe	Reese Rd	Bounded by project 11.2 and 710 ft n/o Gerber Rd	8	Replace	12	70	268	18,761	18,761	24,389	30,000	Business Risk	Highest	Yes, 1-16	100%	0%	30,000	0
									Year 1-5 Subtotal:	2,032,822	2,642,669	3,430,000							
									Subtotal (w/o FF CIP Imps)	323,870	421,031	550,000							
RR-2	**5-Year Pipeline Renewal and Replacement Program with an annual budget of $600,000 / year (2031-2035)**																		
5.1	Pipe	Diana Way	From Kara Dr to 275 ft s/o Vivian Ct	6	Replace	8	1,600	197	315,971	315,971	410,762	530,000	Business Risk	Highest	-	100%	0%	530,000	0
5.2	Pipe	Kara Dr to Jerry Way	From Florin Road to Bruns Way	6, 8	Replace	8	1,830	197	361,392	361,392	469,809	610,000	Business Risk	Highest	-	100%	0%	610,000	0
5.3	Pipe	Outside Right of Way	Area bounded by Kara Dr, Jerry Way, and Bruns Way	4, 6, 8	Replace	8	960	197	189,583	189,583	246,457	320,000	Business Risk	Highest	-	100%	0%	320,000	0
5.4	Pipe	Outside Right of Way	Within the ditch bounded by Kara Dr and Diana Way	6	Replace	8	790	197	156,011	156,011	202,814	260,000	Business Risk	High	-	100%	0%	260,000	0
6.1	Pipe	Florin Rd	From Kingsley St to Precision Smog and Tune	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Business Risk	Highest	-	100%	0%	80,000	0
6.2	Pipe	Kinglsey St	From Florin Rd	4	Replace	8	70	197	13,824	13,824	17,971	20,000	Business Risk	High	-	100%	0%	20,000	0
6.3	Pipe	Simon St	From Florin Rd	2	Replace	8	380	197	75,043	75,043	97,556	130,000	Business Risk	High	-	100%	0%	130,000	0
7.1	Pipe	Elaine Dr	From French Rd to Fletcher Farms Dr	8	Replace	8	2,350	197	464,082	464,082	603,307	780,000	Business Risk	High	-	100%	0%	780,000	0
7.2	Pipe	Hayward Dr	From Elaine Dr to Danridge Dr	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Business Risk	High	-	100%	0%	320,000	0
7.3	Pipe	Danridge Dr	From French Rd to Alden Way	8	Replace	8	770	197	152,061	152,061	197,679	260,000	Business Risk	Highest	-	100%	0%	260,000	0
7.4	Pipe	Branbury Way	From Elaine Dr to Danridge Dr	8	Replace	8	1,000	197	197,482	197,482	256,726	330,000	Business Risk	Medium	-	100%	0%	330,000	0

Table ES.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs: Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)	Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority	CIP and R&R Improvement Overlap	% Benefit: Existing Users	% Benefit: Future Users	Cost Sharing: Existing Users ($)	Cost Sharing: Future Users ($)
								Year 5-10 Subtotal:		2,158,477	2,806,020	3,640,000							
											Subtotal - R&R	**4,190,000**						**4,190,000**	**0**
Advanced Metering Infrastructure																			
A-1	AMI Water Meter Implementation											2,100,000				100%	0%	2,100,000	0
A-2	Annual Maintenance Cost (10-yr Horizon, $35,000 per year)											350,000				100%	0%	350,000	0
											Subtotal - AMI	**2,450,000**						**2,450,000**	**0**
Miscellaneous (10-Year Horizon)																			
M-1	Water Master Plan Updates ($150,000 Every 5 years)											300,000				100%	0%	300,000	0
M-2	Water Rate Study Updates ($50,000 Every 5 years)											100,000				100%	0%	100,000	0
											Subtotal - Miscellaneous	**400,000**						**400,000**	**0**

Capital Improvement Program Summary				
Subtotal - Fire Flow Deficiencies		**11,930,000**	**11,930,000**	**0**
Fire Flow Priorities	Priority A	5,600,000	5,600,000	
	Priority B	3,840,000	3,840,000	
	Priority C	2,490,000	2,490,000	
Subtotal - Supply Wells		**18,930,000**	**14,700,000**	**4,230,000**
Supply Well Priorities	Highest	6,250,000	6,250,000	
	High	4,400,000	4,400,000	
	Long Term/ Future	8,280,000	4,050,000	4,230,000
Subtotal - 10Yr R&R Program		**4,190,000**	**4,190,000**	**0**
Subtotal - AMI		**2,450,000**	**2,450,000**	**0**
Subtotal - Miscellaneous		**400,000**	**400,000**	**0**
Total		**37,900,000**	**33,670,000**	**4,230,000**

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12/16/2025

Notes:

1. Baseline construction costs plus 30% to account for unforeseen events and unknown conditions.
2. Estimated construction cost plus 30% to cover other costs including: engineering design, project administration (developer and City staff), construction management and inspection, and legal costs.
3. Construction costs estimated using September 2025 ENR CCI of 13928

CHAPTER 1 - INTRODUCTION

This chapter provides a brief background of Florin County Water District's domestic water system, the need for this master plan, and the objectives of this study.

1.1 BACKGROUND

Florin County Water District (FCWD) provides potable water service to approximately 2,400 residential, commercial, industrial, and institutional accounts. FCWD operates a domestic water distribution system that consists of ten groundwater wells and over 32 miles of distribution pipelines.

Recognizing the importance of planning, developing, and financing water system facilities to provide enhanced service and reliability for existing customers, FCWD initiated the Water System Master Plan (WSMP). On December 9th, 2024, FCWD authorized Akel Engineering Group Inc. to prepare this Water System Master Plan.

1.2 OBJECTIVE

This master plan provides FCWD with a tool for planning the domestic water infrastructure facilities. The objective of this master plan is to evaluate FCWD's domestic water distribution system and recommend capacity improvements necessary to service the needs of existing users and future developments. Should planning conditions change, and depending on their magnitude, adjustments to the master plan recommendations might be necessary.

This master plan includes the following elements:

- Summarize FCWD's existing domestic water system facilities.
- Document growth planning assumptions
- Establish the domestic water system performance criteria.
- Project future domestic water demands.
- Develop and calibrate the hydraulic water model.
- Evaluate the capacity adequacy of the distribution mains and supply wells to meet existing and projected demand requirements and fire flows.
- Complete a system-wide fire flow analysis.
- Perform a risk analysis

- Recommend a capital improvement program (CIP) with an opinion of probable costs
- Perform a capacity allocation between existing and future developments. Capacity allocation was identified for each known development and may be used for cost sharing.
- Evaluate the well water quality used to supply the water distribution system
- Develop a system wide preliminary advanced metering infrastructure technology.
- Prepare a Water System Master Plan.

1.3 STUDY AREA DESCRIPTION

FCWD is located in Sacramento County south of the City of Sacramento and north of Elk Grove, as shown in **Figure 1.1**. FCWD's service area is about 2.5 square miles and services approximately 7,600 people. It is bound by the City of Sacramento Water to the north, by the Sacramento County Water District to the east, by Cal American Water Company to the south and both Cal American Water Company and Tokay Park Water Company to the west as shown on **Figure 1.2**.

1.4 RELEVANT REPORTS

The following lists relevant reports that were used in completion of this master plan, as well as a brief description of each document:

- **Sacramento County General Plan of 2005-2030 (November 9, 2011)**: The Sacramento County 2005-2030 General Plan provides the future land use assumptions for the planning areas.

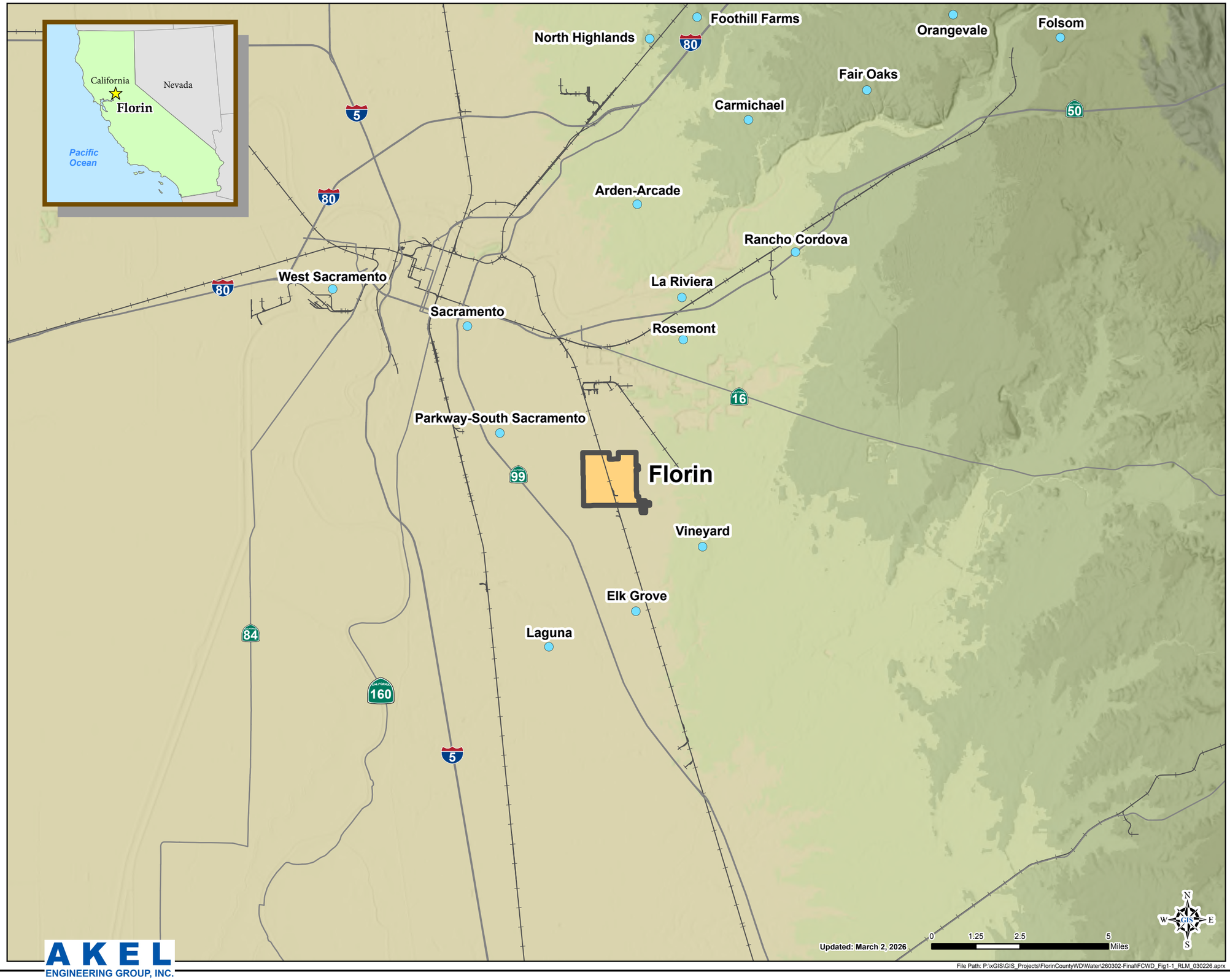
1.5 REPORT ORGANIZATION

The water system master plan report contains the following chapters:

Chapter 1 - Introduction. This chapter provides a brief background of FCWD's domestic water system, the need for this master plan, and the objectives of the study.

Chapter 2 - Existing Domestic Water Facilities. This chapter provides a description of FCWD's existing domestic water system facilities including the distribution mains and supply wells.

Chapter 3 - Planning Areas Characteristics. This chapter presents a discussion of the planning area characteristics for this master plan and defines the land use classifications.



Legend

Locations

- Cities
- Major Highways
- Railroad

Water Purveyors

- Florin County Water District

Elevation (ft)

- < 50
- 50 - 100
- 100 - 150
- 150 - 250
- 250 - 500
- > 500

Figure 1.1
Regional Location Map
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT
INCORPORATED
OCT. 19, 1959
CALIFORNIA

AKEL
ENGINEERING GROUP, INC.

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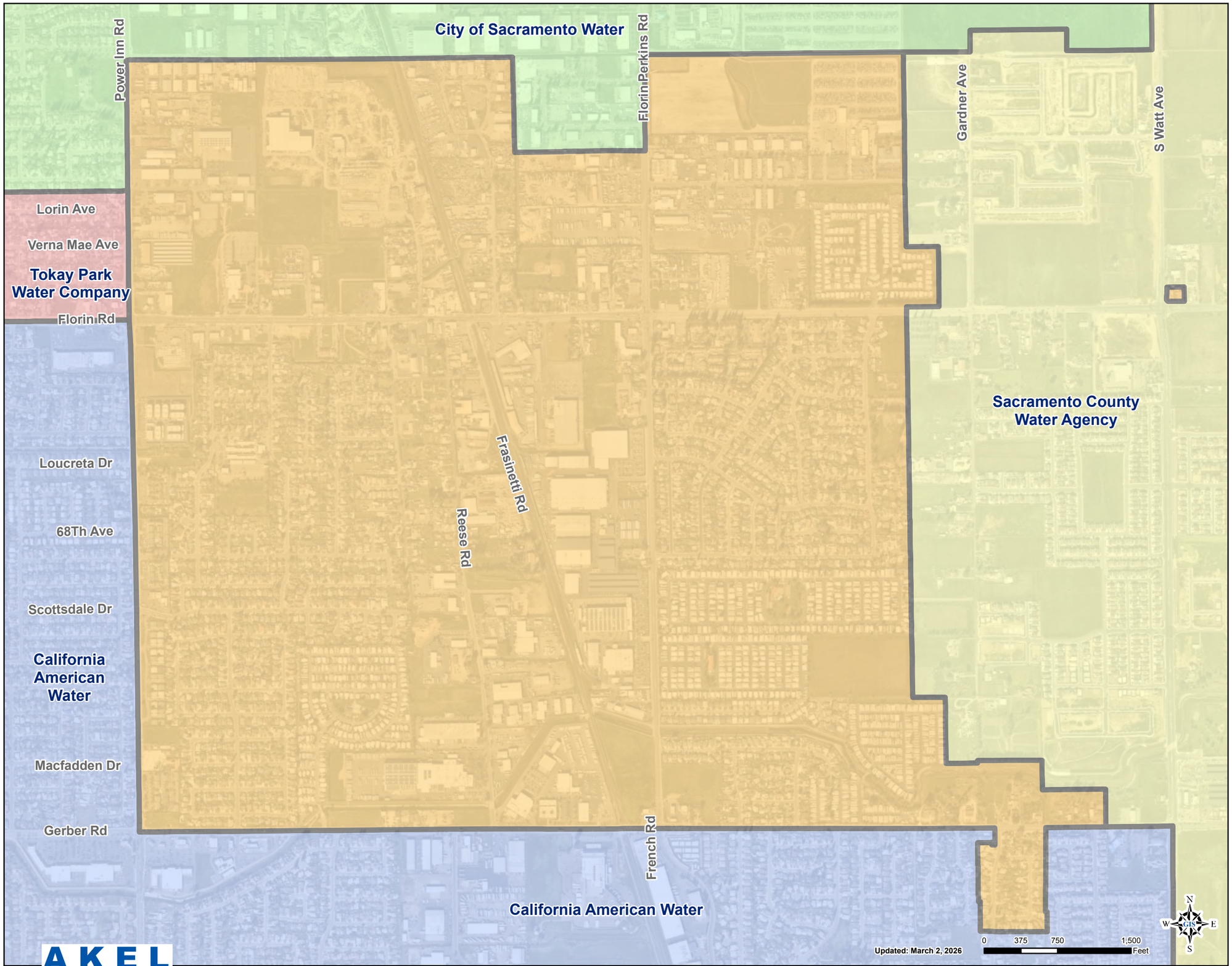

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Water Purveyors

- Florin County Water District
- California American Water
- City of Sacramento Water
- Sacramento County Water Agency
- Tokay Park Water Company

Figure 1.2
Service Area
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

Chapter 4 - System Performance and Design Criteria. This chapter presents FCWD's performance and design criteria, which were used in this analysis for identifying current system capacity deficiencies and for sizing proposed transmission mains.

Chapter 5 - Domestic Water Demands. This chapter summarizes existing domestic water demands and projects the future domestic water demands.

Chapter 6 - Hydraulic Model Development. This chapter describes the development and calibration of FCWD's domestic water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the existing system and to service future growth.

Chapter 7 - Evaluation and Proposed Improvements. This chapter presents a summary of the domestic water system evaluation and identifies improvements needed to mitigate existing deficiencies as well as improvements needed to service future growth.

Chapter 8 - Risk Analysis This chapter documents the risk analysis of the existing domestic water pipelines within FCWD's service area. This risk analysis included the following elements:

- Define risk criteria
- Perform a risk and criticality analysis for existing pipelines
- Prioritization of renewal and replacement improvements

Chapter 9 – Water Quality Considerations This chapter documents the evaluation of the well water supply sources used to supply the water distribution system and meet customers demands. In this section the water quality monitoring regulations, special monitoring requirements and current well monitoring and frequency will be documented.

Chapter 10 – Advanced Metering Infrastructure Project This chapter documents the preliminary study for implementing system-wide advanced metering infrastructure (AMI) technology.

Chapter 11 - Capital Improvement Program. This chapter provides a summary of the recommended domestic water system improvements to mitigate existing capacity deficiencies and for accommodating anticipated future growth. The chapter also presents the cost criteria and methodologies for developing the capital improvement program. Finally, a capacity allocation analysis, usually used for cost-sharing purposes, is also included.

1.6 ACKNOWLEDGEMENTS

Obtaining the necessary information to complete the analysis presented in this report and developing the long-term strategy for mitigating the existing system deficiencies and for accommodating future growth was accomplished with the strong commitment and very active input from dedicated team members, including:

- Edmond Leggette, General Manager
- Beau Kirby, Operations Manager
- Dawn Leggette, Office Manager
- Mia Lampkin, Office Supervisor

1.7 GEOGRAPHIC INFORMATION SYSTEMS

This master planning effort made extensive use of Geographic Information Systems (GIS) technology for completing the following tasks:

- Developing the physical characteristics of the hydraulic model (pipes, junctions, wells, hydrants)
- Allocating existing water demands, as extracted from the water billing records, and based on each user's physical address
- Calculating and allocating future water demands based on projected future development water use
- Extracting ground elevations along the distribution mains from available contour maps
- Generating maps and exhibits used in this master plan

CHAPTER 2 - PLANNING AREA CHARACTERISTICS

This chapter discusses the planning area characteristics for this master plan and defines the land use classifications.

2.1 EXISTING SERVICE AREA LAND USE

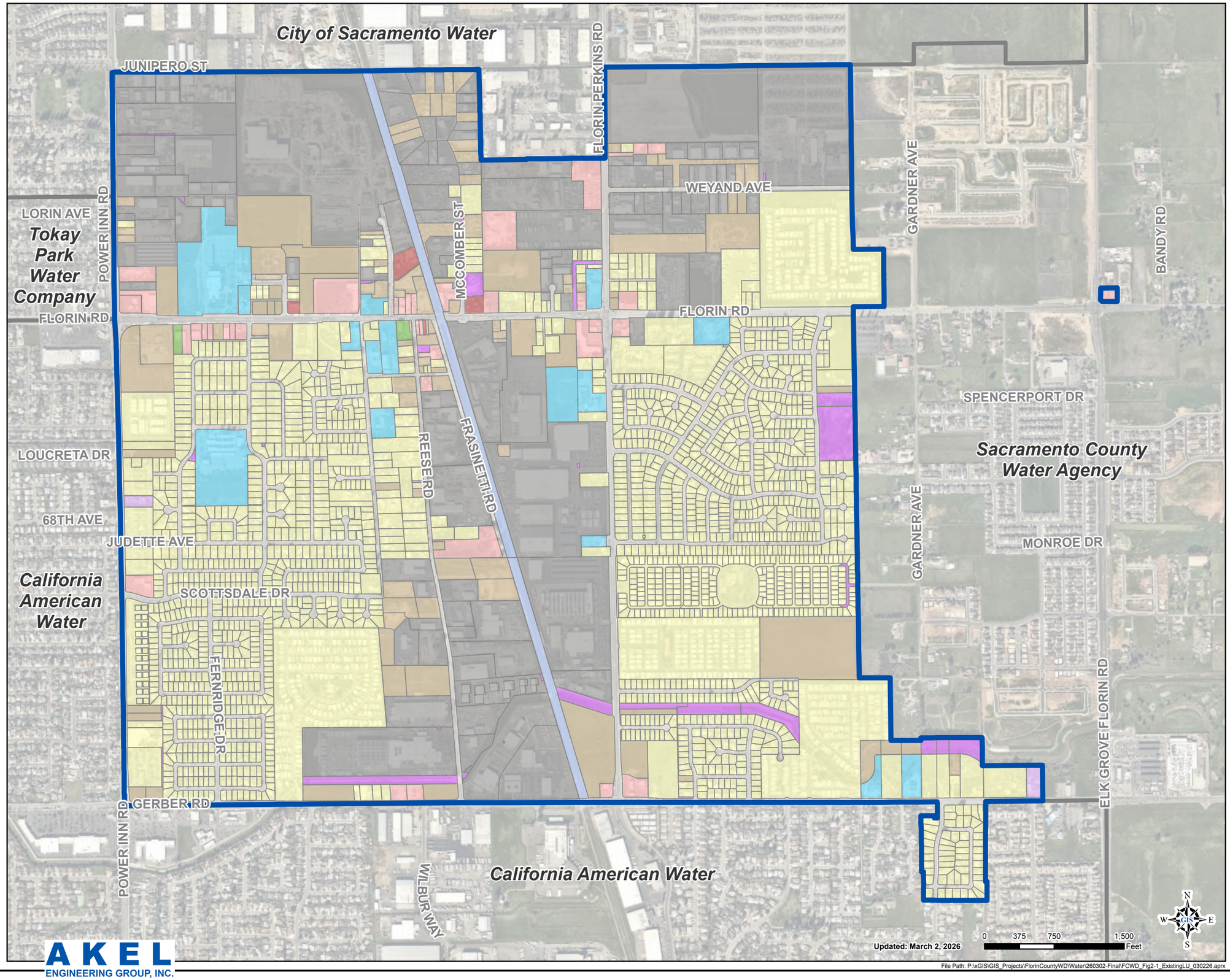
The FCWD's existing land use is depicted on **Figure 2.1**. The existing land use is comprised of 40% residential use, 40% non-residential use (e.g. commercial, industrial), and 20% vacant parcels or right of ways. The land use summary is documented on **Table 2.1** and summarized as follows:

- Residential: 590 acres
- Non-Residential: 586 acres (primarily consists of Industrial land use: 449 acres)
- Other: 148 acres of vacant land and 136 acres of right of way

2.2 GENERAL PLAN LAND USE

The Sacramento County General Plan of 2005-2030 (2030 GP) was initially adopted in 2011 and identified the planned future land use within for Sacramento County which includes the FCWD's service area. The general plan land use map was amended in 2017 and is documented on **Figure 2.2** for the FCWD service area. The general plan land use summary is documented on **Table 2.1**. The parcels that will change land use type or are currently vacant are identified on **Figure 2.3** and the totals summarized as follows:

- Residential land use will increase by approximately 52 acres
- Non-Residential land use will increase by approximately 96 acres



Legend

Existing Land Use

- Residential
- Retail / Commercial
- Office
- Industrial
- Care / Health
- Miscellaneous
- Public / Utilities
- Church / Welfare
- Recreational
- Vacant

Water Purveyors

- Florin County Water District
- Surrounding Water Districts

Figure 2.1
Existing Land Use
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT * INCORPORATED * OCT. 19, 1959 * CALIFORNIA

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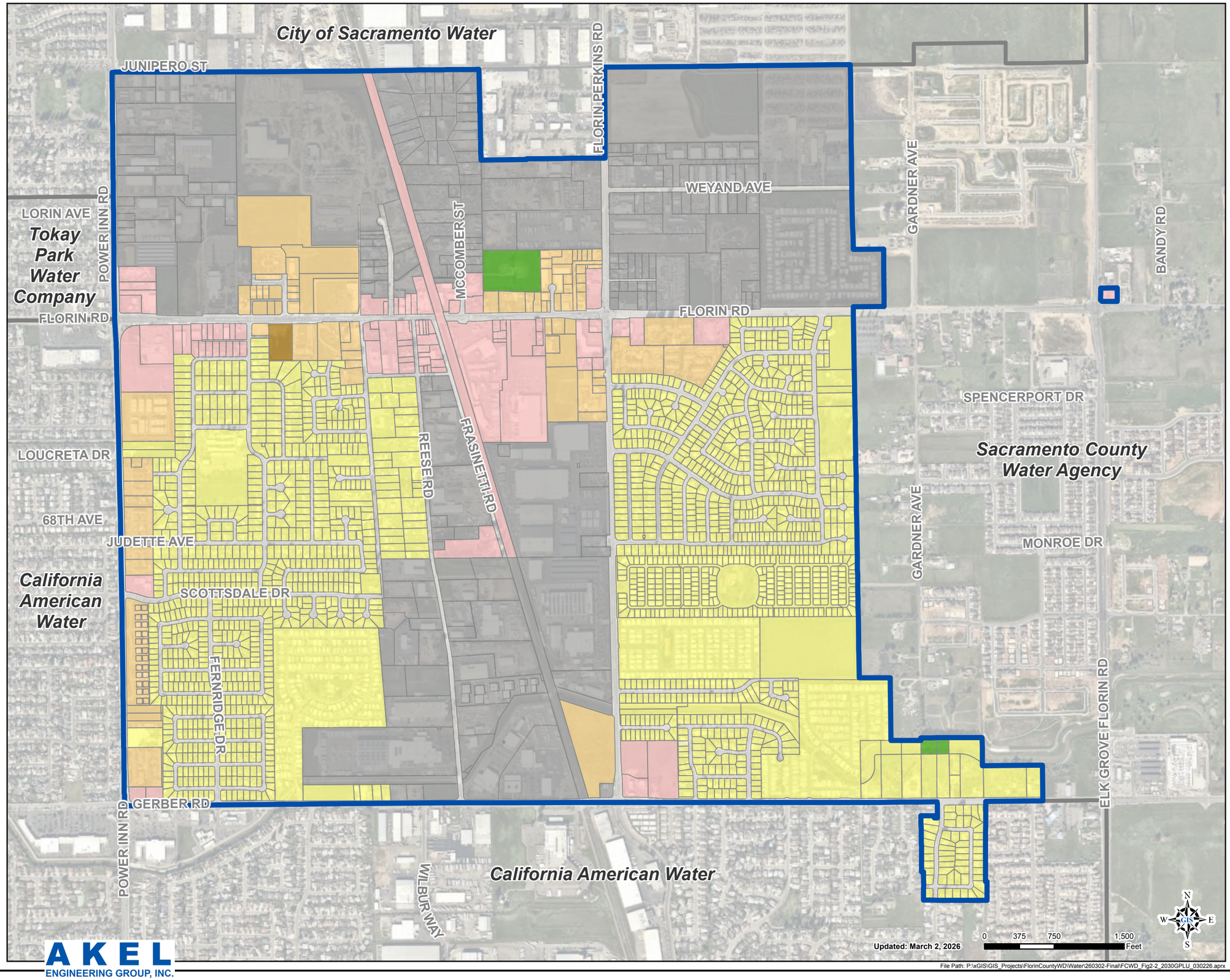


Legend

2030 Sacramento County General Plan

- Agricultural Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial And Office
- Intensive Industrial
- Recreation

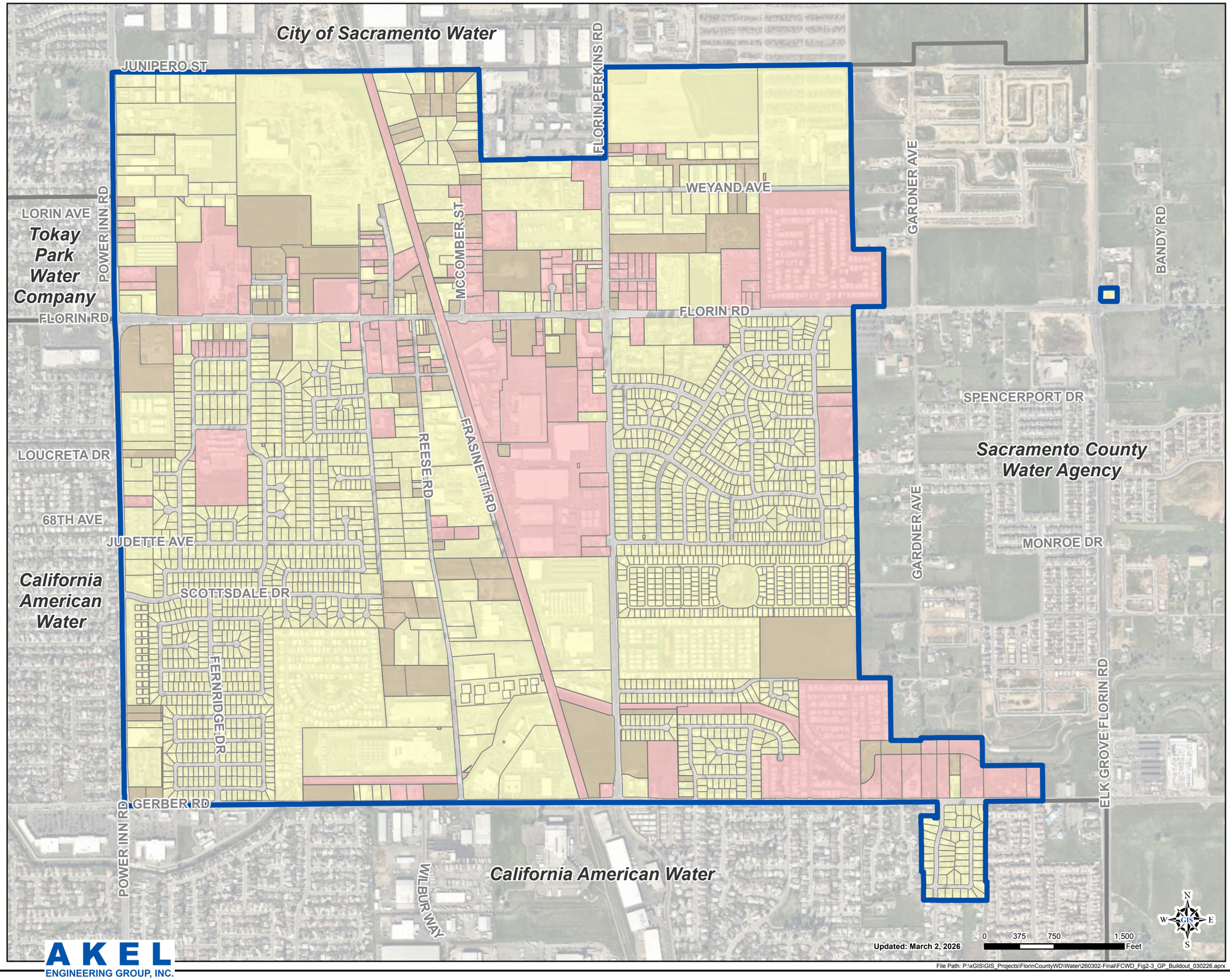
Water Purveyors

- Florin County Water District
- Surrounding Water Districts

Figure 2.2
2030 General Plan
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT
INCORPORATED
OCT. 19, 1959
CALIFORNIA

AKEL ENGINEERING GROUP, INC.



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Existing Land Use

- Vacant Land Use Changes
- Land Uses Changing
- Land Uses Staying the Same

Water Purveyors

- Florin County Water District
- Surrounding Water Districts

Figure 2.3
General Plan Buildout and Vacancies
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

Table 2.1 Land Use Inventory

Water System Master Plan

Florin County Water District

Existing Land Use	(acres)	General Plan Land Use	(acres)
Residential			
Residential	589.7	Low Density Residential	528.0
		Medium Density Residential	110.9
		High Density Residential	2.3
		Agriculture-Residential	0.2
Sub-Total	589.7		641.4
Non-Residential			
Industrial	449.1	Intensive Industrial	572.8
Retail / Commercial	37.3	Commercial and Office	101.7
Public / Utilities	18.7	Recreation	7.5
Church / Welfare	50.9		
Office	2.8		
Recreational	1.5		
Care / Health	2.2		
Miscellaneous	23.5		
Sub-Total	585.9		682.0
Other			
Vacant	147.7	Right of Way	136.0
Right of Way	136.0		
Total	**1459.4**		**1459.4**

1/5/2026

CHAPTER 3 - SYSTEM PERFORMANCE AND DESIGN CRITERIA

This chapter presents FCWD's performance and design criteria, which were used in this analysis, for identifying current system capacity deficiencies and for sizing proposed transmission mains, storage reservoirs, and supplies. The water supply criteria discussed in this chapter are summarized on Table 3.1 and based on Title 22, Division 4, Chapter 16, Article 2, Section §64554 of the California Code of Regulations.

3.1 HISTORICAL WATER USE TRENDS

The historical domestic water production records are documented on Table 3.2. In 2016 FCWD had a peak annual usage of 28.6 acre-feet per year (afy) and has decrease by 14% to 24.5 afy in 2022. From 2018-2022 the annual production has remained relatively steady.

Please note that between December 2022 and October 2024 an intertie was open and flowing to Sacramento County resulting with a large water production increase, not related to FCWD actual water use. Therefore, water production from these years will be omitted for the water use trends and the subsequent peaking factor analysis.

3.2 SYSTEM PERFORMANCE AND DESIGN CRITERIA SURVEY

The system performance and design criteria recommended in this Master Plan is based first on Title 22, Division 4, Chapter 16, Article 2, Section §64554 of the California Code of Regulations and secondly on a criteria survey of nearby water agencies. The minimum supply and storage requirements are documented in Title 22 and a criteria survey of nearby water agencies was performed to determine if additional requirements should be recommended. The recommended system performance and design criteria is documented on Table 3.1. The criteria survey is included in Appendix A and includes the Title 22 requirements and the recommendations for this Master Plan.

3.3 SUPPLY CRITERIA

In determining the adequacy of the domestic water supply facilities, the source must be large enough to meet the varying water demand conditions, as well as provide sufficient water during potential emergencies such as power outages and natural or created disasters.

Table 3.1 Planning and Design Criteria Summary

Water System Master Plan

Florin County Water District

Design Parameter	Criteria		
Supply	Well Firm Capacity = Larger of 1) Peak Hour Demands or 2) Maximum Day Demand + Fire Flow		
Storage	Total Required Storage = Operational + Fire + Emergency		
	Operational Storage	25% of Maximum Day Demand	
	Emergency Storage	25% of Maximum Day Demand	
	Fire Storage (Largest requirement)	3,000 gpm for 3 hours (0.54 MG)	
Pump Station	Pump Station capacity should meet the following:		
	Largest of Fire Flow or PHD - MDD		
Distribution Mains	Criteria for existing and future pipelines include :		
	Maximum Pipeline Velocity (during PHD): 5 ft/s (excluding fire flows)		
Service Pressures	Maximum Pressure	80 psi	
	Minimum Pressure (during Maximum Day)	40 psi	
	Minimum Pressure (during Peak Hour)	35 psi	
	Minimum Residual Pressure (during Fires)	20 psi	
Demand Peaking Factors	Maximum Month Demand	1.4 x Average Day Demand	
	Maximum Day Demand	1.6 x Average Day Demand	
	Peak Hour Demand	2.4 x Average Day Demand	
Fire Flows		(gpm)	(hours)
	Single Family Residential	1,500	2
	Commercial	2,000	3
	Industrial	3,000	3

Table 3.2 Historical Water Production and Water Use Trends

Water System Master Plan

Florin County Water District

Year	Annual Production[1]			Minimum Month Production[1]				Maximum Month Production[1]				Maximum Day Production[1]		
	(afy)	(MGD)	(gpm)	Month	(gpm)	(MGD)	Min to Avg Ratio	Month	(gpm)	(MGD)	Max to Avg Ratio	Day	(MGD)	Max to Avg Ratio
Historical Production (2015-2024)														
2015	22.2	2.0	1,379	February	1,048	1.5	0.8	June	1,610	2.3	1.2	October 13	4.3	2.2
2016	28.6	2.6	1,771	January	1,282	1.8	0.7	August	2,425	3.5	1.4	September 16	3.9	1.5
2017	27.0	2.4	1,672	April	1,155	1.7	0.7	August	2,152	3.1	1.3	August 30	3.6	1.5
2018	23.8	2.1	1,476	December	983	1.4	0.7	July	2,049	3.0	1.4	June 22	3.3	1.6
2019	23.0	2.1	1,425	February	973	1.4	0.7	July	2,090	3.0	1.5	August 16	3.4	1.7
2020	23.3	2.1	1,442	February	1,090	1.6	0.8	July	2,010	2.9	1.4	August 14	3.4	1.6
2021	22.6	2.0	1,399	February	962	1.4	0.7	June	2,027	2.9	1.4	June 30	3.2	1.6
2022	24.5	2.2	1,518	January	1,027	1.5	0.7	August	2,003	2.9	1.3	July 01	3.3	1.5
2023	37.0	3.3	2,297	February	1,997	2.9	0.9	July	2,764	4.0	1.2	August 17	4.4	1.3
2024	34.9	3.1	2,165	November	1157	1.7	0.5	July	3275	4.7	1.5	July 25	5.2	1.7
Demand and Peaking Factor Trends														
8-Year Scope	28.6	2.6	1,771		962	1.4	0.7		2,425	3.5	1.5		4.3	2.2
5-Year Scope	24.5	2.2	1,518		962	1.4	0.7		2,090	3.0	1.5		3.4	1.7
3-Year Scope	24.5	2.2	1,518		962	1.4	0.7		2,027	2.9	1.4		3.4	1.6
Last Year	24.5	2.2	1,518		1,027	1.5	0.7		2,003	2.9	1.3		3.3	1.5

Water Master Plan Recommended Peaking Factors and Design Demands

Average Day Demand	**1.0 x Average Day Demand**	**2.1 mgd**
Minimum Month Demand	**0.7 x Average Day Demand**	**1.5 mgd**
Maximum Month Demand	**1.4 x Average Day Demand**	**2.9 mgd**
Maximum Day Demand	**1.6 x Average Day Demand**	**3.4 mgd**
Peak Hour Demand (1.5xMDD)	**2.4 x Average Day Demand**	**5.0 mgd**

Notes:

1. Between December 2022 and October 2024 a intertie was open and flowing to Sacramento County resulting with a large water production increase, not related to FCWD actual water use. Therefore water production from these years will be omitted for the peaking factor analysis.

Ideally, a water distribution system should be operated at a constant water supply rate with a consistent supply from the source with diurnal peaks or fire flows supplied from storage tanks. On the day of maximum demand, it is desirable to maintain a water supply rate equal to the maximum day demand rate. Water required for peak hour demands or for fire flows would come from storage.

Since FCWD does not maintain storage tanks the firm water supply from the groundwater wells is required to equal the larger of peak hour demands or maximum day demands plus fire flows.

3.4 STORAGE CRITERIA

Domestic water storage is intended to provide domestic water supply for operation equalization, fire protection, and other emergencies, such as power outages or supply outages. Operational or equalization storage provides the difference in quantity between the customer's peak hour demands and the system's available reliable supply. The planning and design criteria for storage tanks are summarized on **Table 3.1**.

Please note the FCWD currently does not maintain storage in the water system, resulting with additional requirements on the supply criteria. If adding storage to the FCWD water system is feasible option in the future, the following storage criteria is recommended.

3.4.1 Operational Storage

Operational or equalization storage capacity is necessary to reduce the variations imposed on the supply system by daily demand fluctuations. Peak hour demands may require up to 2 times the amount of maximum day supply capacity. With storage in place, this increase in peak water demand can be met by operational storage rather than by increasing production from supply sources.

Equalization storage also stabilizes system pressures for enhancing the service in the pressure zone. Equalization storage requirements typically range from 25 percent to 50 percent of maximum day demand. The recommended FCWD criterion requires that 25 percent of the maximum day demand be reserved for operational storage.

3.4.2 Fire Storage

Fire storage is also needed to maintain acceptable service pressures within the system, in the event of a fire flow which may occur during the maximum day demand. The recommended fire storage capacity is based on the largest fire flow requirement in the system. The FCWD largest fire flow requirement is an industrial fire flow of 3,000 gpm for 3 hours.

3.4.3 Emergency Storage

Emergency storage is the volume of water stored to meet demand during emergency situations such as transmission and distribution main failures, pump failures, power outages, natural disasters, or other cases in which the supply sources are not able to meet the demand condition.

The amount of water reserved for emergencies is determined by policies adopted by FCWD and based on an assessment of the costs and benefits, including the desired degree of system reliability, risk during an emergency situation, economic considerations, and water quality concerns.

In California, the amount of emergency storage reserves in municipal water systems is usually between 25 percent and 100 percent of the maximum day demand. FCWD criterion for emergency storage is 25 percent of the maximum day demand.

3.4.4 Total Storage

The total storage is the summation of operational (equalization), fire, and emergency storage requirements as follows:

Qs = 25% MDD (equalization) + fire flow (varies) + 25% MDD (emergency)

where:

Qs is the Total Required Storage, in gallons

MDD is the Maximum Day Demand, in gallons

This criterion is used for evaluating the capacity adequacy of the existing storage facilities in the system, and for recommending storage improvements for future growth.

3.5 SERVICE PRESSURE CRITERIA

Acceptable service pressures within distribution systems vary depending on criteria and system topography. It is essential that the water pressure in a consumer's residence or place of business be maintained within an acceptable range. Low pressures below 30 psi can cause undesirable flow reductions when multiple faucets or water-using appliances are used simultaneously.

Excessively high pressures can cause faucets to leak and valve seats to wear out prematurely. Additionally, high service pressures can cause unnecessarily high flow rates, which can result in wasted water and high utility bills. The criteria for pressures in the domestic water system include the following:

- Maximum pressure, usually experienced during low demands and winter months
- Minimum pressure, usually experienced during peak hour demands and summer months
- Minimum pressure during maximum day demand plus fire flows

The American Water Works Association Manual on Computer Modeling and Water Distribution System (AWWA M-32) indicates that maximum pressures in transmission and distribution pipes are usually in the range of 90-110 pounds per square inch (psi). It is also important to comply with plumbing codes which impose a maximum pressure of 80 psi to mitigate the impact on internal plumbing. FCWD's existing system was evaluated based on the maximum allowable pressure in the distribution system of 80 psi. Individual pressure-reducing valves are required on services where the 80 psi pressure is exceeded.

The minimum acceptable pressure is usually in the range of 40-50 psi, which generally provides sufficient pressure for second-story fixtures. When backflow preventers are required, they may reduce the pressure by approximately 12-15 psi. The required minimum pressure during fire flows is 20 psi, established by the National Fire Protection Association (NFPA), California Waterworks Standards, and California Fire Code.

The Division of Drinking Water (DDW) approved revised waterworks standards, which changed Title 22 of the California Code of Regulations. The revised standards require that new development must maintain the service pressures greater than or equal to 40 psi, excluding fire flows. Therefore, to meet the updated waterworks standards, the pressure criteria were updated accordingly.

The FCWD's existing pressure criteria are documented in **Table 3.1** and summarized as follows:

- Maximum pressure: 80 psi
- Minimum pressure: 40 psi during the maximum day and 35 psi during peak hour demands (existing system) and 40 psi during peak hour demand for new developments.
- Minimum pressure during fire flows: 20 psi

3.6 UNIT FACTOR ANALYSIS

Domestic water demand unit factors are coefficients commonly used in planning level analysis to estimate future average daily demands for areas with predetermined land

uses. The unit factors are multiplied by the number of dwelling units or gross acreages for residential categories, and by the gross acreages for non-residential categories, to yield the average daily demand projections.

This analysis relied on the FCWD's 2024 water billing records and 2024 production records. There are many flat rate customers in the FCWD water system, so their total actual water use is unknown. The analysis first focused on users with metered usage and calculated an unadjusted unit factor based on the information from the metered users. From this factor, water use for flat rate users could be estimated to develop the final recommended unit factor.

The customer accounts were grouped by land use including residential, retail/commercial, public/institutional, and industrial to determine the average amount of water use per land use type. The billed water demand was then adjusted to balance with 2024 production records, and to account for unaccounted for water that occurs in the system. The demand unit factor was then calculated using the total water production and total number of residential and non-residential land use acreages or units. The unit factor analysis is documented on **Table 3.3**.

3.7 SEASONAL DEMANDS AND PEAKING FACTORS

Domestic water demands within municipal water systems vary with the time of day and month of the year. It is necessary to quantify this variability in water demands so that the water distribution system can be evaluated and designed to provide reliable water service under varying conditions.

Water use conditions that are of particular importance to water distribution systems include:

- Average Day Demand (ADD) which represents the annual water demand.
- Maximum Month Demand (MMD) which is highest demand that occurs within a calendar month during a year
- Maximum Day Demand (MDD) which is the highest demand that occurs within a 24-hour day during a year,
- Peak Hour Demand (PHD) which is the highest demand that occurs within a one-hour period during a year,
- Minimum Month Demand (MinMD or winter demand) which represents the low month water demands and is used for simulating water quality analysis.

Table 3.3 Unit Factor Analysis

Water System Master Plan

Florin County Water District

Land Use Designation[1]	Metered Users[2]			Total Service Area[3]	Flat Rate Users[4]			Estimated Total Consumption[5]	Adjusted to Production		
	Service Area	Consumption per Billing Records	Unadjusted Water Unit Factors		Service Area	Estimated Water Unit Factors	Estimated Consumption		Demand Based on Production[6]	Adjusted Factors	Recommended Unit Factor
	(acres)	(gpd)	(gpd/acres)	(acres)	(acres)	(gpd/acre)	(gpd)	(gpd)	(gpd)	(gpd/acre)	(gpd/acre)
Residential	157.7	233,944	1,484	589.7	432.0	1,750	756,031	989,976	1,097,567	1,940	**1,950**
Retail / Commercial	21.6	14,166	657	63.6	42.0	950	39,898	54,064	59,939	1,053	**1,075**
Public / Institutional	50.0	37,331	746	73.3	23.2	1,050	24,408	61,739	68,449	1,164	**1,175**
Industrial	257.0	403,926	1,572	449.1	192.1	1,600	307,375	711,301	788,605	1,774	**1,775**
Totals											
	486	**689,367**		**1,176**	**689**		**1,127,712**	**1,817,079**	**2,014,560**		

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Notes:

1. Due to the limited numbers of water users are metered, the following land use categories are used in the water demand factor analysis:
   a. Retail / Commercial includes the original Retail / Commercial and Office categories.
   b. Public / Institutional includes Care / Health, Church / Welfare, Public / Utilities, Recreational, and Miscellaneous – Park / Greenbelt.
2. The metered consumptions are extracted from the 2024 water billing records.
3. The water service areas are extracted from parcel shapefiles and categorized based on land use types.
4. Flat rate users are defined as water customers who were charged the minimum meter rate based on meter size.
5. The estimated total consumption is the sum of the metered consumption and the estimated consumption from flat rate users.
6. Between December 2022 and October 2024, an intertie was open and delivering flow to Sacramento County, resulting in a significant increase in water production that does not reflect actual FCWD water use. Therefore, production data from 2021 is used in this water demand factor analysis.

The peaking factors are based on an analysis of the historical production records and are documented on Table 3.2.

3.7.1 Maximum Month Demand

The maximum month demand (MMD) is the highest demand that occurs within a calendar month during a year. FCWD's MMD usually occurs in the summer months in either July or August.

Historical monthly water production records, obtained between 2015 and 2022 (Table 3.2), indicate the maximum month to average month ratio ranging between 1.2 and 1.5. Over the reviewed period, this ratio showed a slightly decreasing trend. A MMD of 1.4 seems to represent the overall trends in FCWD. The following equation is recommended for estimating the maximum month demand, given the average day demand:

Maximum Month Demand = **1.4** x Average Day Demand

3.7.2 Maximum Day Demand

The MDD is the highest demand that occurs within a 24-hour day during a year. FCWD's MDD, which usually occurs during the summer months, is typically used for the evaluation and design of storage facilities, distribution mains, pump stations, and supply capability. The MDD, when combined with fire flows, is one of the highest demands that these facilities should be able to service while maintaining acceptable pressures within the system.

The maximum day demands were also obtained from FCWD's water production records. The maximum day to average day demand ratios for the period between 2015 and 2022 ranged from 1.5 to 2.2.

Through an analysis of these maximum day demands, it was determined that a ratio of 1.6 would be used in this master plan. The following equation is then used to estimate the MDD, given the ADD:

Maximum Day Demand = **1.6** x Average Day Demand

3.7.3 Peak Hour Demand

The PHD is another high-demand condition that is used in the evaluation and design of water distribution systems. The peak hour demand is the highest demand that occurs within a one-hour period during a year. The peak hour demand is considered to be the largest single measure of the maximum demand placed on the distribution system. The

PHD is often compared to the MDD plus fire flow to determine the largest demand imposed on the water system for the purpose of evaluating distribution mains.

Consistent with the maximum day peaking factor, the peak hour demand factor was reduced proportionately in conjunction with recent water use trends. The PHD can be calculated using the ADD and the following equation:

Peak Hour Demand = **2.4** x Average Day Demand

3.8 TRANSMISSION AND DISTRIBUTION MAIN CRITERIA

Transmission and distribution mains are usually designed to convey the maximum expected flow condition. In municipal water systems, this condition is usually the greater of either the PHD or the MDD plus fire flow. The hydrodynamics of pipe flow create two parameters that are taken into consideration when evaluating or sizing water mains: head loss and velocity.

Head loss is a loss of energy within pipes that is caused by the frictional effects of the inside surface of the pipe and friction within the moving fluid itself. Head loss creates a loss in pressure which is undesirable in water distribution systems. Head loss, by itself, is not an important factor as long as the pressure criteria are not violated. However, a high head loss may be an indicator that the pipe is nearing the limit of its carrying capacity and may not have sufficient capacity to perform under stringent conditions.

Since high flow velocities can cause damage to pipes and lead to high head loss, it is desirable to keep the velocity below a predetermined limit. The recommended FCWD criterion for maximum pipeline velocity is 5 feet per second (ft/s). This criterion also ensures that the head loss is kept below an acceptable limit, as the head loss in a pipe is a function of the flow velocity.

CHAPTER 4 - EXISTING DOMESTIC WATER FACILITIES

This chapter provides a description of FCWD's existing domestic water system facilities including the distribution mains and groundwater wells.

4.1 EXISTING WATER SYSTEM OVERVIEW

FCWD's water system consists of 10 groundwater wells and 32 miles of distribution mains which provide water to over 2,400 accounts. The existing domestic water distribution system is shown in **Figure 4.1**, and provides a general color coding for the distribution mains by pipe size and identifies the existing well locations. The system operates as a single pressure zone. Atlas maps are for the existing system are included In **Appendix B**.

4.2 SOURCE OF SUPPLY

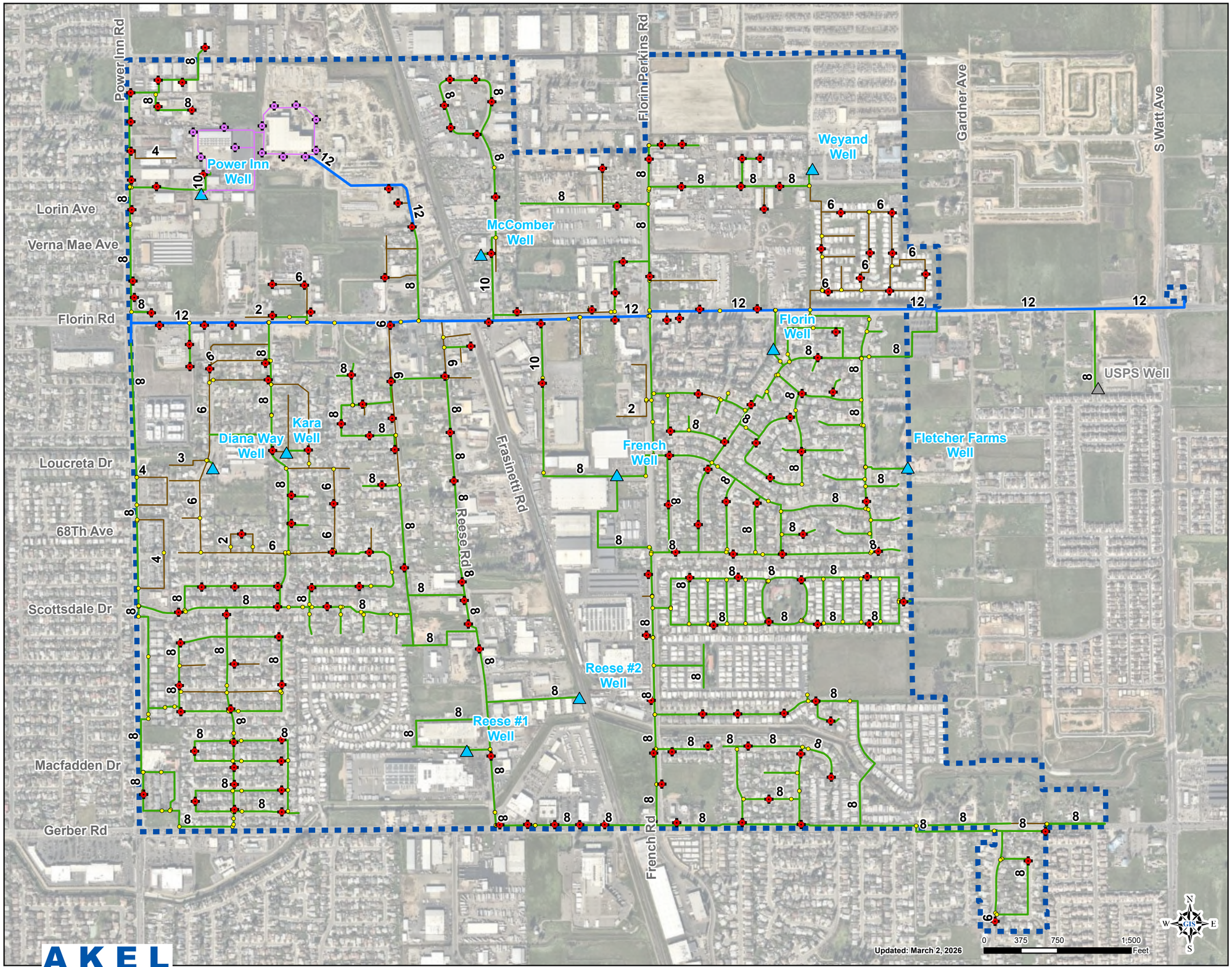
The FCWD supply comes from 10 groundwater wells with a total capacity of approximately 5,000 gpm as documented on **Table 4.1**. There are 5 wells impacted by exceeding the PFOA MCL.

PFOA Impacted Wells:

- Florin (ion exchange filtration in progress)
- Kara
- Reese #1
- Reese #2
- Diana (ion exchange filtration in progress)

4.3 DISTRIBUTION PIPELINES

Water is conveyed from the 10 groundwater wells via 32 miles of distribution pipelines. An inventory of existing pipes, extracted from the GIS-based hydraulic model and used in this analysis, is included in **Table 4.2**. For each pipe diameter, the inventory lists the length in feet for each pipe material, as well as the total length in units of feet and miles.



Legend

Existing System

- Wells
- Abandoned Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Private Systems

- Hydrant
- Pipes

Water Purveyors

- Florin County Water District

Figure 4.1
Existing Water Distribution System
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT
INCORPORATED OCT. 19, 1959
CALIFORNIA

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File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\FCWD_Fig4-1_ExistingSystem_030226.aprx

Table 4.1 Groundwater Well Inventory

Water System Master Plan

Florin County Water District

Facility ID	2025 Status	Pump Capacity (gpm)	Production Capacity (gpm)	Ground Elevation (ft)	Static Water Level (ft)	Pumping Water Level (ft)	Notes
Diana Way	Active	400	400	36	58		PFOA MCL exceeded (ion exchange filtration in progress)
Fletcher Farms	Active	650	650	45	68.5	113	-
Florin	Offline	400	400	43	70	78	PFOA MCL exceeded (ion exchange filtration in progress)
French	Active	650	650	43	64		-
Kara	Offline	400	400	37	56	62	PFOA MCL exceeded
McComber	Active	550	550	38	57	64.5	
Power Inn	Active	500	500	36	57.5	75	
Reese #1	Offline	500	500	36	56.5	150	PFOA MCL exceeded
Reese #2	Offline	400	400	39	62	114	PFOA MCL exceeded
Weyand	Active	550	550	44	66	210	
Post Office	Destroyed						

Table 4.2 Distribution System Pipeline Inventory

Water System Master Plan

Florin County Water District

Diameter (in)	Polyvinyl Chloride (PVC) (ft)	Asbestos Concrete (AC) (ft)	Steel (ft)	High-Density Polyethylene (HDPE) (ft)	Cast Iron Pipe (CIP) (ft)	Total Length (ft)	Total Length (miles)
2	2,326	807	513	0	0	3,646	0.7
3	510	0	866	0	0	1,377	0.3
4	3,131	2,126	348	0	0	5,605	1.1
6	774	13,239	7,372	0	0	21,385	4.1
8	14,227	110,572	103	0	73	124,974	23.7
10	313	2,877	0	0	0	3,189	0.6
12	1,562	0	0	10,898	306	12,766	2.4
Total	**22,842**	**129,621**	**9,202**	**10,898**	**379**	**172,942**	**32.8**

4.4 WATER SYSTEM INTERTIES

There are 3 existing system interties with other water agencies. The interties are documented on Table 4.3 and summarized as follows:

- Cal American Water Company at Gerber Ave and Tiogawoods Dr
- Cal American Water Company at Gerber Rd and Valley Wood Drive
- Sacramento County Water District (SCWD) at Gardner Ave and Florin Rd: Flow only to SCWD due to Hydraulic Grade Line (HGL) difference.

These interties are normally closed and typically only used as an emergency water connection.

4.5 BOOSTER PUMP STATIONS

Booster stations will boost water from one pressure zone to another or boost from ground level tanks into the distribution system. There are no existing booster stations in the FCWD water system.

4.6 STORAGE RESERVOIRS

Storage reservoirs are incorporated in the water system to provide water supply for operation during periods of high demand, for meeting fire flow requirements, and for other emergencies, as defined in the FCWD's planning criteria. There are no storage reservoirs in the FCWD water system as the existing system currently relies on the groundwater wells for meeting PHD and fire flows.

Table 4.3 Water System Intertie Inventory

Water System Master Plan

Florin County Water District

Water Agency	Status	Location	Notes
Cal American Water Company (CalAM Parkway)	Emergency	Gerber Rd and Tiogawoods Dr	
Cal American Water Company (CalAM Parkway #2)	Emergency	Gerber Rd and Valley Wood Dr	
Sacramento County Water District (Laguna/Vineyard)	Emergency	Gardner Ave and Florin Rd	Flows only to SCWD due to HGL difference

CHAPTER 5 – DOMESTIC WATER DEMANDS

This chapter summarizes the existing domestic water demands and documents the future domestic water demand projections.

5.1 EXISTING DOMESTIC WATER DEMANDS

The existing water demands used for this master plan were based on an analysis of the historical water production. Table 3.2 in the System Performance and Design Criteria chapter documents the annual water production from 2015 to 2024. In 2016 and 2017 water production peaked up to 2.6 mgd and since 2018, the annual water production has remained consistent, averaging 2.1 mgd.

The domestic water demands used in this WSMP are summarized in Table 5.1. The design average day demand for the hydraulic analysis is determined to be 2.1 million gallons per day (mgd). The maximum day and peak hour demands for the existing users were calculated using the average day demands and FCWD peaking factor criteria. The maximum day to average day ratio of 1.6, and peak hour to average day ratio of 2.4, were applied to the average day demands to obtain estimates of the higher demand conditions. The existing maximum day and peak hour demands are calculated at 3.4 mgd and 5.0 mgd, respectively.

5.2 FUTURE DOMESTIC WATER DEMANDS

The future water demands were projected based on the buildout of the vacant parcels and the planned land uses from the 2030 General Plan. Future demands were estimated using the unit factors for residential and non-residential land uses developed in the System Performance and Design Criteria chapter, Table 3.3. The projected demand for the vacant parcels is 178 gpm and the projected demand for the General Plan buildout is 337 gpm. There are some parcels that have an existing water use that changes land use type in the General Plan, resulting with a reduction of 170 gpm. The future net demand is 345 gpm as documented on Table 5.2.

The average day domestic water demands for the buildout are calculated at 2.6 MGD. The projected maximum day and peak hour demands are calculated at 4.2 mgd and 6.2 mgd, respectively. These demands were used in sizing the future infrastructure facilities The projected demand summary is documented on Table 5.1.

Table 5.1 Water Demand Summary

Water System Master Plan
Florin County Water District

	Demands		Peaking Factor
	(gpm)	(mgd)	
Design Demands			
Minimum Month Demand	1,021	1.5	0.7
Average Day Demand	1,458	2.1	-
Maximum Day Demand	2,333	**3.4**	1.6
Peak Hour Demand	3,500	**5.0**	2.4
Projected Demands [1]			
Minimum Month Demand	1,262	1.8	0.7
Average Day Demand	1,803	2.6	1.0
Maximum Day Demand	2,885	**4.2**	1.6
Peak Hour Demand	4,327	**6.2**	2.4

Notes:

1. Future demands based on the General Plan Land Use

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Table 5.2 General Plan Water Demand Projections

Water System Master Plan

Florin County Water District

Category	Average Day Demand (gpm)	Average Day Demand (mgd)	Max Day Demand (mgd)
Vacant Land	178	0.26	0.41
General Plan Land Use	337	0.48	0.78
Existing Demand Replaced with General Plan	170	0.24	0.39
Total Buildout Demands	**345**	**0.50**	**0.79**

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CHAPTER 6 - HYDRAULIC MODEL DEVELOPMENT

This chapter describes the development and calibration of FCWD's domestic water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the system for existing water users and for the General Plan buildout.

6.1 OVERVIEW

Hydraulic network analysis has become an effectively powerful tool in all aspects of water distribution planning, design, operation, management, emergency response planning, system reliability analysis, fire flow analysis, and water quality evaluations. FCWD's hydraulic model was used to evaluate the capacity adequacy of the existing system and to plan its expansion to service anticipated future growth.

6.2 MODEL SELECTION

FCWD's hydraulic model combines information on the physical characteristics of the water system (pipelines, wells) and operational characteristics (how they operate). The hydraulic model then performs calculations and solves a series of equations to simulate flows in pipes and calculate pressures at nodes or junctions.

There are several network analysis software products that are released by different manufacturers, which can equally perform the hydraulic analysis. The selection of a particular software depends on user preferences, the distribution system's unique requirements, and the costs of purchasing and maintaining the software.

FCWD's model was developed using Innovyze's InfoWater Pro (by Autodesk), which offers robust integration with ESRI's ArcGIS. The model has an intuitive graphical interface and is directly integrated with ESRI's ArcGIS Pro, providing a useful modeling tool linked to the newly developed FCWD GIS.

6.3 HYDRAULIC MODEL DEVELOPMENT

The hydraulic model development process includes developing an inventory of the water system facilities, developing water system GIS from operation staff maps, developing modeling databases, quality assurance and quality control (QA/QC) checks, and allocating water demands.

6.3.1 Water Facility Inventories

FCWD's water system infrastructure, which is typically included in the hydraulic model, consists of groundwater wells and distribution mains. The inventories of these FCWD water facilities were developed to consolidate the naming convention, operational status, physical aspects, and hydraulic information from different data sources. The discrepancies in data sources were submitted to FCWD staff for review and comments.

6.3.2 Modeling Databases

Computer modeling requires the compilation of large numerical databases that enable data input into the model. Detailed physical aspects, such as pipe size, pipe elevation, and pipe lengths, contribute to the accuracy of hydraulic modeling.

Pipes and nodes represent the physical aspect of the system within the model. A node is a computer representation of a place where demand may be allocated into the hydraulic system, while a pipe represents the distribution and transmission aspect of the water demand. In addition to the pipelines well capacity and pump head were also included in the hydraulic model.

6.3.3 Hydraulic Model Development

FCWD's existing domestic water distribution system was digitized in GIS shapefiles using several sources of data and various levels of quality control. The GIS files were developed from physical maps maintained by operations staff. Using the new GIS shapefiles of the system, the domestic water system hydraulic model was developed in InfoWater Pro by Autodesk. Additionally, atlas maps for the existing system were developed from the GIS and are included in **Appendix B**.

6.3.4 Quality Assurance and Quality Control

During the development of the hydraulic model, coordination was conducted between FCWD and Akel Engineering staff, to implement a thorough quality control program to resolve discrepancies. The hydraulic modeling software includes numerous network review tools which aid in identifying potential issues in the imported GIS network. These tools help identify potential pipe split locations, diameter discrepancies, unconnected pipes or junctions, and pipes or nodes in too close of proximity to one another.

Resolving discrepancies in data sources was accomplished by graphically identifying each disparity and submitting it to FCWD staff for review and comments. FCWD comments were incorporated into the verified model.

6.3.5 Demand Allocation

Demand allocation consists of assigning water demand values to the appropriate nodes in the model. The goal is to distribute the demands throughout the model to represent the actual system response.

Allocating demands to nodes within the hydraulic model required multiple steps, incorporating the efficiency and capabilities of GIS and hydraulic modeling software. The water billing records, which contain usage and location, were geocoded to reflect actual and current water demands locations.

Domestic water demands from each anticipated future development, presented in a previous chapter, were also allocated to the model for the purpose of sizing the required future facilities.

The demands extracted from the water billing records are lower than the total demands listed in the groundwater well production records due to system losses that occurred between the supply and customer service connections. The total domestic water demands were increased proportionally to reflect the total 2024 production and account for transmission main losses.

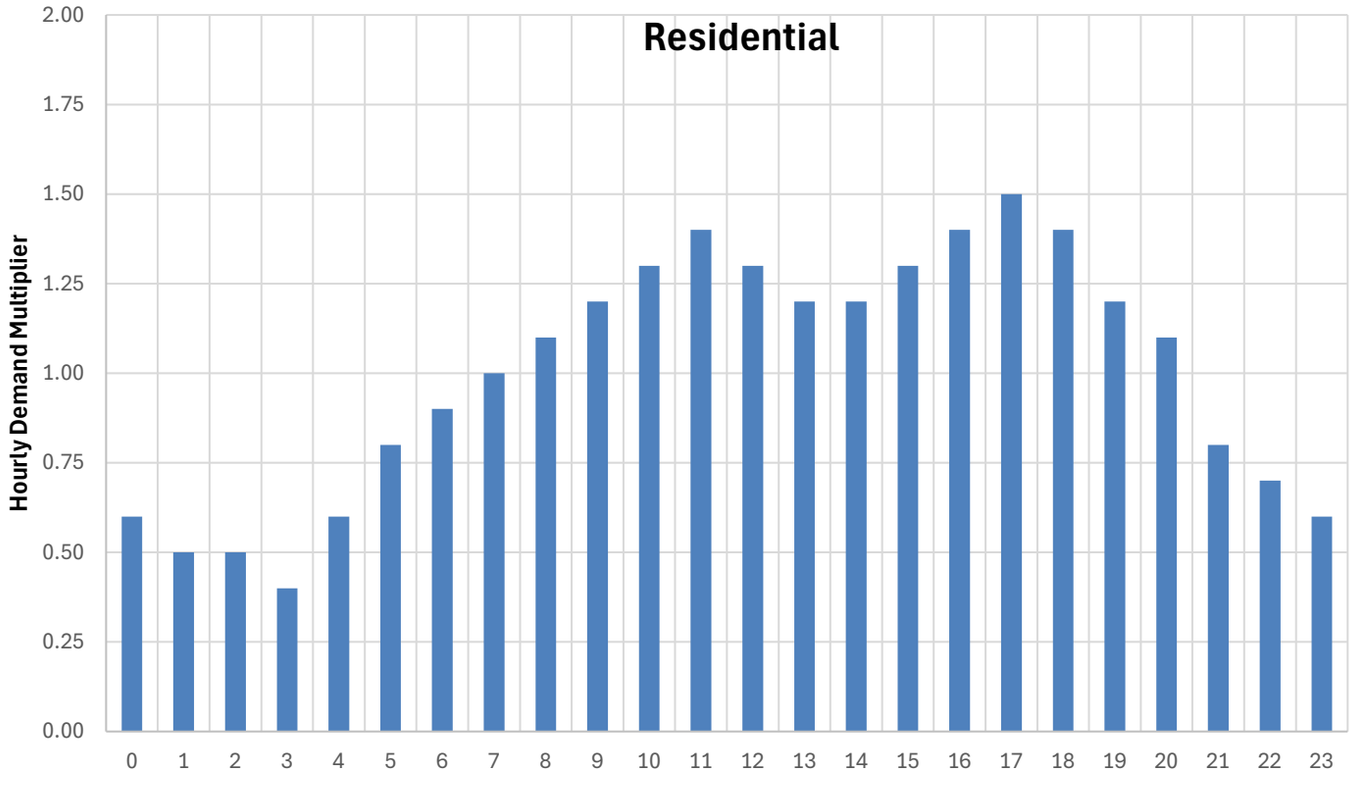
6.3.6 Diurnal Demand Patterns

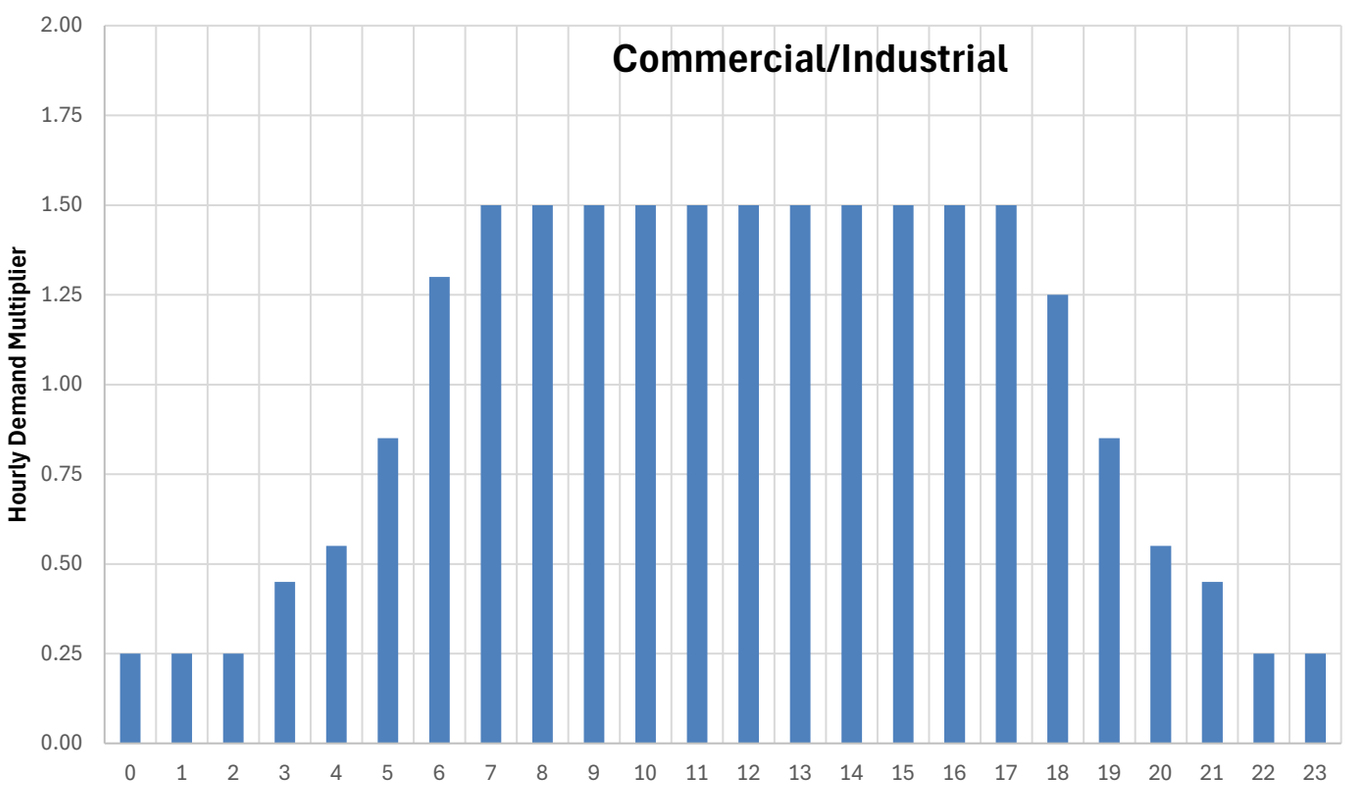
Water demands vary with the time of day and by account type according to the land use designation. These fluctuations were accounted for in the modeling effort and evaluation of the water distribution system by applying diurnal demand patterns.

Unique diurnal curves for the water system could not be developed due to lack of Supervisory Control and Data Acquisition (SCADA) from the wells or meter data. Therefore, standard American Water Works Association (AWWA) diurnal patterns for residential and commercial/industrial were utilized in the hydraulic model. **Figure 6.1** documents the hourly demand multipliers for the residential and commercial/industrial diurnal patterns.

6.4 MODEL CALIBRATION

Calibration is intended to instill a level of confidence in the simulated pressures and flows and generally consists of comparing model predictions to field-measured results and making necessary adjustments. The calibrated hydraulic model was updated with system operational controls at wells and verified using historical fire flow tests.





LEGEND

Peaking Factor

January 5, 2026

Figure 6.1
Water Demand Diurnal Patterns

Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

6.4.1 Calibration Methodology and Standards

The following sections describe the calibration methodology and standards that was used in the calibration of the hydraulic model. Calibration can be performed for steady-state conditions or extended-period simulations (EPS). In steady-state calibration, the model is compared to field monitoring results of a single value, such as a single hydrant test. EPS calibration consists of comparing model predictions to diurnal operational changes in the water system.

Calibration Standards and Guidelines

The hydraulic model calibration for FCWD water distribution system follows acceptable industry standards and guidelines, including those stipulated in the latest edition of the AWWA Manual for Computer Modeling of Water Distribution Systems (M32). These calibration guidelines as they pertain to system pressures, system flows, and tank levels, are documented as follows:

24-hour extended period simulations:

- System Pressures: 90% of the pressure calibration points should be within 5% of field measurements.
- System Flows: System flows should be within 10% to 20% of field measurements.
- Tank Levels: Tank fluctuations should be within 3 to 6 feet of field measurements

State-State simulations:

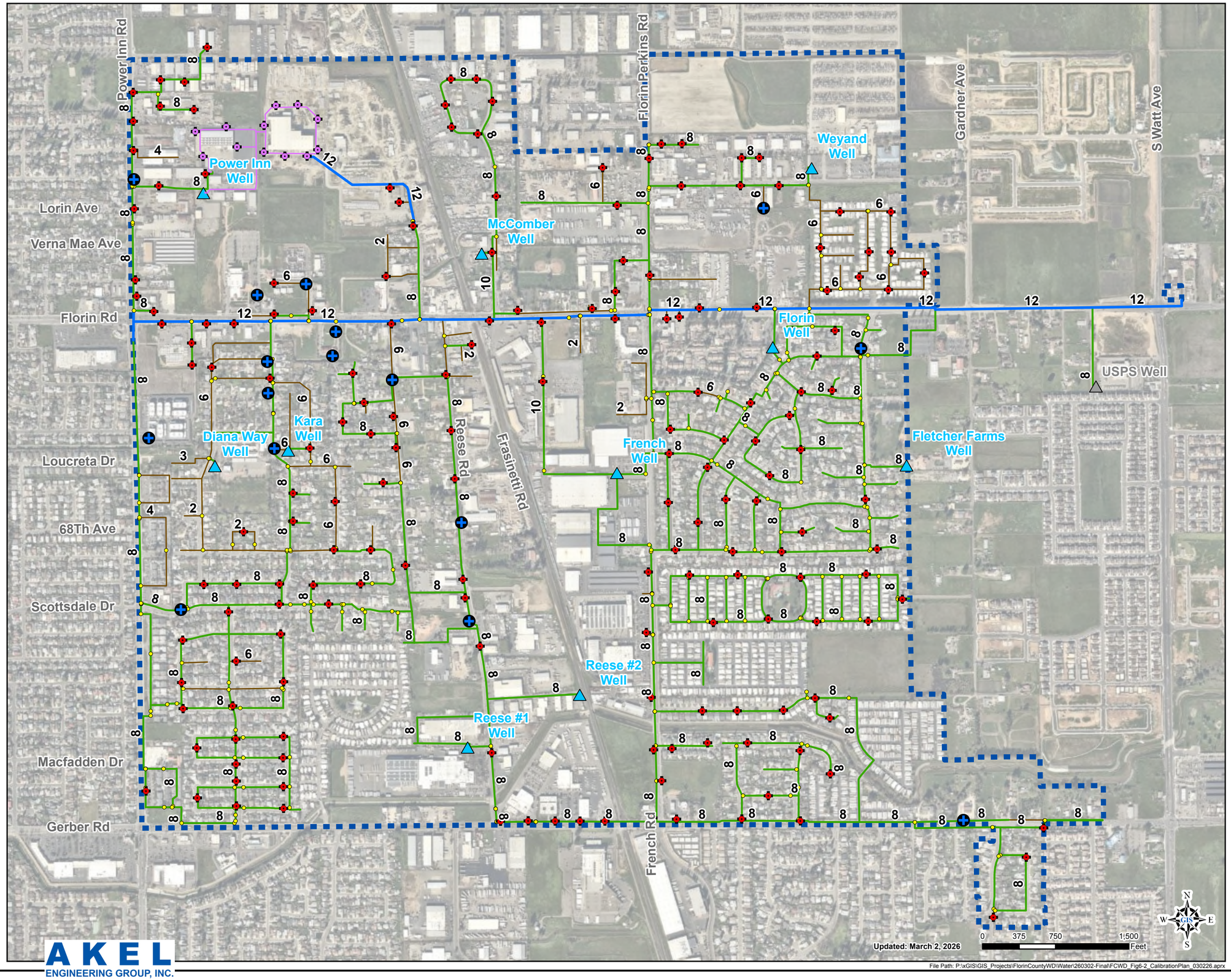
- System Pressures: 90% of verified HGL points within ± 10 feet (± 4.3 psi) of field values

Calibration Plan

FCWD does not have sufficient SCADA nor pressure loggers to record system pressures in order to perform an extended period simulation calibration. A steady state calibration using historical fire flow tests was performed to verify system operations. The historical fire flow test locations utilized for the calibration effort are documented on **Figure 6.2**.

Steady State Calibration Results

The calibration process was iterative and resulted in satisfactory comparisons between the field measurements and the hydraulic model predictions at the 17 hydrants. The calibration effort resulted with over 90% of the calibration points within the recommended



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Legend

Existing System

- Wells
- Abandoned Wells
- Calibration Site
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Private Systems

- Hydrants
- Pipes

Water Purveyors

- Florin County Water District

Figure 6.2
Hydraulic Model Calibration Plan
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT INCORPORATED OCT. 19, 1959 CALIFORNIA

AKEL ENGINEERING GROUP, INC.

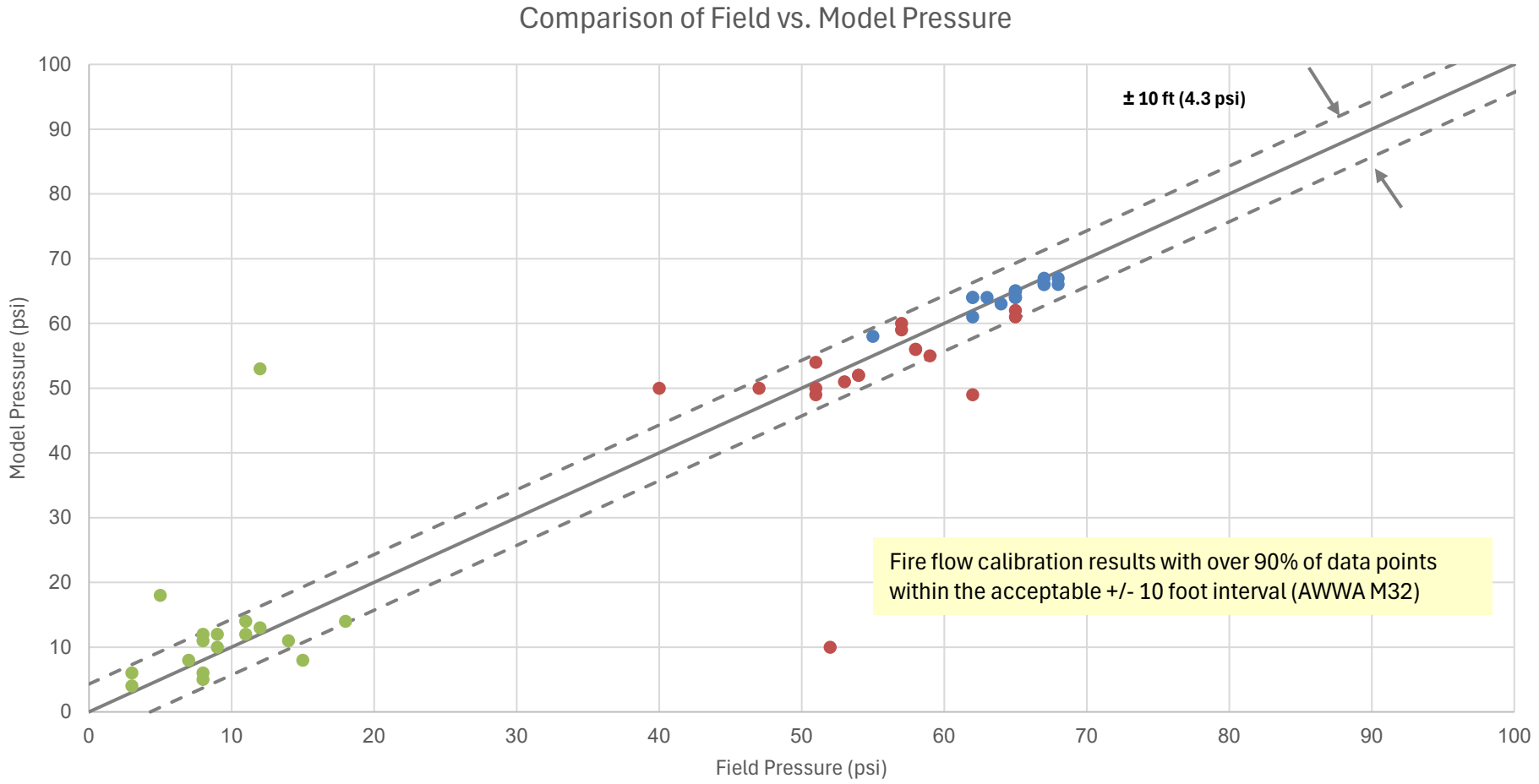
4.3 psi range. The fire flow calibration summary is documented on Table 6.1 and graphically on Figure 6.3.

6.4.2 Use of the Calibrated Model and Recommended Future Enhancements

The hydraulic model was used as an established benchmark in the capacity evaluation of the existing water distribution system. The model was also used to identify improvements necessary for mitigating existing system deficiencies and for accommodating future growth.

This valuable investment will continue to prove its value to FCWD as future planning issues or other operational conditions surface. It is recommended that the model be maintained and updated with recent construction to preserve its integrity.

Since the model was limited to a steady state calibration, it is recommended that when hourly SCADA from the wells (flows and pressures) becomes available and/or FCWD staff have pressure loggers they can install in the field to record pressures, an extended period simulation (EPS) calibration effort should be completed to enhance the accuracy of the model calculations.



LEGEND

- Static Pressures
- Residual Pressures
- Pressure Drop

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Last updated:7/23/2025

Figure 6.3

Fire Flow Calibration Results

Water System Master Plan

Florin County Water District

Table 6.1 Fire Flow Calibration Summary

Water System Master Plan

Florin County Water District

Test No.	Project	Date	Location	Field Tests			Hydraulic Model		Pressure Difference			Comments
				Flow (gpm)	Static Pressure (psi)	Residual Pressure (psi)	Static Pressure (psi)	Residual Pressure (psi)	Static Pressure (psi)	Residual Pressure (psi)	Pressure Drop (psi)	
1	8300 McNie Avenue	2024	Westside of Pritchard at McNie Avenue	1060	67	58	66	56	1	2	1	
2	6939 Power Inn Road	March 6, 2023	Hydrant in Planter in front of 6943 Power Inn Road	1060	55	40	58	50	3	10	7	Pressure can vary due to the proximity to Power Inn Well
3	7223 Kara Drive	April 21, 2022	South Corner of Kara Drive and Diana Way	1190	68	65	67	61	1	4	3	
4	7243 Power Inn	July 5, 2022	7337 Power Inn Road at front gate. Closest hydrant to property	1130	65	58	64	56	1	2	1	
5	7300 Kara Drive	October 31, 2022	Hydrant Located at 7279 Kara Drive	1060	62	51	64	50	2	1	3	
6	7418 Reese Road	March 10, 2023	Hydrant in Parking Lot, SE Corner of property, 7406 Reese Road	1060	63	54	64	52	1	2	3	
7	7325 Reese Road	June 28, 2023	Hydrant across from address 7370 Reese Road	1060	67	59	66	55	1	4	3	
8	8172 Venn Court	April 6, 2023	Hydrant on North Corner of Venn Court and Kara Drive	1130	65	53	64	51	1	2	1	
9	8272 Florin Road	March 7, 2023	Hydrant in Parking Lot Southside of Property	1060	68	65	66	62	2	3	1	
10	8741 Gerber Road	September 3, 2021	Front of Address next to drive way	1000	64	52	63	10	1	42	41	2,100 feet of non-looped 8-inch, verify connectivity
11	Augusta	July 5, 2022	Corner of Augusta and Bacchini	1160	67	62	67	49	0	13	13	Dead end 6-inch main, no test hydrant identified only the flow hydrant.
12	7100 Hayward Drive	September 7, 2023	Hydrant on the Corner of Fletcher Farms Drive and Hayward Drive	1000	65	51	65	54	0	3	3	
13	Scottsdale Area ISO Test	March 30, 2023	Northwest Corner of Scottsdale and Millsgap	1060	65	47	64	50	1	3	4	
14	8629 Weyand Avenue	July 25, 2023	Hydrant in front of address 8600 Weyand Avenue	1060	65	57	65	59	0	2	2	
15	7402 Bouvais Circle	July 5, 2022	In front of address 7412 Bouvais Circle	1060	62	54	64	52	2	2	4	
16	8181 Florin Road	July 5, 2022	1st Hydrant @ East Gate	1060	62	51	61	49	1	2	1	
17	Between Gardner and S. Watt	March 29, 2022	8270 Florin Road @ East Gate	920	65	57	65	60	0	3	3	

8/1/2025

CHAPTER 7 - EVALUATION AND PROPOSED IMPROVEMENTS

This section presents a summary of the domestic water system evaluation and identifies improvements needed to mitigate existing deficiencies, as well as improvements needed to service growth.

7.1 OVERVIEW

The calibrated hydraulic model was used for evaluating the distribution system for capacity deficiencies during PHD and during MDD in conjunction with fire flows.

The criteria for evaluating the capacity adequacy of the domestic water distribution system facilities (transmission mains and wells) were discussed and summarized in the System Performance and Design Criteria chapter.

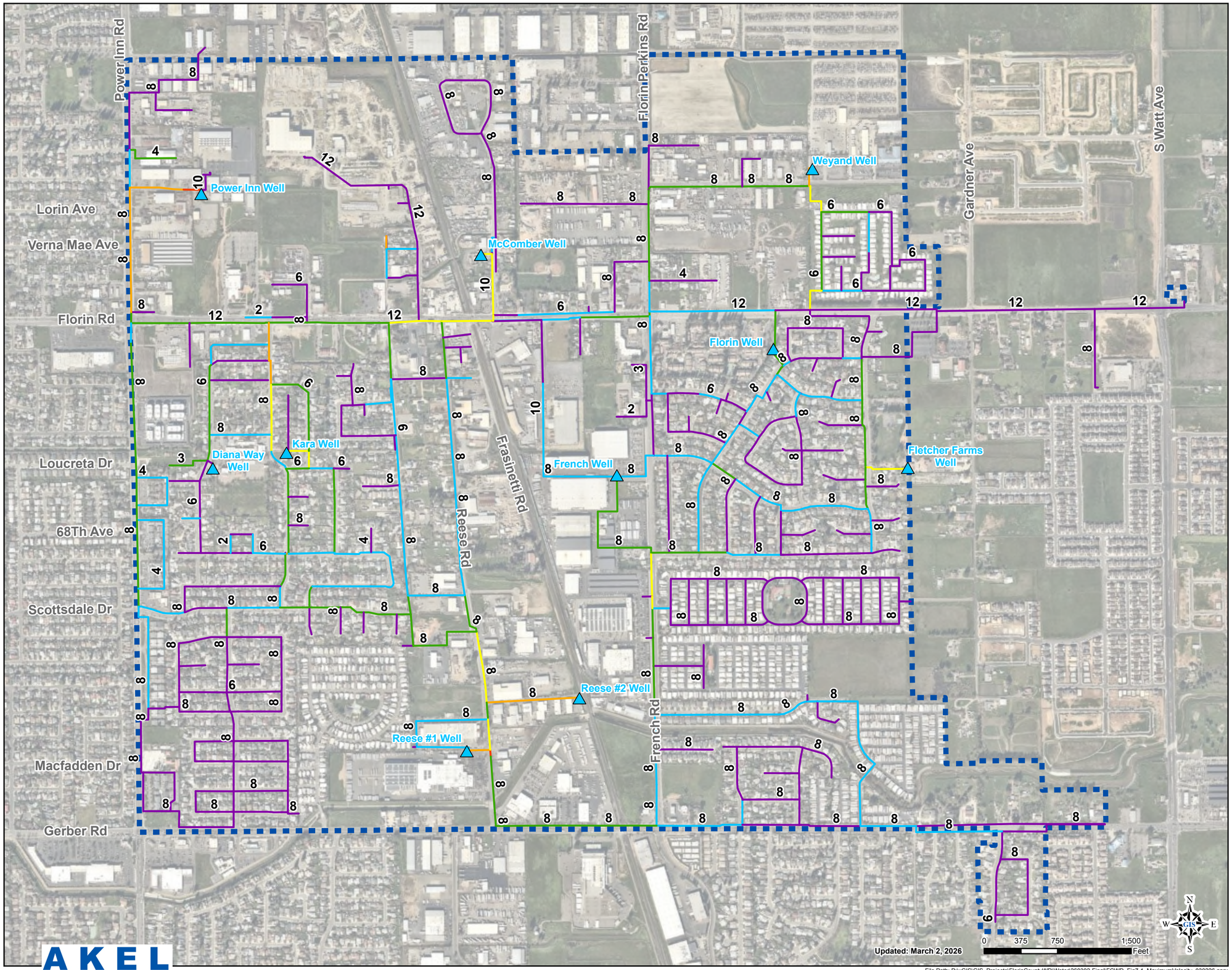
7.2 PIPELINE CAPACITY EVALUATION

The hydraulic model was used to identify pipelines in FCWD's existing distribution that experience high velocity under peak hour demand conditions. Areas of high head loss or high velocity may be more susceptible to water main breaks and ruptures. FCWD water distribution system performed well during PHDs and no pipeline velocity deficiencies were identified. The pipeline velocity criteria is 5 ft/s and only a few areas exceeded 4 ft/s as documented on **Figure 7.1**.

7.3 SYSTEM PRESSURE EVALUATION

The hydraulic model was also used to determine if the existing domestic water distribution system meets the minimum pressure requirements outlined in the FCWD's System Performance and Design Criteria chapter. During PHD the minimum pressure requirement is 35 psi.

FCWD operates the water system to maintain system pressures between 50 and 80 psi. The minimum pressure observed during PHDs was 50 psi, well above the criteria of 35 psi. The PHD system pressures are documented on **Figure 7.2**.



Legend

Existing System

- Wells

Maximum Pipeline Velocity

- 0.5 ft/s or Less
- 0.5 - 1 ft/s
- 1 - 2 ft/s
- 2 - 3 ft/s
- 3 - 4 ft/s
- 4 - 5 ft/s
- Greater than 5 ft/s

Water Purveyors

- Florin County Water District

Figure 7.1
Maximum Velocity
Water System Master Plan
Florin County Water District

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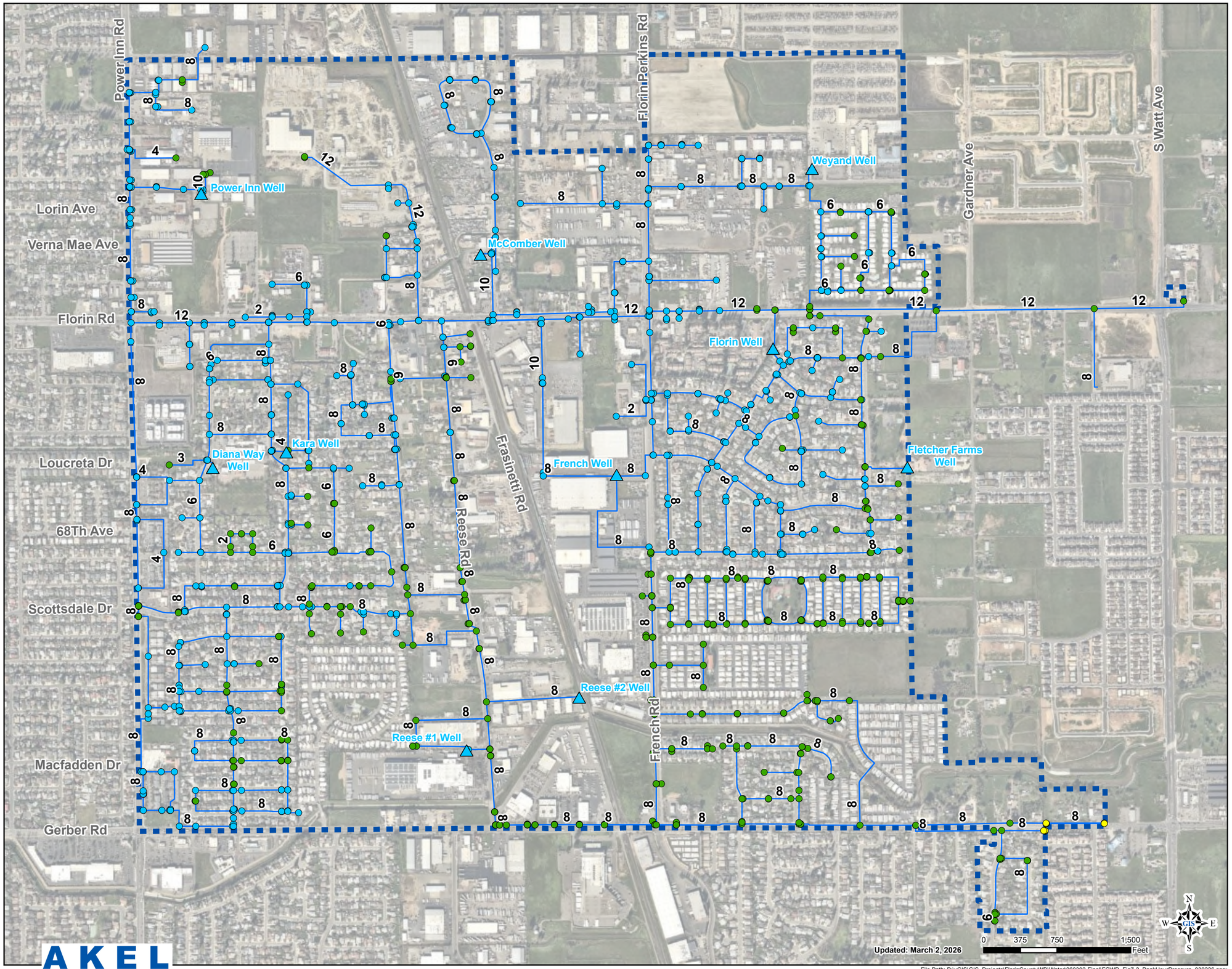

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Peak Hour Pressures

- 35 - 40 psi
- 40 - 45 psi
- 45 - 50 psi
- 50 - 55 psi
- Greater than 55 psi

Existing System

- Wells
- Pipes

Water Purveyors

- Florin County Water District

Figure 7.2
Peak Hour Pressure
Water System Master Plan
Florin County Water District

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7.4 FIRE FLOW EVALUATION

The fire flow analysis consisted of using the MDD in the hydraulic model and applying hypothetical fire flows. The magnitude and duration of each fire flow were based on the governing land use type within proximity to the fire location.

7.4.1 Fire Flow Analysis

For the existing fire flow analysis, each hydrant in the service area has a correlated junction in the model. The required fire flows at each hydrant are assigned based on the existing land use categories, as shown previously in this report on **Figure 2.1**.

Using the existing MDD as the base system demand, the model computes the available fire flow at 20 psi as documented on **Figure 7.3**. The model will also calculate the residual psi at the required fire flow. The hydrant junctions that are unable to meet the existing fire flow criteria (maintaining the minimum of 20 psi under MDD plus fire flow requirement) are identified as deficient.

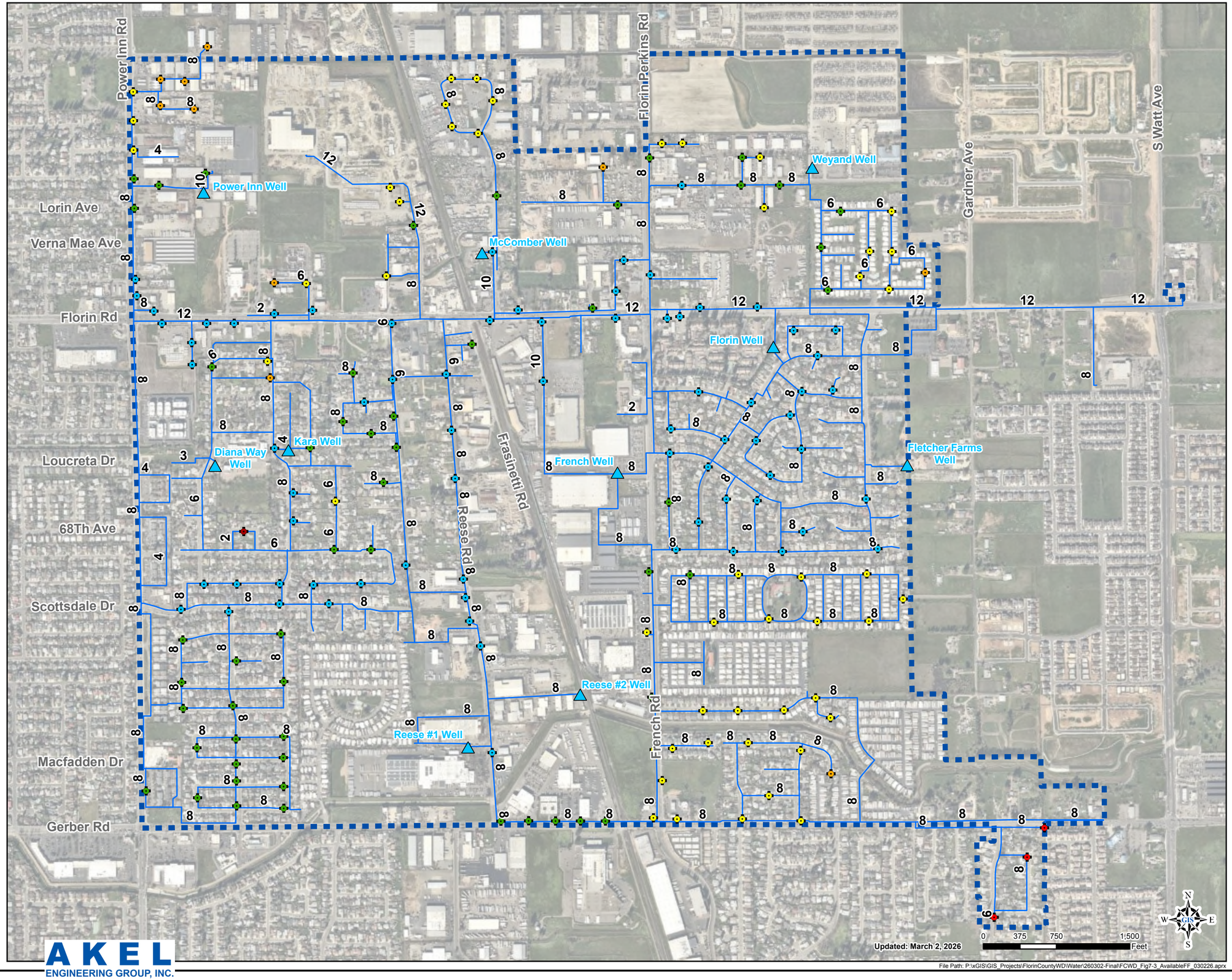
The hydraulic model indicates that FCWD's existing distribution system has some areas of pipelines that do not loop and industrial corridors that do not meet the fire flow criteria. The model shows that approximately sixty-four percent (64%) of hydrants can meet the FCWD's fire flow criteria, while thirty-six percent (36%) of the hydrants cannot maintain a residual pressure of 20 psi under MDD plus required fire flow demand. The hydrants in the FCWD's water system that do not meet the fire flow criteria are identified on **Figure 7.4**.

7.4.2 Fire Flow Improvements

This study identified specific improvements to mitigate the existing fire flow deficiencies. These improvements consist of replacing old and ill-conditioned watermains, upsizing several segments of distribution mains or looping connectivity to enhance the pressures and meet the fire flow requirements.

The fire flow improvements are identified on **Figure 7.5**, and documented **Table 7.1**. The fire flow improvements and corresponding improvement numbers are documented as follows:

- **1-1.** Replace approximately 2,360 feet of existing 8 and 12-inch water main with a new 18-inch water main along Power Inn Road from approximately 450 ft south of 53rd Avenue to Florin Road.



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Available Fire Flows

- Greater than 2,500 gpm
- 2,000 - 2,500 gpm
- 1,500 - 2,000 gpm
- 1,000 - 1,500 gpm
- 500 - 1,000 gpm
- Less than 500 gpm

Existing System

- Wells
- Pipes

Water Purveyors

- Florin County Water District

Note:
• Each of FCWD 10 wells are active

Figure 7.3
Available Fire Flow
Water System Master Plan
Florin County Water District

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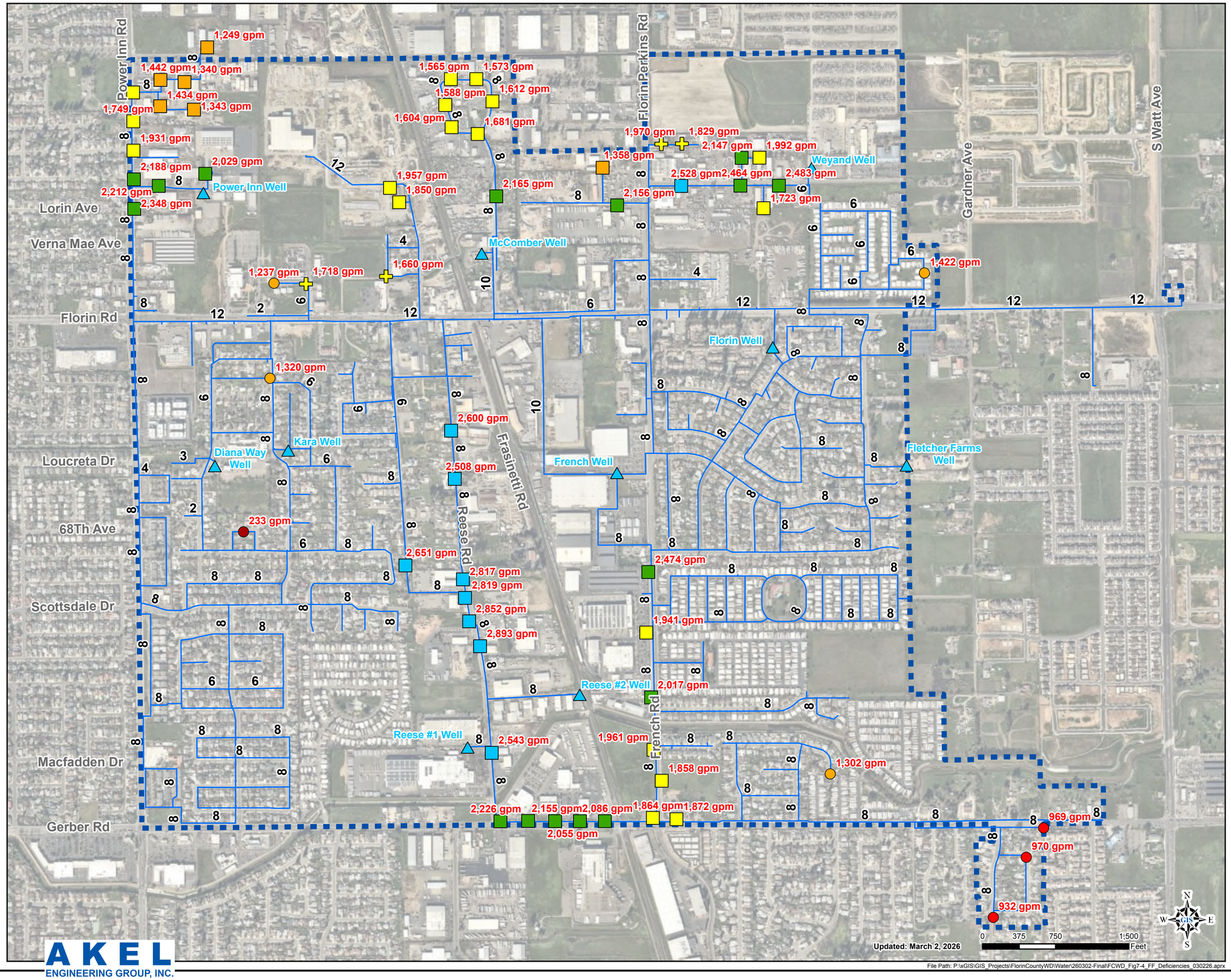

Legend

Required Fire Flows

- 3,000 gpm
- 2,000 gpm
- 1,500 gpm

Available Fire Flows

- Greater than 2,500 gpm
- 2,000 - 2,500 gpm
- 1,500 - 2,000 gpm
- 1,000 - 1,500 gpm
- 500 - 1,000 gpm
- Less than 500 gpm

Existing System

- Wells
- Pipes
- Service Area

Note:
- Each of FCWD 10 wells are active

Figure 7.4
Fire Flow Deficiencies
Water System Master Plan
Florin County Water District

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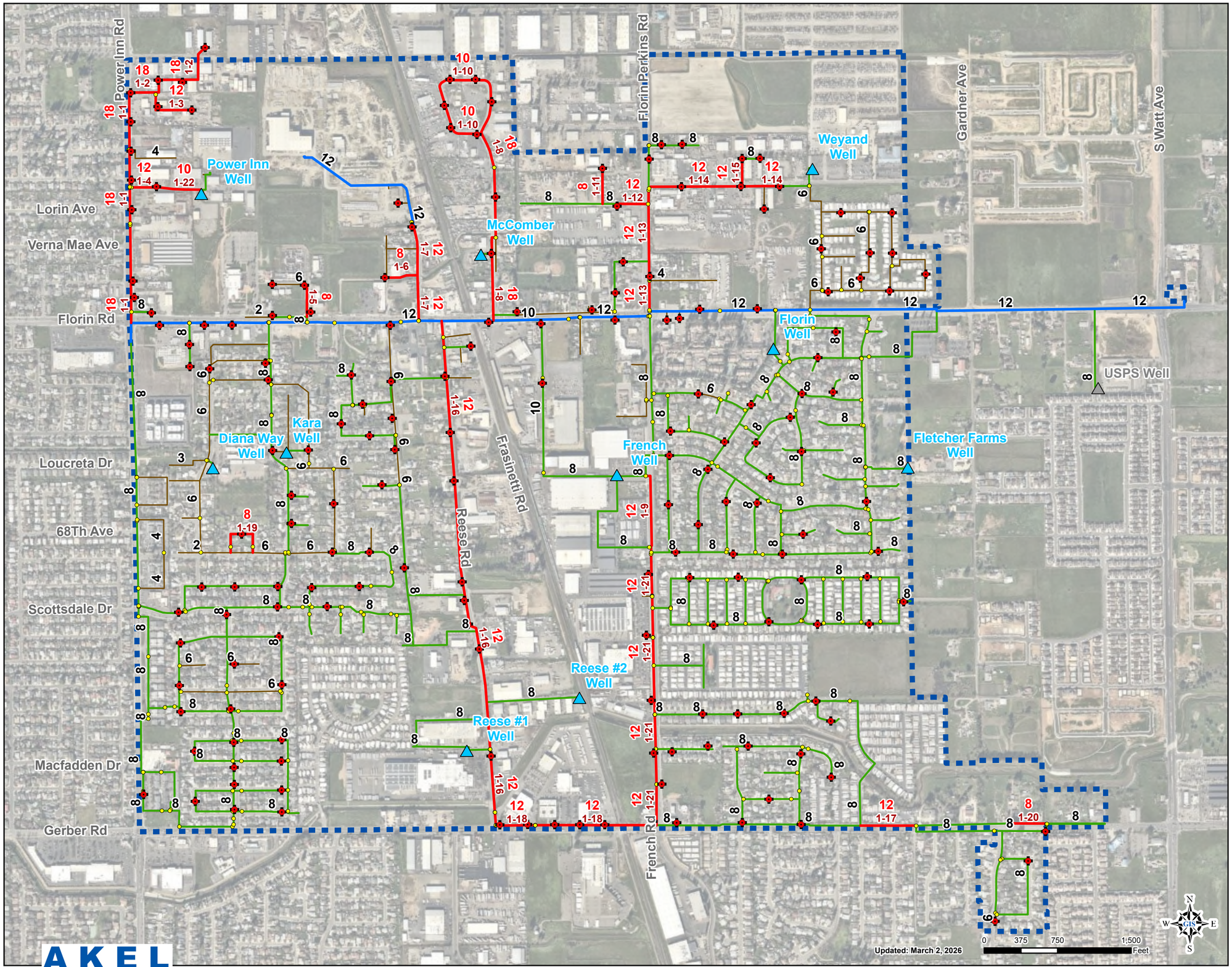


Legend

System Improvements

- Fire Flow Improvements

Existing System

- Wells
- Abandoned Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Figure 7.5
Fire Flow Improvements
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

Table 7.1 Recommended Fire Flow Improvements

Water System Master Plan

Florin County Water District

Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements			
				Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)
1-1	Pipe	Power Inn Rd	From approx. 450 ft s/o 53rd Ave to Florin Rd	8/12	Replace	18	2,360
1-2	Pipe	Power Inn Rd / ROW	From approx. 380 ft s/o Junipero St to Junipero St	8	Replace	18	1,200
1-3	Pipe	Alley b/w Junipero St and Florin Rd	From approx. 290 ft e/o Power Inn Rd to approx. 650 ft e/o Power Inn Rd	8	Replace	12	550
1-4	Pipe	Public Parking Lot e/o Power Inn Rd	From Power Inn Rd to approx. 270 ft e/o Power Inn Rd	8	Replace	12	280
1-5	Pipe	Bacchini Ave	From Florin Rd to approx. 15 ft s/o Augusta Way	6	Replace	8	320
1-6	Pipe	Alley n/o Florin Rd	From Mc Curdy Ln to Tokay Ave	6	Replace	8	320
1-7	Pipe	Tokay Ave	From approx. 970 ft n/o Florin Rd to Florin Rd	8	Replace	12	970
1-8	Pipe	McComber St	From Florin Rd to approx. 1,915 ft n/o Florin Rd	8/10	Replace	18	1,980
1-9	Pipe	French Rd	From approx. 180 ft s/o Elaine Dr to approx. 55 ft n/o Danridge Dr	-	New	12	790
1-10	Pipe	McComber St	McComber St Loop	8	Replace	10	1,860
1-11	Pipe	Alley b/w McComber St and Florin Perkins Rd	From approx. 420 ft s/o Specialty Circle to approx. 1,130 ft n/o Florin Rd	6	Replace	8	370
1-12	Pipe	Alley b/w Specialty Circle and Florin Rd	From approx. 320 ft w/o Florin Perkins Rd to Florin Perkins Rd	8	Replace	12	330
1-13	Pipe	Florin Perkins Rd	From Weyand Ave to Florin Rd	8	Replace	12	1,240
1-14	Pipe	Weyand Ave	From Florin Perkins Rd to approx. 1,350 ft e/o Florin Perkins Rd	8	Replace	12	1,350
1-15	Pipe	Alley b/w Gardner Ave and Florin Perkins Rd	From Weyand Ave to approx. 280 ft n/o Weyand Ave	8	Replace	12	280
1-16	Pipe	Reese Rd	From Florin Rd to Gerber Rd	6/8	Replace	12	5,230
1-17	Pipe	Gerber Rd	From Millbrook Cr to Lakewood Rd	8	Replace	12	570
1-18	Pipe	Gerber Rd	From Reese Rd to French Rd	8	Replace	12	1,650
1-19	Pipe	Tommy Circle	Toomy Circle north of Judette Avenue	2	Replace	8	610
1-20	Pipe	Gerber Rd	From approx. 100 feet e/o Southbreeze Dr to approx. 500 ft w/o Tamarindo Bay Dr	2	Replace	8	370
1-21	Pipe	French Rd	From approx. 55 ft n/o Danridge Dr to Gerber Rd	8	Replace	12	2,860
1-22	Pipe	Public Parking Lot e/o Power Inn Rd	From approx. 270 ft e/o Power Inn Rd to Power Inn Well	8	Replace	10	460

- **1-2**. Replace approximately 1,200 feet of existing 8-inch water main with a new 18-inch water main along Power Inn Road and the Right of Way (ROW) from approximately 380 ft south of Junipero Street to Junipero Street.
- **1-3**. Replace approximately 550 feet of existing 8-inch water main with a new 12-inch water main in the Alley between Junipero Street and Florin Road from approximately 290 feet east of Power Inn Road to approximately 650 feet east of Power Inn Road
- **1-4.** Replace approximately 280 feet of existing 8-inch water main with a new 12-inch water main along the Public Parking Lot east of Power Inn Road from Power Inn Rd to approximately 270 ft east of Power Inn Rd.
- **1-5**. Replace approximately 320 feet of existing 6-inch water main with a new 8-inch water main along Bacchini Avenue from Florin Road to approximately 15 feet south of Augusta Way.
- **1-6**. Replace approximately 320 feet of existing 6-inch water main with a new 8-inch water main in the Alley north of Florin Road from Mc Curdy Lane to Tokay Avenue.
- **1-7**. Replace approximately 970 feet of existing 8-inch water main with a new 12-inch water main in Tokay Avenue from approximately 465 feet north of Florin Road to Florin Road.
- **1-8**. Replace approximately 1,980 feet of existing 8 and 10-inch water main with a new 18-inch water main in McComber Street Avenue from Florin Road to approximately 1,915 feet north of Florin Road.
- **1-9**. Construct 790 feet of new 12-inch main in French Road from approximately 180 feet south of Elaine Drive to approximately 55 feet north of Danridge Drive.
- **1-10**. Replace approximately 1,860 feet of existing 8-inch water main with a new 10-inch water main in the McComber Street Loop.
- **1-11**. Replace approximately 370 feet of existing 6-inch water main with a new 8-inch water main in the Alley between McComber Street and Florin Perkins Road from approximately 420 feet south of Specialty Circle to approximately 1,130 feet north of Florin Road.

- **1-12**. Replace approximately 330 feet of existing 8-inch water main with a new 12-inch water main in the Alley between Specialty Circle and Florin Road from approximately 320 feet west of Florin Perkins Road to Florin Perkins Road.
- **1-13**. Replace approximately 1,240 feet of existing 8-inch water main with a new 12-inch water main in Florin Perkins Road from Weyand Avenue to Florin Road.
- **1-14**. Replace approximately 1,350 feet of existing 8-inch water main with a new 12-inch water main in Weyand Avenue from Florin Perkins Road to approximately 1,350 feet east of Florin Perkins Road.
- **1-15**. Replace approximately 280 feet of existing 8-inch water main with a new 12-inch water main in the Alley between Gardner Avenue and Florin Perkins Road from Weyand Avenue to Approximately 280 feet north of Weyand Avenue.
- **1-16**. Replace approximately 5,230 feet of existing 6 and 8-inch water main with a new 12-inch water main in Reese Road from Florin Road to Gerber Road.
- **1-17**. Replace approximately 570 feet of existing 8-inch water main with a new 12-inch water main in Gerber Road from Millbrook Circle to Lakewood Road.
- **1-18**. Replace approximately 1,650 feet of existing 8-inch water main with a new 12-inch water main in Gerber Road from Reese Road to French Road.
- **1-19**. Replace approximately 610 feet of existing 2-inch water main with a new 8-inch water main in Tommy Circle north of Judette Avenue.
- **1-20**. Replace approximately 370 feet of existing 2-inch water main with a new 8-inch water main in Gerber Road from approximately 100 feet east of Southbreeze Drive to approximately 500 feet west of Tamarindo Bay Drive.
- **1-21**. Replace approximately 2,860 feet of existing 8-inch water main with a new 12-inch water main in French Road approximately 55 feet north of Danridge Dr to Gerber Rd.
- **1-22**. Replace approximately 460 feet of existing 8-inch water main with a new 10-inch water main in the Public Parking Lot east of Power Inn Road from 270 feet east of Power Inn Road to Power Inn Well.

7.5 SUPPLY EVALUATION AND RECOMMENDED IMPROVEMENTS

There are no storage tanks in the FCWD water system so the groundwater wells must be able to supply the largest demand between Peak Hour Demands or Maximum Day Demands plus Fire Flow (MDD+FF) with the firm capacity of the wells (largest well out of service).

7.5.1 Supply Capacity Analysis

The total well capacity is 5,000 gpm with a firm capacity of 4,350 gpm, however due to water quality issues the current total capacity is reduced to 3,300 gpm and the firm capacity to 2,650 gpm. The existing maximum day and peak hour demands are 2,333 gpm and 3,500 gpm respectively which result with a current capacity deficiency of 850 gpm during peak hours and 2,683 gpm during MDD+FF. If the wells are at full capacity, the deficiency is mitigated during PHD as documented on **Table 7.2**. With the buildout demands there is a surplus of 23 gpm during PHD.

7.5.2 Recommended Water Supply Improvements

The recommended water supply improvements to mitigate the existing supply deficiencies are shown in **Figure 7.6** and documented on **Table 7.3** and summarized as follows:

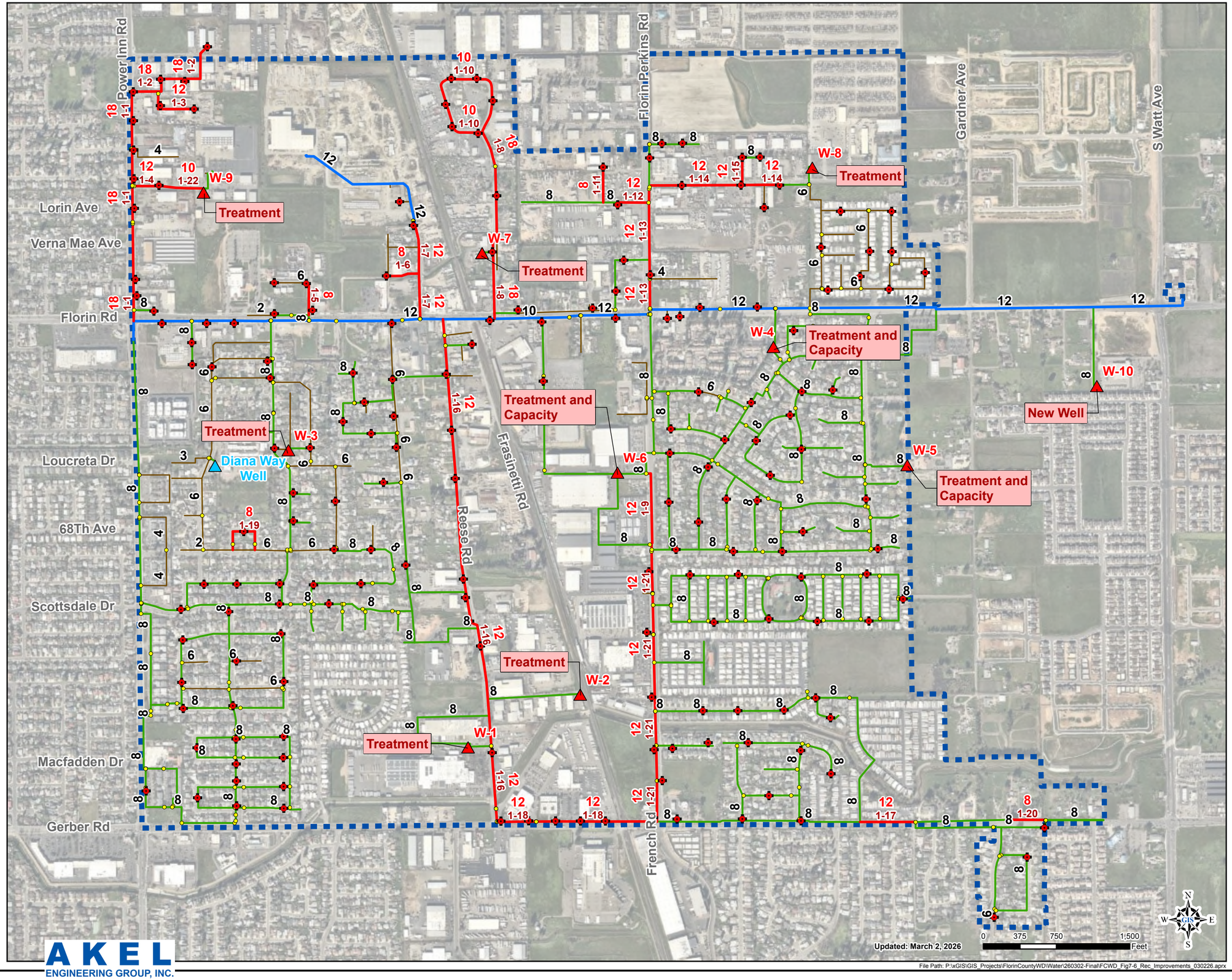
- PFAs treatment at wells Reese #1, Reese #2, Kara, and Florin to bring the wells back online due to exceeding the PFOA maximum containment level (MCL).
- Drilling deeper at the following wells: Florin, Fletcher, and French to increase capacity in order to mitigate the existing supply deficiency.

The recommended water supply improvements to mitigate impending water quality concerns are to add PFAs treatment to each remaining well in the system. The following wells will require PFAs treatment as needed based on water quality testing.

- Fletcher, French, McComber, Weyand, Power Inn

The recommended water supply improvements for future users/demands are as follows:

- Re-Drill the USPS well and include PFAs treatment to meet future demands (future deficiency = 676 gpm)



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System Improvements

- Wells
- Fire Flow Improvements

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Figure 7.6
Recommended Improvements
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

Table 7.2 Water Supply and Demand Analysis

Water System Master Plan

Florin County Water District

WATER SUPPLY CAPACITY				
1	2	3	4	5
Supply Well ID	**Well Capacity** (gpm)	**Current Well Capacity** (gpm)	**Current Well Status** **(provided 6/13/25)**	**Operation Staff Comments**
Mc Comber	550	550	Active	
Florin	400	-	Offline	PFOA MCL exceeded (ion exchange filtration in progress)
Fletcher	650	650	Active	
French	650	650	Active	
Reese #1	500	-	Offline	PFOA MCL exceeded
Reese #2	400	-	Offline	PFOA MCL exceeded
Kara	400	-	Offline	PFOA MCL exceeded
Diana	400	400	Active	PFOA MCL exceeded (ion exchange filtration in progress)
Weyand	550	550	Active	Needs maintenance, has vibration and noise (possible failed bearing)
Power Inn	500	500	Active	
Total Supply Capacity	5,000	3,300		
Firm Capacity (Excluding largest supply well)	**4,350**	**2,650**		

WATER DEMANDS		Existing	Buildout
Average Day Demands	gpm	1,458	1,803
	MGD	2.1	2.6
Maximum Day Demands	gpm	**2,333**	**2,885**
	MGD	3.4	4.2
Peak Hour Demands	gpm	**3,500**	**4,327**
	MGD	5.0	6.2

SUPPLY vs. DEMAND	Existing Current Well Status/Capacity	Existing Wells at Full Capacity	Buildout Wells at Full Capacity
1. Maximum Day Demands Vs Total Capacity	**967**	**2,667**	**2,115**
2. Maximum Day Demands Vs Firm Capacity	**317**	**2,017**	**1,465**
3. Peak Hour Demands Vs Total Capacity	**-200**	**1,500**	**673**
4. Peak Hour Demands Vs Firm Capacity	**-850**	**850**	**23**
5. MDD + 3,000 gpm Fire Flow Vs Total Capacity	**-2,033**	**-333**	**-885**
6. MDD + 3,000 gpm Fire Flow Vs Firm Capacity	**-2,683**	**-983**	**-1,535**

Table 7.3 Recommended Water Supply Improvements

Water System Master Plan
Florin County Water District

Improvement No.	Supply Well ID	Well Status (gpm)	Operation Staff Comments (gpm)	Improvements Recommended to Mitigate Existing Deficiencies		As Required Future Improvements	
				Improvement	Trigger	Improvement	Trigger
W-1	**Reese #1**	Offline	PFOA MCL exceeded	PFAs Treatment for the Reese #1 Well	PFOA MCL exceeded	-	-
W-2	**Reese #2**	Offline	PFOA MCL exceeded	PFAs Treatment for the Reese #2 Well	PFOA MCL exceeded	-	-
W-3	**Kara**	Offline	PFOA MCL exceeded	PFAs Treatment for the Kara Well	PFOA MCL exceeded	-	-
W-4	**Florin**	Offline	PFOA MCL exceeded	Increase capacity by drilling deeper and adding PFAs treatment.	PFOA MCL exceeded, Additional capacity required to mitigate the existing 983 gpm supply deficiency	-	-
W-5	**Fletcher**	Active	-	Increase capacity by drilling deeper and adding PFAs treatment.	Additional capacity required to mitigate the existing 983 gpm supply deficiency.	PFAs Treatment for the Fletcher Well	As required for future PFOA MCL exceedance
W-6	**French**	Active	-	Increase capacity by drilling deeper and adding PFAs treatment.	Additional capacity required to mitigate the existing 983 gpm supply deficiency.	PFAs Treatment for the French Well	As required for future PFOA MCL exceedance
W-7	**Mc Comber**	Active	-	-	-	PFAs Treatment for the Mc Comber Well	As required for future PFOA MCL exceedance
W-8	**Weyand**	Active	Needs maintenance, has vibration and noise (possible failed bearing)	-	-	PFAs Treatment for the Weyand Well	As required for future PFOA MCL exceedance
W-9	**Power Inn**	Active	-	-	-	PFAs Treatment for the Power Inn Well	As required for future PFOA MCL exceedance
W-10	**USPS Well**	Destroyed	-	-	-	Re-Drill the USPS Well and include PFAs Treatment	To meet future supply needs (future supply deficiency = 676 gpm)

7.6 STORAGE EVALUATION ANALYSIS

FCWD currently does not have plans for a storage tank(s) and booster station(s) due to lack of available space to build, however if there is a future opportunity, this section documents what the storage and booster station requirements would be and the impacts to the recommended improvements. The recommended storage and supply exercise is documented on Table 7.4.

7.6.1 Supply vs Storage Evaluation

The existing supply is required to supply the largest of PHD or MDD+FF as there is no storage in the system to supplement these demands. This results with an existing supply deficiency of 983 gpm and a future deficiency of 1,535 gpm. Mitigating this deficiency will require drilling deeper at multiple wells to increase capacity and re-drilling the destroyed USPS well.

If storage capacity is added to the distribution system the supply requirements would be reduced to just meeting maximum day demands as peak hour operational demands and fire flows would be supplied from storage. This results with an existing supply surplus of 2,017 gpm and future surplus of 1,465 gpm.

7.6.2 Potential Storage Improvements

The storage requirements for the general plan buildout demands are documented as follows:

- Operational Storage: 25% of MDD = 1.01 MG
- Fire Flow Storage: 3,000 gpm for 3 hours = 0.54 MG
- Emergency Storage: 25% of MDD = 1.01 MG

Total Storage Requirement: 2.62 MG

Additionally, due to the flat topography of FCWD the tank is assumed to be at ground level and therefore will require a booster station to pump into the system. The largest demand the pump station will be required to supply is the 3,000 gpm fire flow. The booster station should have a firm capacity of 3,000 gpm (e.g. 3 duty pumps at 1,000 gpm and 1 standby pump at 1,000 gpm for a total of 4,000 gpm and a fire capacity of 3,000 gpm).

Table 7.4 Supply vs. Storage

Water System Master Plan

Florin County Water District

Water System Demands

		Existing Water Demands	General Plan Projected Water Demands
Maximum Day Demands	gpm	**2,333**	**2,885**
	MGD	3.4	4.2
Peak Hour Demands	gpm	**3,500**	**4,327**
	MGD	5.0	6.2

Water Supply Summary

	Well Capacity	Current Well Status
Total Supply Capacity	5,000	3,300
Firm Capacity (Excluding largest supply well)	**4,350**	**2,650**

Criteria No. 1:

Supply = Largest of Peak Hour Demand or Maximum Day Demand + Fire Flow

	Existing Demands (gpm)	Projected Demands (gpm)
Peak Hour Demand	3,500	4,327
Maximum Day Demand + Fire Flow	**5,333**	**5,885**
Current Well Status: Surplus/Deficiency	**-2,683**	**-3,235**
Number of Wells (at 500 gpm)	**5**	**7**
Full Well Capacity: Surplus/Deficiency	**-983**	**-1,535**
Number of Wells (at 500 gpm)	**2**	**4**

Criteria No. 2:

Supply = Maximum Day Demand

Storage = Operational (0.25 x MDD) + Fire Flow + Emergency (0.25 x MDD)

Booster Station = Largest of Fire Flow or PHD - MDD

Supply Analysis	Existing Demands (gpm)	Projected Demands (gpm)
Current Well Status: Surplus/Deficiency	**317**	**-235**
Full Well Capacity: Surplus/Deficiency	**2,017**	**1,465**

Storage Analysis	(MG)	(MG)
Operational Storage (0.25 x MDD	0.84	1.04
Fire Flow Storage: 3,000 gpm x 3 hr	0.54	0.54
Emergency Storage (0.25 x MDD)	0.84	1.04
Total Storage Requirement	**2.22**	**2.62**

Booster Station Analysis for Ground Level Tank(s)	(gpm)	(gpm)
Fire Flow Requirement	3,000	3,000
PHD - MDD	1,167	1,442
Booster Station Requirement	**3,000**	**3,000**
Recommendation	3 duty pumps @ 1,000 gpm 1 standby pump @ 1,000 gpm	3 duty pumps @ 1,000 gpm 1 standby pump @ 1,000 gpm

8/18/2025

CHAPTER 8 – RISK ANALYSIS

This section documents the risk analysis of the existing water distribution system within the FCWD service area. The following sections include a discussion of the data utilized to establish risk and criticality, criteria development, results of the risk analysis, and replacement priorities for high risk/high criticality pipelines.

8.1 OVERVIEW

The purpose of this evaluation is to identify pipelines in the water distribution system with the largest risk and highest criticality based on their likelihood of failure (LOF) and the consequence of failure (COF). This risk analysis will be used to provide improvement recommendations so the system can maintain levels of service desired by FCWD and expected by the customers. This evaluation will aid FCWD staff in justifying capital improvement budgets and assist FCWD in changing from a reactive repair strategy to a proactive renewal and replacement strategy by identifying high risk/high criticality pipelines.

This chapter documents the methodology used to identify risk and prioritize pipeline improvement recommendations.

8.2 AVAILABLE DATA

The following data were used as a basis for the risk assessment (Table 8.1). The review included system maps, asset data inventory, and pipeline maintenance records.

- **Hydraulic Model**: The model was developed from FCWD's water system GIS which includes the pipeline spatial location, diameters, materials, and construction year, where available. The hydraulic model was also used to extract pipeline flows and pressures.
- **System Maps**: These maps included pipeline connections and alignments based on FCWD's operation staff's institutional knowledge.
- **Asset Data Inventory:** This inventory included age, diameter, capacity, and material.
- **Geographic Data information:** These data included geographic information and aerial imaging used to determine general plan land use, local channels and rivers, and local roads.

Table 8.1 Condition Assessment Data Availability and Quality

Water System Master Plan

Florin County Water District

No.	Focus	Group	Availability	Quality Need Improvement — Excellent
1	**Hydraulic Information**	**Hydraulic Model**	The hydraulic model was used to extract pipeline flows, velocities, and peak pressures.	
2	**Asset Information**	**Up-to-Date System Maps**	The system maps were updated based on the GIS current as of Jan 2025.	
3	**Asset Information**	**Asset Data Inventory (Age, Material, Size)**	Age: Estimated Material: Available for 100% of pipes Size: Avaliable for 100% of pipes	
4	**Public Exposure**	**Main Break History**	Have not received maintenance history.	
5	**Geographic Information**	**Geographic Data Inventory**	The geographic data inventory includes the general plan land use, local channels and rivers, and local roads.	
6	**Municipal Information**	**Municipal Data Inventory**	The municipal data inventory includes the critical facilities such as medical and childcare facilities.	

- **Municipal Data Inventory:** This inventory included an inventory of all critical facilities such as medical and childcare facilities.

8.3 RISK ASSESSMENT METHODOLOGY

Risk assessment and analysis are at the heart of asset management planning and are one of the primary tools for identifying and prioritizing renewal projects with the highest urgency. The results of this process guide optimized decisions on financial planning and are used for choosing where the limited available public funds are more wisely spent.

The risk analysis incorporated information about the water system extracted from the hydraulic model as well as user-defined risk assessment criteria to perform a risk analysis for each asset included in the analysis. The results of this analysis can be used to prioritize capital projects throughout FCWD, focusing on the areas of highest risk first and developing an improvement plan for the recommendations.

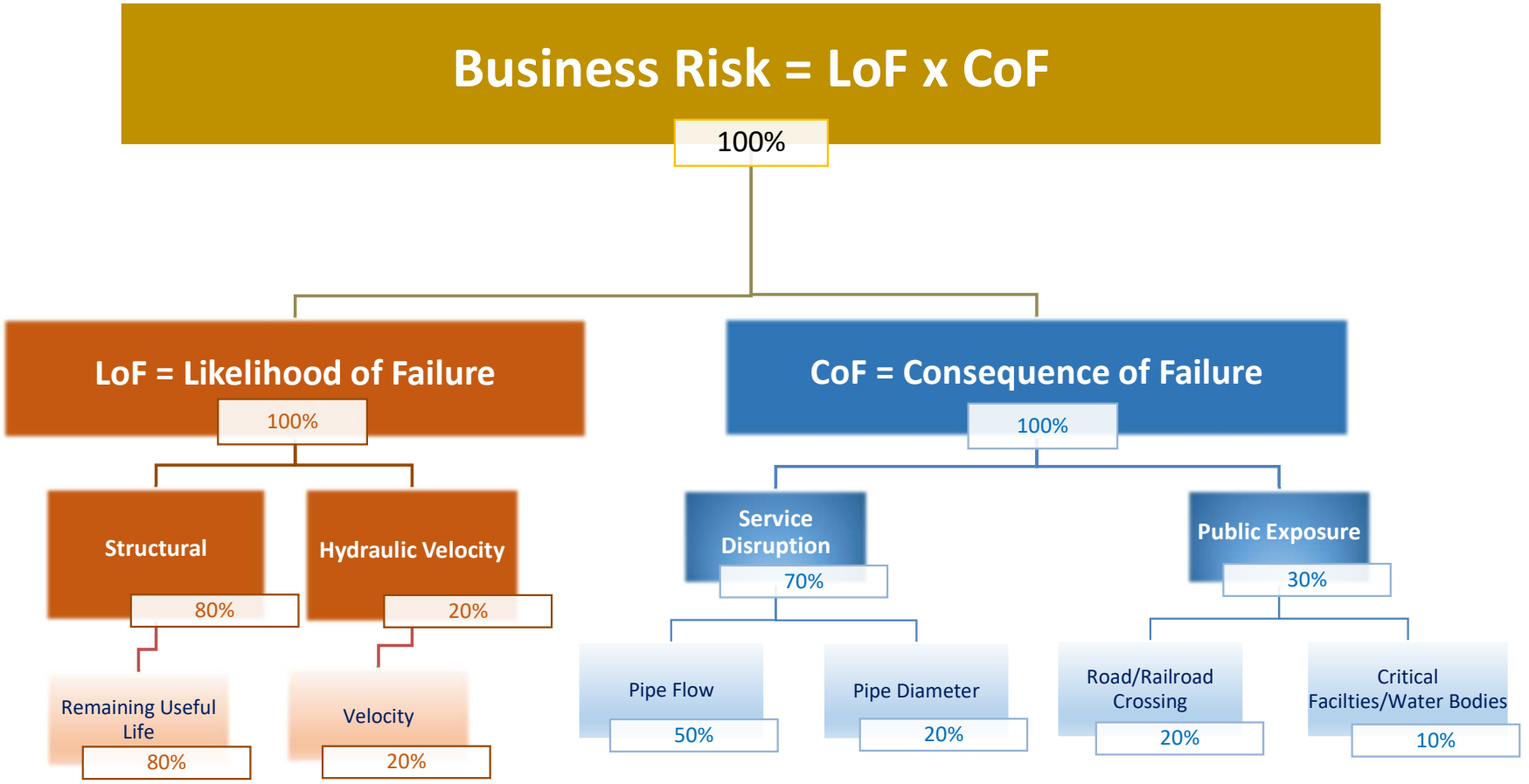
Risk analysis consists of assessing the probability (or likelihood) of an asset failing and, more importantly, linking it to a consequence if such failure was to occur. This analysis allows the agency to identify existing and future risks that potentially impact the level of customer service and the associated costs. Thus, the risk, also known as the business risk exposure (BRE), is calculated by multiplying the probability or likelihood of failure (LOF) by the consequence of failure (COF), as shown in **Figure 8.1**.

Risk (BRE) = Likelihood of Failure (LOF) x Consequence of Failure (COF)

A likelihood (or probability) of failure analysis allows a prediction of failure timing for a particular asset. Did the asset fail to meet the level of service? Has capacity become inadequate? How is the structural condition? Is the lifecycle cost-efficient? A numerical LOF score is assigned to each asset based on this assessment.

A consequence of failure analysis assesses the impact of such failure on the residential or environment and the resulting anticipated economic loss.

Criterion Type: The various criteria can be categorized differently based on the information evaluated. Some of the various criterion types included in this risk assessment are briefly summarized on the following page.



LEGEND

- Business Risk
- LoF
- CoF

March 3, 2026

Figure 8.1
Risk Assessment Diagram

Water System Master Plan
Florin County Water District

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- Proximity to specific locations or infrastructure elements (critical facilities such as schools or hospitals, active service connections, critical pumping facilities, railroads, major roads, or freeways)
- Hydraulic results (asset flows, velocities, maximum pressure, and available fire flow)
- Maintenance record (year of installation, historical leak repair information, and problematic materials)
- Asset material and age

Criterion Score: Each criterion assigns a score, typically between one and five, to an asset based on a scale specific to each criterion. A score of one indicates that a given criterion will minimally contribute to the total consequence or likelihood of failure for a specific asset, while a score of five indicates a criterion will maximally contribute to the asset's total score.

Criterion Weight: Each criterion includes a weight that determines how much contribution it makes to the total COF or LOF scores. A higher weight means the score for an asset from a particular criterion will contribute more to the total COF or LOF score than a criterion with a lower weight.

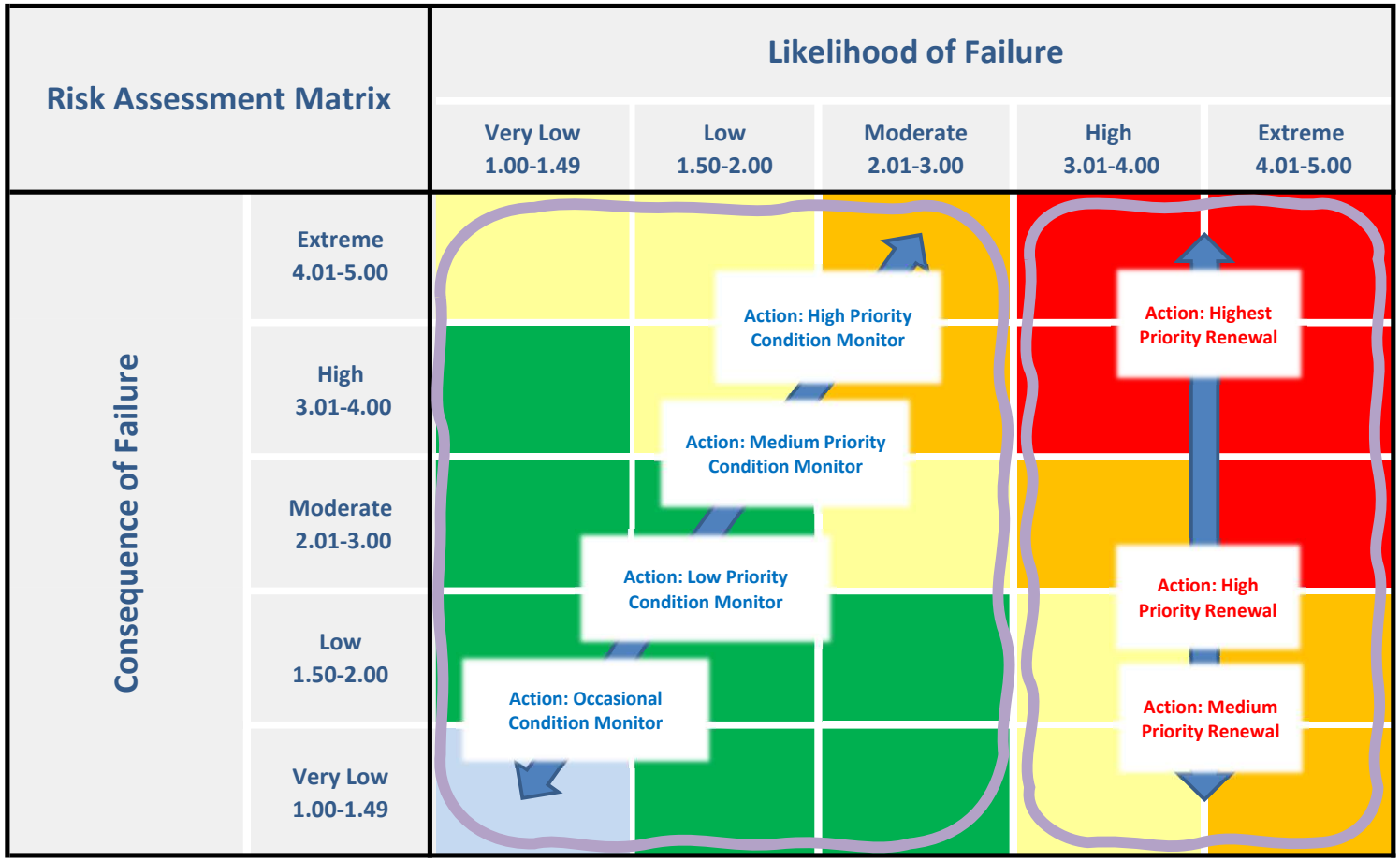
The criteria type, score, and weight for both COF and LOF calculations was established in coordination with FCWD staff before being incorporated into the risk assessment analysis.

A total of 5 categories were used to assign numerical scores to each likelihood of failure and consequence of failure category. The five rating categories include Extreme, High, Moderate, Low, and Very Low, as documented in Table 8.2. High scores are associated with the Extreme and High rating categories and represent at-risk assets that require immediate attention. Low scores are associated with the Very Low or Low rating categories and may represent new or low-risk assets.

Table 8.2 Rating and Scores

Risk Rating	Score
Extreme	**5**
High	**4**
Moderate	**3**
Low	**2**
Very Low	**1**

The Risk Assessment Matrix in Figure 8.2 illustrates how pipelines are classified in the Extreme rating category (red) or High rating category (orange), by combing their LOF and COF scores.



LEGEND

Risk Color Coding

Extreme	*High*	*Moderate*	*Low*	*Very Low*

Renewal Actions Levels

Highest Priority	*High Priority*	*Medium Priority*

Condition Monitoring Levels

High Priority	*Medium Priority*	*Low Priority*	*Occasional*

March 3, 2026

Figure 8.2

Risk Assessment Scoring and Action Plan

Water System Master Plan

Florin County Water District

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The red and orange zone in Figure 8.2 indicate the pipelines require immediate attention for renewal or replacement. The yellow zone highlights assets that required more aggressive monitoring. The green and blue zones need simple monitoring.

8.4 RISK ASSESSMENT CRITERIA

This section documents the risk assessment criteria for the distribution mains in FCWD's potable water system. The criteria for evaluating the risk for distribution mains are divided into two categories: Consequence of Failure (COF) and Likelihood of Failure (LOF).

Consequence of Failure: The COF criteria are intended to qualitatively identify the consequences of the failure of pipelines within the system and are used in the COF score calculation; the measure or proxy, scale, and weights vary for each criterion. These criteria, scores, and weights were reviewed and approved by FCWD staff before incorporation into risk assessment.

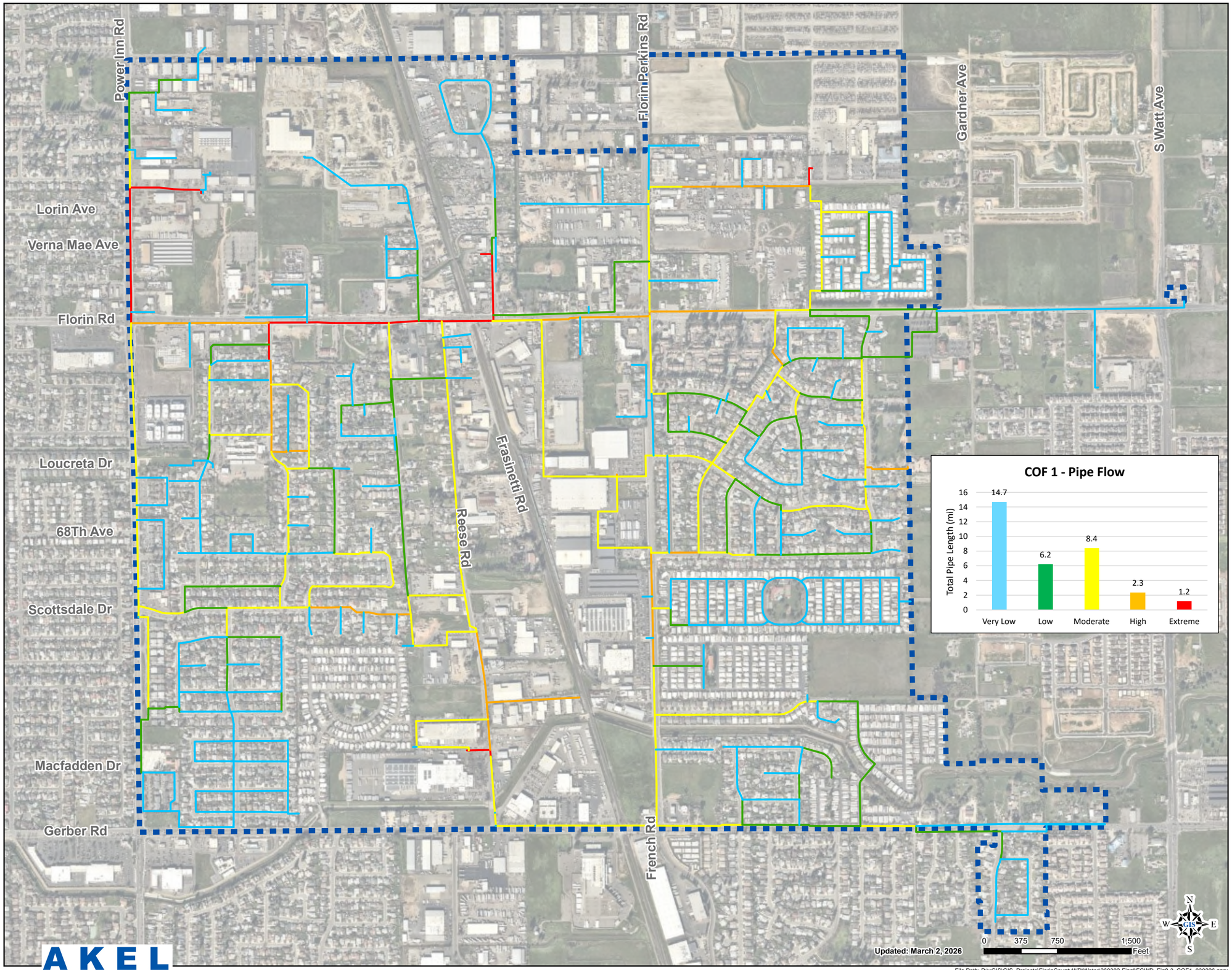
Likelihood of Failure: The LOF criteria are intended to qualitatively identify the likelihood of failure of distribution mains within the system and are used in the LOF score calculation; the type, score values, and weights vary for each criterion. These criteria, scores, and weights were reviewed and approved by FCWD staff before incorporation into the risk assessment.

8.4.1 Consequence of Failure Criteria

The specific score values and weights for pipeline consequences of failure are documented below and summarized in Table 8.3.

Pipe Flow (50%): This criterion assesses the consequence of pipeline failure based on the maximum flow conveyed in the pipe based on the results from the existing hydraulic water model. Scores range from a value of 1 for pipelines that convey less than 50 gpm of flow to a value of 5 for pipelines with flows greater than or equal to 500 gpm. The peak flows in the modeled pipelines were extracted from the hydraulic model and are documented in Figure 8.3.

- **Pipe Diameter (20%)**: This criterion categories the pipeline by diameter. Failures in pipelines larger than 12-inch will have a greater level of service interruption than 6 or 8-inch pipelines. Scores range from a value of 5 for pipelines larger than 12-inch to a value of 1 for pipelines smaller than 4-inch. The pipeline diameters were identified and documented in Figure 8.4.



Legend

Consequence of Failure

- Very Low (Less than 50 gpm) (14.7 Miles, 44.9%)
- Low (50 - 100 gpm) (6.2 Miles, 18.9%)
- Moderate (100 - 250 gpm) (8.4 Miles, 25.6%)
- High (250 - 500 gpm) (2.3 Miles, 7.2%)
- Extreme (Greater than 500 gpm) (1.2 Miles, 3.6%)

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Figure 8.3
COF 1 - Pipe Flow
Water System Master Plan
Florin County Water District

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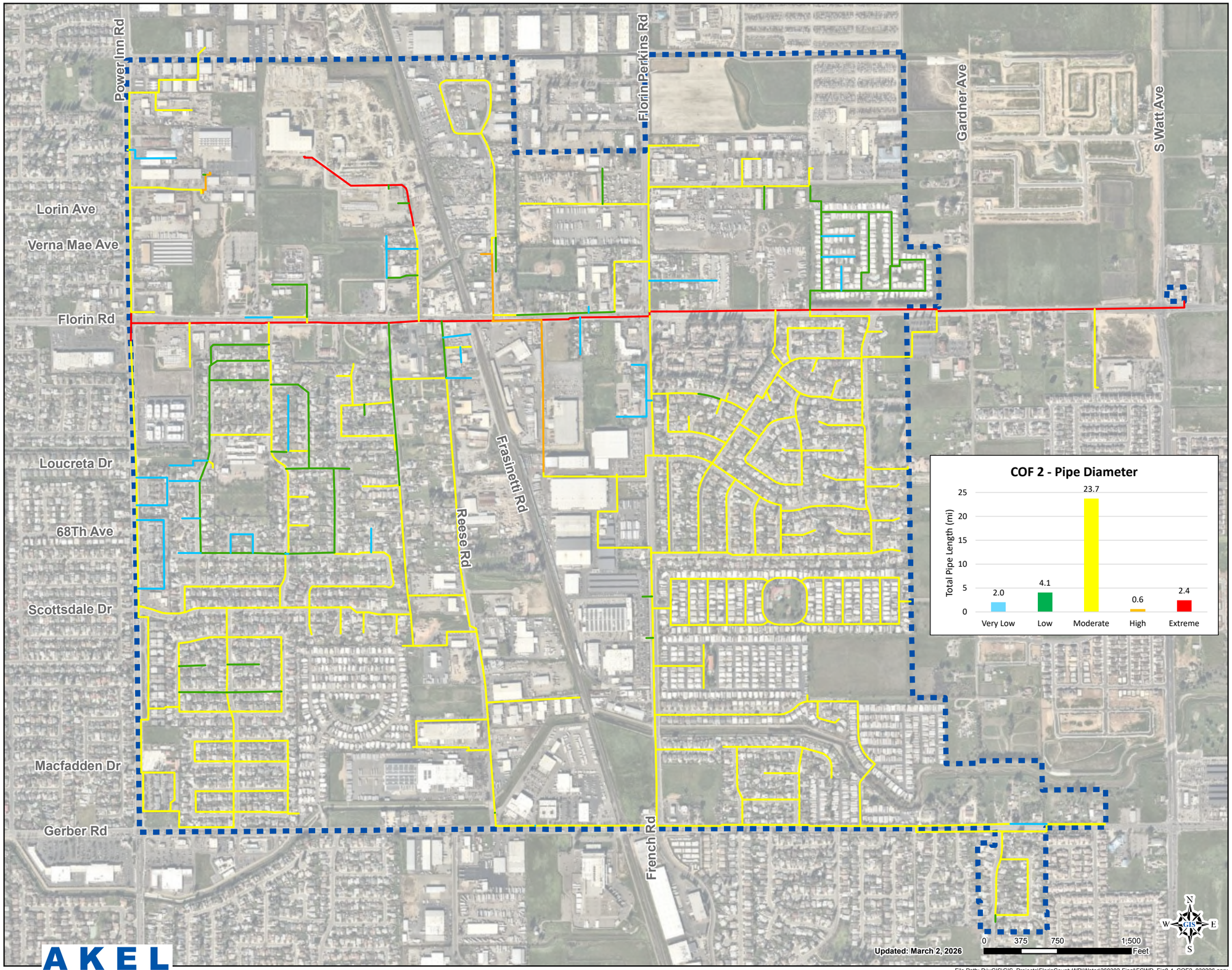

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Consequence of Failure

- Very Low (4" or Smaller) (2.0 Miles, 6.1%)
- Low (6") (4.1 Miles, 12.4%)
- Moderate (8") (23.7 Miles, 72.3%)
- High (10") (0.6 Miles, 1.8%)
- Extreme (12") (2.4 Miles, 7.4%)

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Figure 8.4
COF 2 - Pipe Diameter
Water System Master Plan
Florin County Water District

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Table 8.3 Consequence of Failure Criteria

Water System Master Plan

Florin County Water District

Consequence of Failure	Very Low	Low	Moderate	High	Extreme
Rating	1	2	3	4	5

No.	Failure Category	Consequence Category	Description	Weighting	Category Weighting	Measure or Proxy	Likelihood Scale				
1	Service Disruption	Pipe Flow	Failures in pipelines with higher flow can result in higher disruption of level of service.	50%	70%	Peak Flow	<50 gpm	50 - 100 gpm	100-250 gpm	250 - 500 gpm	>500 gpm
2		Pipe Diameter	Failures of larger diameter pipelines can lead to negative impacts of water delivery.	20%		Pipeline Diameter	≤4"	6"	8"	10"	12"
3	Public Exposure	Roads/Railroad Crossing	Failures of pipelines in high traffic areas/railroad crossings can be more costly repair and involve multiple jurisdictions.	20%	30%	Pipline Location and Proximity to Railroads	Local Road/ Other	-	-	Within 100 ft of Railroad	Arterials/ Intersect Railroad
4		Proximity to Critical Facilities	Critical facilities include schools, hospitals, large water users, and sources of water supply.	10%		Proximity to Critical Facilities	Other	-	-	-	In Close Proximity
				100%	100%						

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- **Major Road Crossing (20%)**: This criterion identifies pipelines that cross a highway or are within arterial roads. Water main breaks in a high-traffic area can be costlier to repair and can have adverse impacts to public opinion. The road types were determined by using GIS road shapefiles from the County's database. Scores range from a value of 5 for pipeline crossing highway roads, a value of 4 for pipeline crossing arterial roads, a value of 3 for pipeline crossing collector roads to a value of 1 for other pipelines. The existing pipelines near the aforementioned road types were identified and documented in **Figure 8.5**.

- **Critical Facilities (10%)**: This criterion characterizes the consequence of pipelines in close proximately of critical facilities, which includes hospitals, schools, prisons, daycare facilities, nursing care facilities, and large water users. Scores range from a value of 1 for pipelines not in proximity to a critical facility to a value of 5 for pipelines within 150 feet of critical facilities. Failure adjacent to schools and specific facilities may require greater level of maintenance, and more critical response. The existing pipelines in close proximity to critical facilities were identified and are documented on **Figure 8.6**.

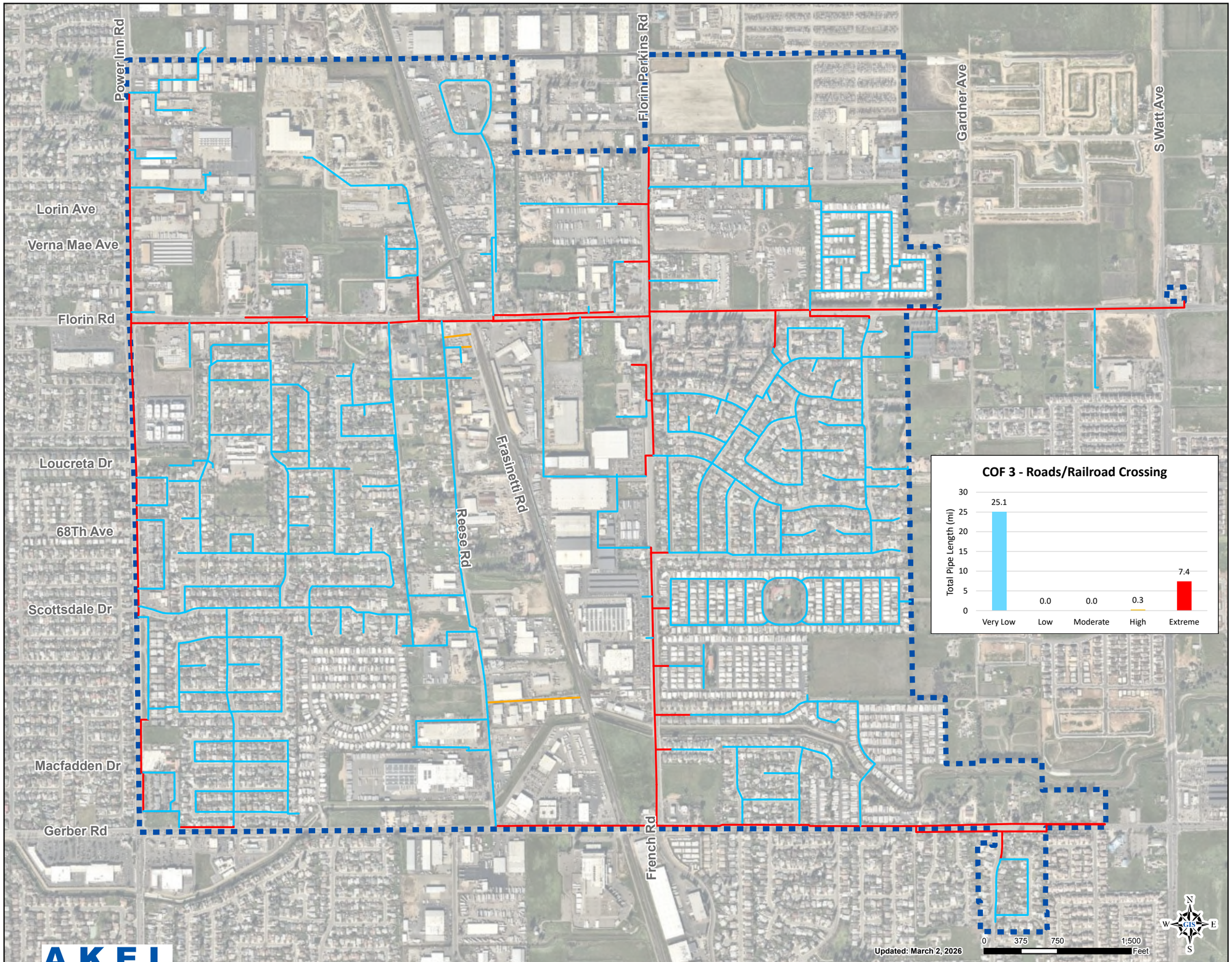
Based on the consequence of failure criteria, each pipeline was assigned a score. The breakdown of the pipeline COF is documented graphically on **Figure 8.7** and summarized below:

- Very Low: 12.4 (38%)
- Low: 5.3 miles (16%)
- Moderate: 10.0 miles (31%)
- High: 3.5 miles (11%)
- Extreme: 1.5 miles (5%)

8.4.2 Likelihood of Failure Criteria

The specific score values and weights for pipeline likelihood of failure are documented below and summarized in **Table 8.4**.

- **Remaining Useful Life (80%)**: This criterion assesses the likelihood of failure of pipelines based on the remaining useful life of the pipeline. The remaining useful life is based on the pipeline age and material and documented on **Table 8.5**. Scores range from a value of 1 for pipelines greater the 41 years left to a value of 5 for pipelines with less than 10 years remaining. The remaining useful life for the pipelines are documented in **Figure 8.8**.



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Consequence of Failure

- Very Low (Other) (25.1 Miles, 76.6%)
- High (Within 100ft of a Railroad) (0.3 Miles, 0.8%)
- Extreme (Arterial or Intersects Railroad) (7.4 Miles, 22.6%)

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Figure 8.5
COF 3 - Major Road Crossing
Water System Master Plan
Florin County Water District

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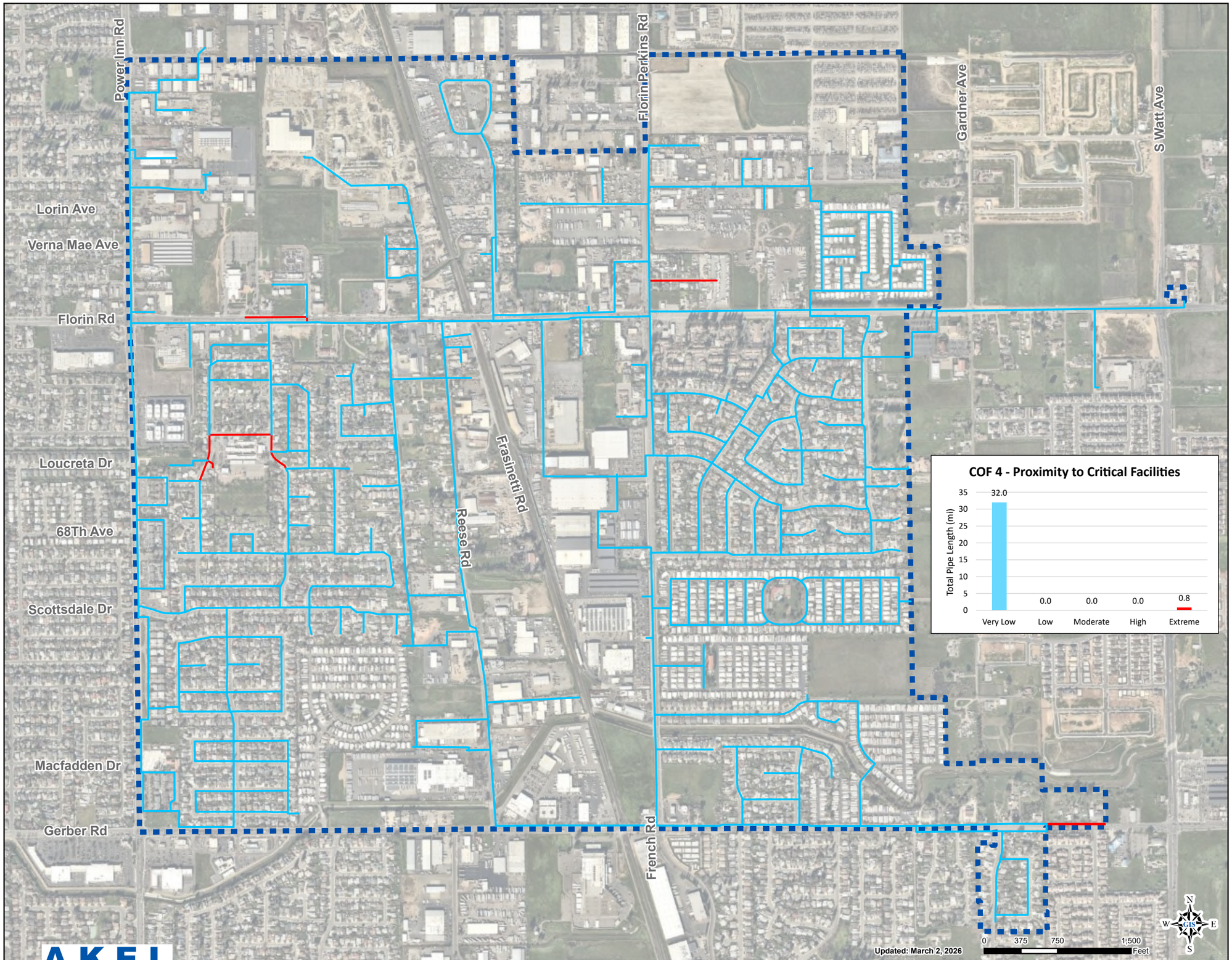

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Consequence of Failure

- Very Low (Other) (32.0 Miles, 97.6%)
- Extreme (Within 100 ft of a critical facility) (0.8 Miles, 2.4%)

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Figure 8.6
COF 4 - Critical Facilities
Water System Master Plan
Florin County Water District

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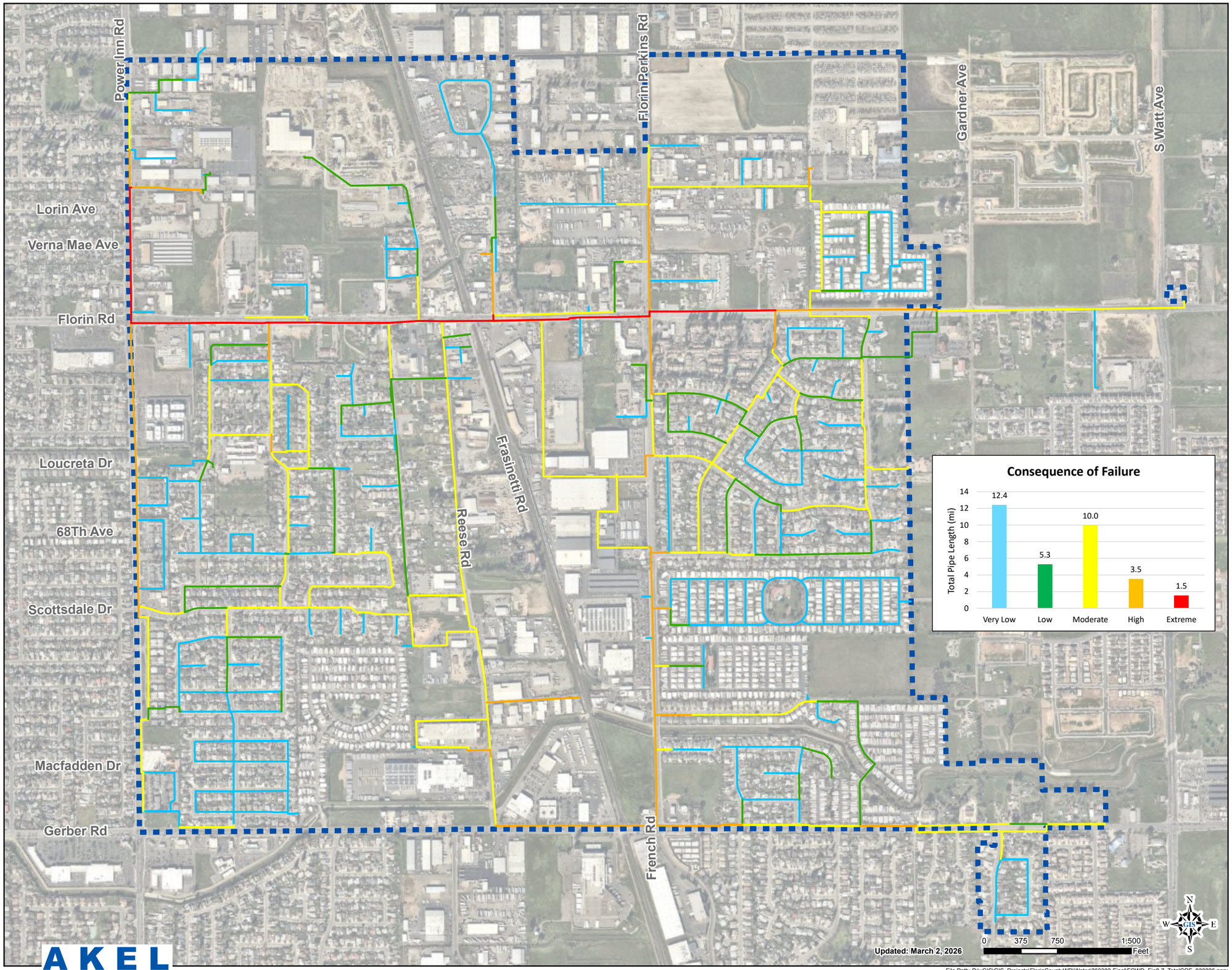

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Total Consequence of Failure

- Very Low (12.4 Miles, 37.9%)
- Low (5.3 Miles, 16.2%)
- Moderate (10.0 Miles, 30.5%)
- High (3.5 Miles, 10.7%)
- Extreme (1.5 Miles, 4.7%)

Water Purveyors

- Florin County Water District

Figure 8.7
Consequence of Failure
Water System Master Plan
Florin County Water District

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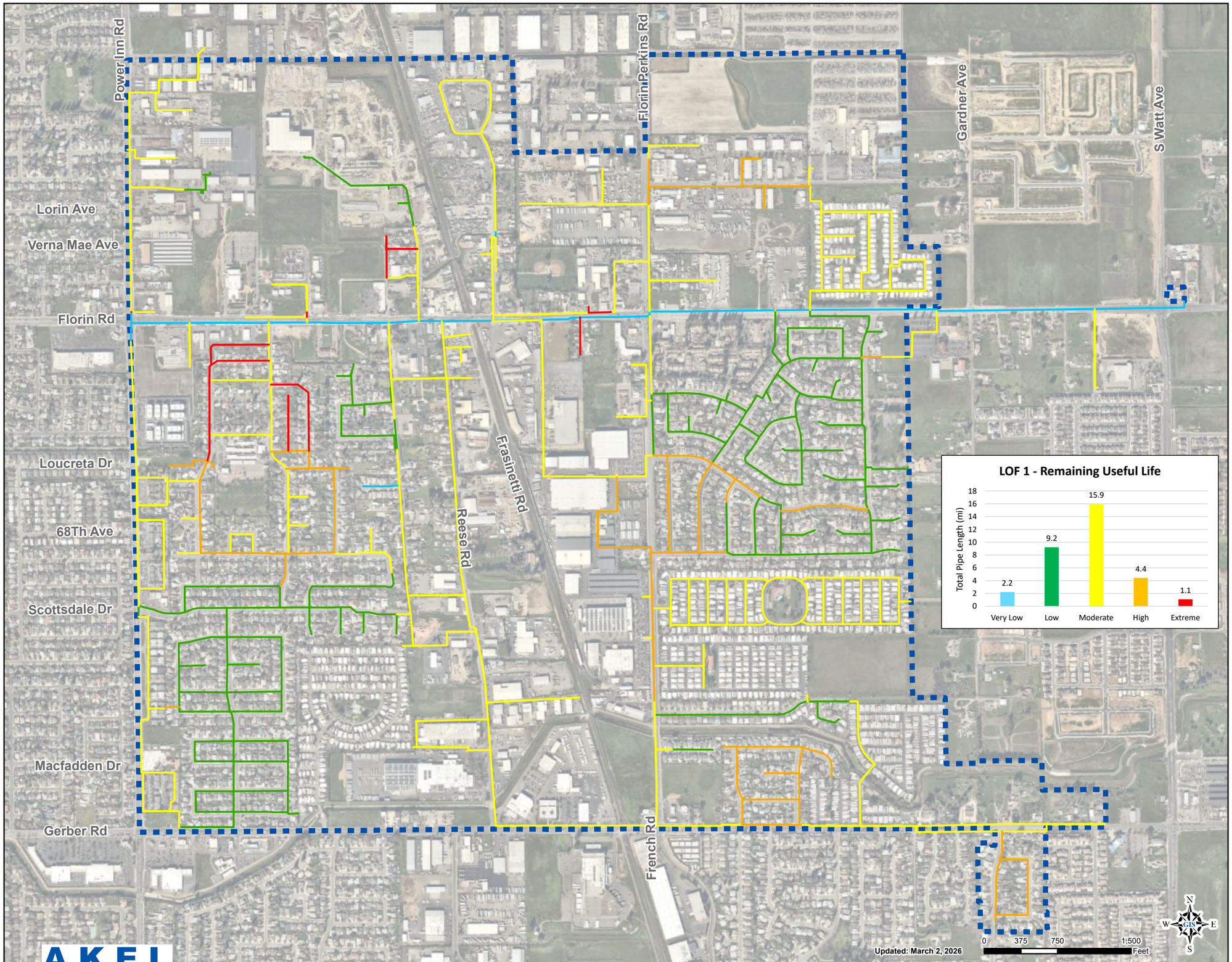

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Likelihood of Failure

- Very Low (51 Years or More) (2.2 Miles, 6.7%)
- Low (41 to 50 Years) (9.2 Miles, 28.1%)
- Moderate (31 to 40 Years) (15.9 Miles, 48.6%)
- High (21 to 30 Years) (4.4 Miles, 13.4%)
- Extreme (20 Years or Less) (1.1 Miles, 3.2%)

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Figure 8.8
LOF 1 - Remaining Useful Life
Water System Master Plan
Florin County Water District

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Table 8.4 Likelihood of Failure Criteria

Water System Master Plan

Florin County Water District

Likelihood of Failure	Very Low	Low	Moderate	High	Extreme
Rating	1	2	3	4	5

No.	Failure Type	Likelihood Category	Description	Weighting	Measure or Proxy	Likelihood Scale				
1	Structural	Remaining Useful Life	Life expectancy based on pipe age and material.	80%	Pipeline Age in Years	≥51 years	41 to 50 years	31 to 40 years	21 to 30 years	≤20 years
2	Hydraulic Velocity	Pipeline Velocities	Failure in mains larger negatively impact the delivery of water to the distribution system.	20%	Peak Pipeline Velocity	<1 fps	1-2 fps	2-3 fps	3-4 fps	>4 fps
				100%						

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Table 8.5 Remaining Useful Life

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Florin County Water District

Pipe Material	Definition	Estimated Useful Life
AC[1,4]	Asbestos Cement	90
CIP[1]	Cast Iron	105
HDPE[2]	High-Density Polyethylene	100
PVC[1]	Polyvinyl Chloride	70
STL[1]	Steel	95
UNK[3]	Unknown	90

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Notes :

1. EULs retrieved from "Buried No Longer," American Water Works Association
2. EUL retrieved from Plastic Pipe Institute (PPI) study
3. Unknown Pipe EUL was calculated as the average EUL of all materials.
4. Average of Long Service Life (LSL) * Short Service Life (SSL)

- **Pipeline Velocity (20%)**: This criterion assesses the likelihood of failure of pipelines based on the maximum pipeline velocity under peak hour demand. High water velocities can impact the expected service life of the pipelines. Scores range from a value of 1 for pipelines with maximum velocity less than 1 ft/s to a value of 5 for pipelines with maximum velocity larger than 4 ft/s. The maximum velocity in the modeled pipes were extracted from the hydraulic model and are shown in **Figure 8.9**.

Based on the likelihood of failure criteria each pipeline was assigned a score. The breakdown of the pipeline LOF is documented graphically on **Figure 8.10** and summarized below:

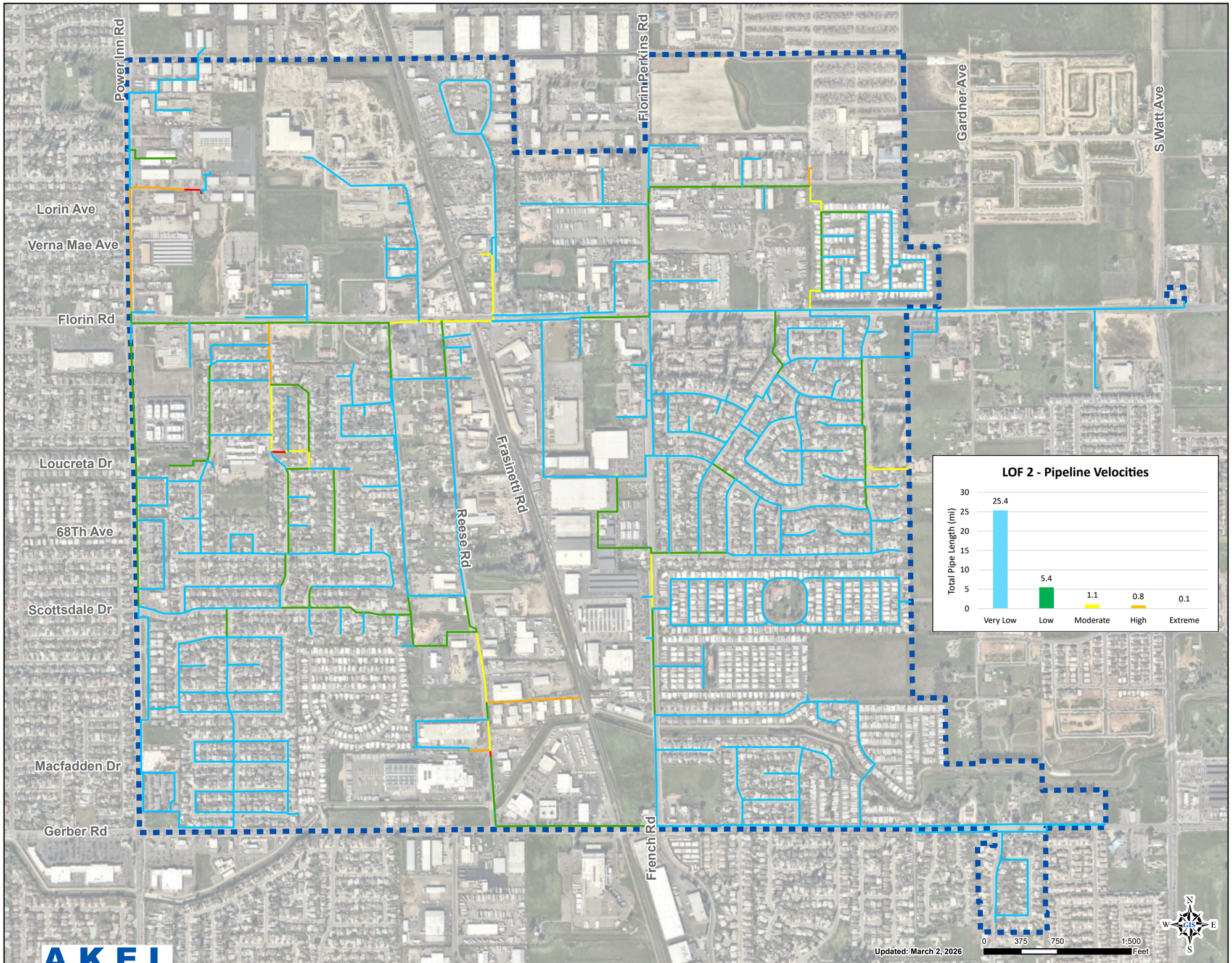
- Very Low: 2.2 miles (7%)
- Low: 9.1 miles (28%)
- Moderate: 15.3 miles (47%)
- High: 5.3 miles (16%)
- Extreme: 1.1 miles (3%)

8.5 RISK ANALYSIS RESULTS

The risk analysis was performed to assess the risk of failure of distribution mains within FCWD's domestic water distribution system. Using the consequence and likelihood of failure criteria discussed in the previous section, a consequence of failure score and likelihood of failure score was determined for each asset.

Based on the breakdown of the COF and LOF scores, thresholds were determined to classify the pipelines as Very Low, Low, Moderate, High, and Extreme risk. The breakdown of pipeline overall risk is briefly summarized as follows:

- **Very Low**: Approximately **0.1 miles** of pipelines are categorized as Very Low Risk, which represented 0.3% of all pipelines included in the risk analysis.
- **Low**: Approximately **17.6 miles** of pipelines are categorized as Low Risk, which represented 54% of all pipelines included in the risk analysis.
- **Moderate**: Approximately **9.0 miles** of pipelines are categorized as Moderate Risk, which represented 28% of all pipelines included in the risk analysis.
- **High**: Approximately **4.5 miles** of pipelines are categorized as High Risk, which represented 14% of all pipelines included in the risk analysis.



Legend

Likelihood of Failure

- Very Low (Less than 1 ft/s) (25.4 Miles, 77.5%)
- Low (1 - 2 ft/s) (5.4 Miles, 16.6%)
- Moderate (2 - 3 ft/s) (1.1 Miles, 3.3%)
- High (3 - 4 ft/s) (0.8 Miles, 2.3%)
- Extreme (Greater than 4 ft/s) (0.1 Miles, 0.3%)

Water Purveyors

- Florin County Water District

Figure 8.9
LOF 2 - Pipeline Velocity
Water System Master Plan
Florin County Water District

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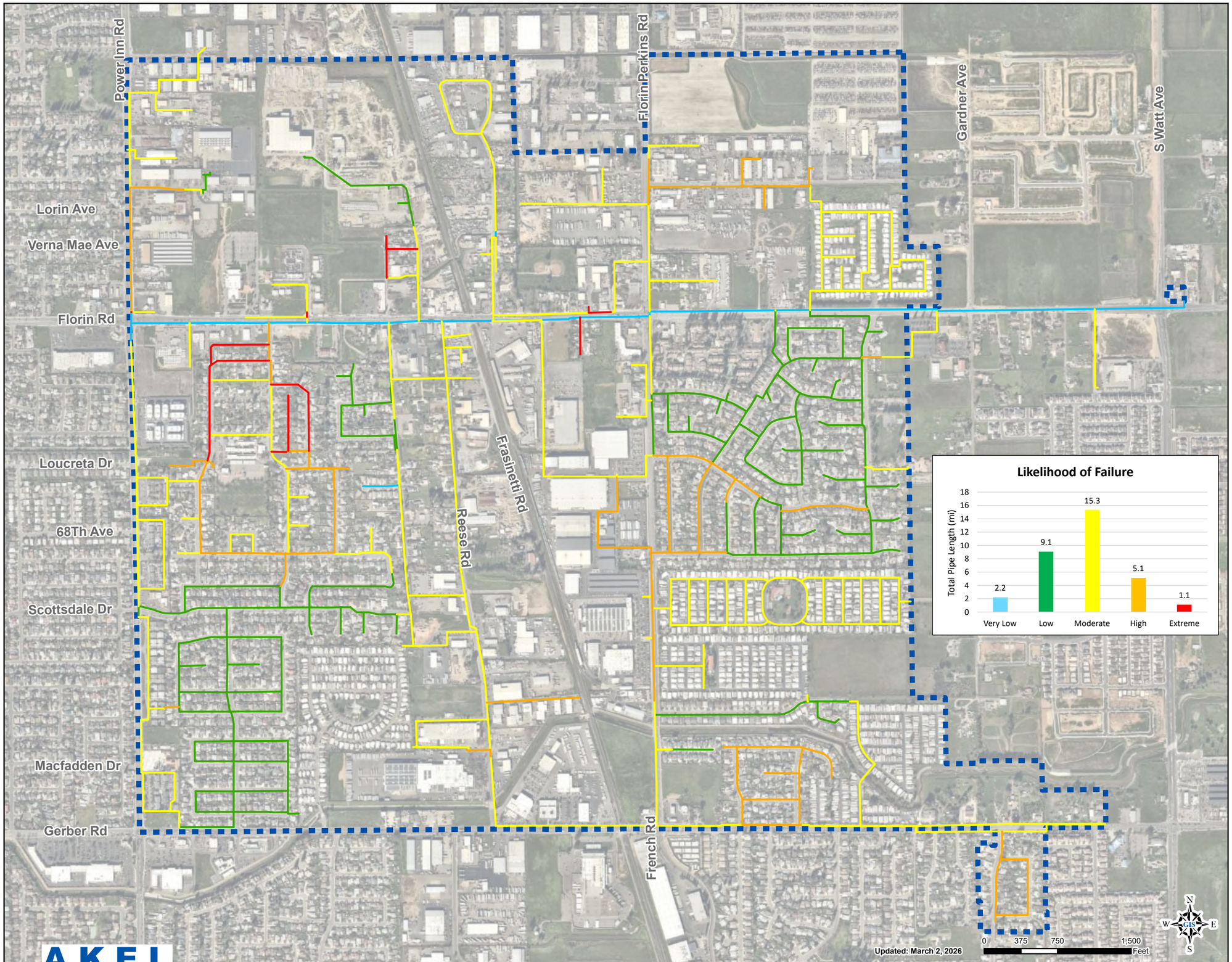

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Total Likelihood of Failure

- Very Low (2.2 Miles, 6.7%)
- Low (9.1 Miles, 27.7%)
- Moderate (15.3 Miles, 46.7%)
- High (5.1 Miles, 15.6%)
- Extreme (1.1 Miles, 3.3%)

Water Purveyors

- Florin County Water District

Figure 8.10
Likelihood of Failure
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\FCWD_Fig8-10_TotalLOF_030226.aprx

- **Extreme**: Approximately **1.5 miles** of pipelines are categorized as Extreme Risk, which represented 5% of all pipelines included in the risk analysis.

The results of the risk assessment are shown graphically on Figure 8.11. Failure of these pipelines results in a larger impact level of service. Overall, approximately 18 percent of the assessed pipelines were determined to have high or extreme risk of failure.

8.6 RECOMMENDED PIPELINE PRIORITY ANALYSIS

The following section summarizes the distribution main renewal and replacement priorities. These risk priorities are intended to acknowledge the criticality of each distribution main and should be used to guide capital improvement priorities and help FCWD staff justify the budget spending strategy.

8.6.1 Risk Analysis Priority Matrix

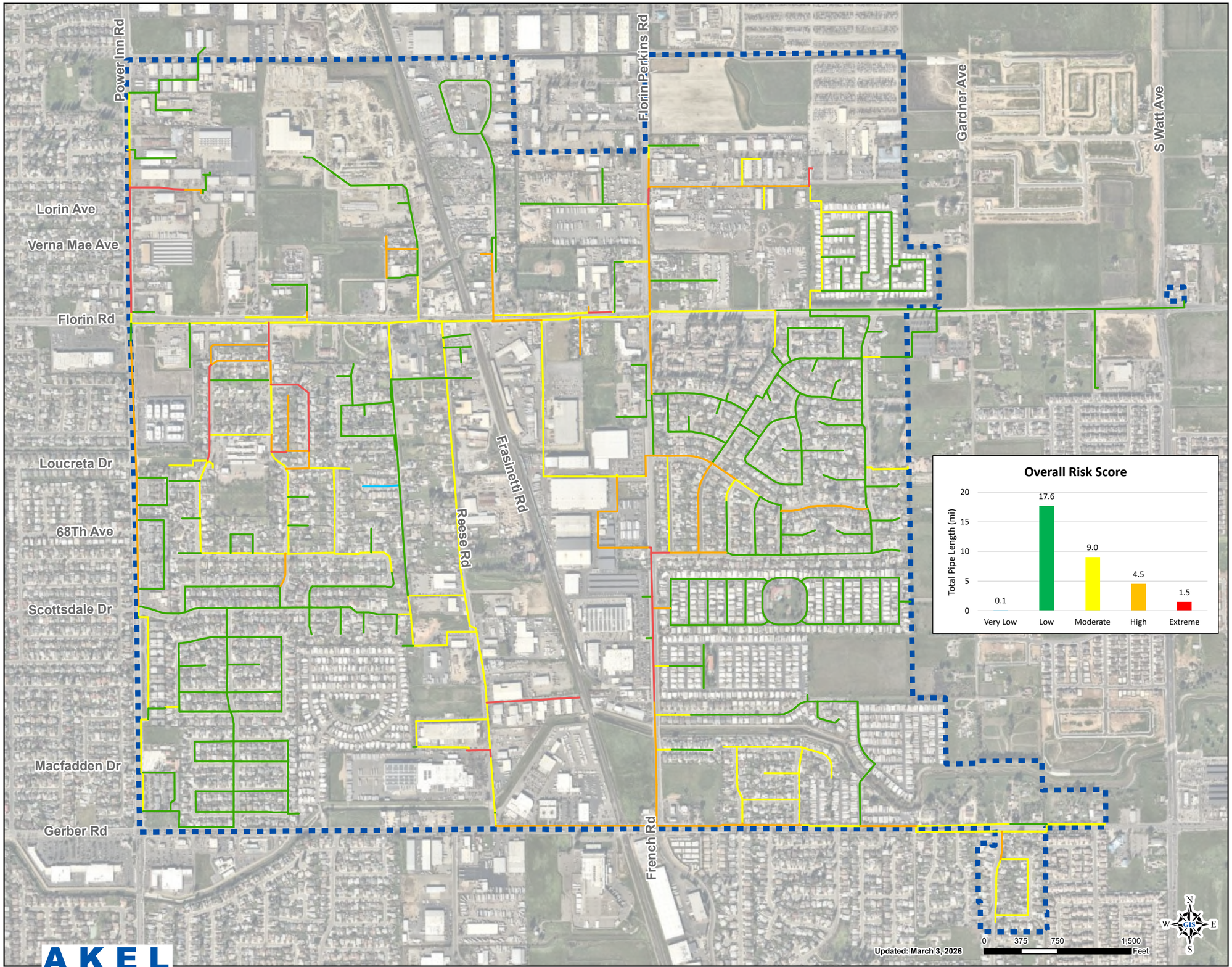
As part of the risk analysis, a risk assessment scoring and action plan matrix (Figure 8.2) was developed. The matrix provides a guideline for pipeline renewal priorities and monitoring priorities. Pipelines with extreme and high risk scores tend to have the highest likelihood of failure scores and should be targeted for replacement. Pipelines with high to medium risk scores tend to have a higher consequence of failure and should be regularly monitored.

- **Renewal:** Extreme and high risk pipelines with High or Extreme LOF (LOF score larger than 4) are more likely to have a failure in the near future and require more urgent replacement if funds are available.
- **Monitoring**: High and medium risk pipelines with Moderate or Low LOF (LOF score less than 3) and are typically in good condition. These pipelines require regular monitoring only.

These actions will change as the distribution mains age or when new leaks occur. It should be noted that these renewal and replacement actions are recommended based on asset information provided by FCWD during the risk assessment conducted. It might not represent the real condition in the field.

8.6.2 Pipeline Priority Analysis

Each pipeline was assigned a renewal or monitoring priority ranking based on the overall risk score, LOF, and COF scores from the Risk Analysis. The assigned priorities are briefly summarized as follows:



Legend

Overall Risk

- Very Low (0.1 Miles, 0.2%)
- Low (17.6 Miles, 53.9%)
- Moderate (9.0 Miles, 27.6%)
- High (4.5 Miles, 13.7%)
- Extreme (1.5 Miles, 4.6%)

Water Purveyors

- Florin County Water District

Figure 8.11
Risk Analysis
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\FCWD_Fig8-11_TotalRisk_030226.aprx

- **Renewal Priority:**
    - **Highest Priority:** This category includes pipelines with extreme risk ranking with a high LOF and COF score.
    - **High Priority**: This category includes pipelines with high risk ranking with a high LOF and a moderate COF score.
    - **Medium Priority**: This category includes pipeline with moderate risk ranking with a high LOF and a low COF score.
- **Monitoring Priority:**
    - **High Priority**: This category includes pipelines with high risk ranking with a moderate LOF and a high COF.
    - **Medium Priority**: This category includes pipeline with moderate risk ranking with a moderate to low LOF and a moderate COF score.
    - **Low Priority**: This category includes pipeline with low risk ranking with a low LOF and COF score.
    - **Occasional Priority**: This category includes pipelines with very low risk ranking and a very low LOF and COF score.

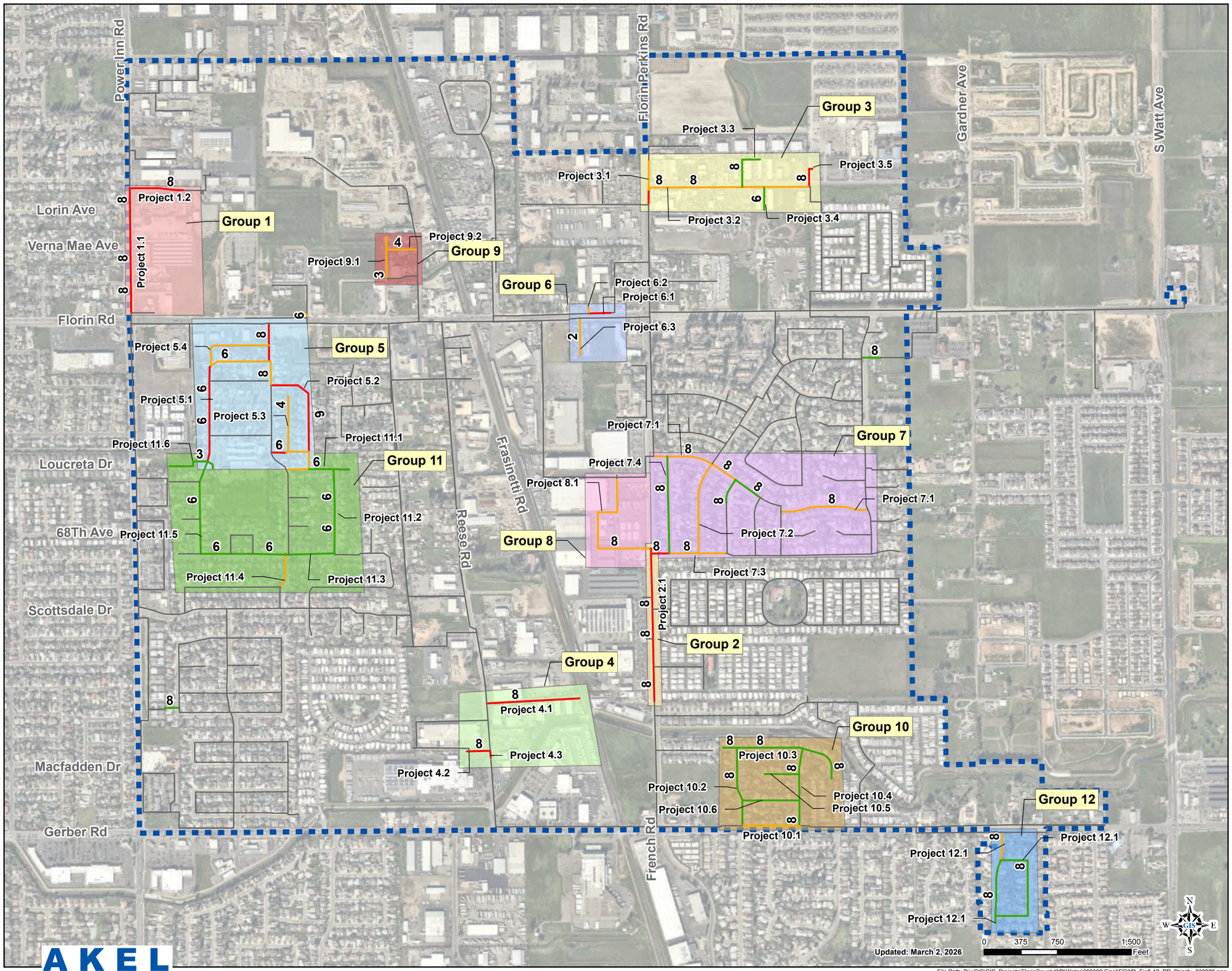
The results of the pipeline priority analysis are documented on **Figure 8.12**. This figure color codes each of the pipelines based on the renewal or monitoring priority.

8.6.3 Recommended Renewal and Replacement Priorities and Projects

The pipelines identified in the priority analysis as Highest, High, or Medium renewal were grouped into projects. The recommended pipeline improvement projects are documented on **Table 8.6** and graphically shown on **Figures 8.12**.

8.7 SUGGESTED PIPELINE REPLACEMENT BUDGET

The industry recommended goal of pipeline annual R&R budgets is 1.0% of system pipeline length for 100-year pipeline replacement cycle. FCWD has approximately 33 miles of pipelines and the estimated costs are $600 thousand per year, to maintain a pipeline replacement rate of 1.0% of system length per year (0.33 miles).



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Improvement Priority

- Highest
- High
- Medium
- Other

Improvement Groupings

- Group 1
- Group 2
- Group 3
- Group 4
- Group 5
- Group 6
- Group 7
- Group 8
- Group 9
- Group 10
- Group 11
- Group 12

Water Purveyors

- Florin County Water District

Figure 8.12
Risk Analysis Improvement Priorities
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\FCWD_Fig8-12_RR_Priority_030226.aprx

Table 8.6 Recommended Pipeline Priorities

Water System Master Plan

Florin County Water District

Itemized Cost Estimate												CIP Overlap	Improvement Priority	
Improvement Number	Type of Improvement	Alignment	Limits (Approximate)	Pipeline Improvements and Appurtenances Costs: Existing Diameter (in)	Renewal Type	Diameter (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)	Baseline Construction Cost ($)	Estimated Construction Cost[3] ($)	Capital Improvement Cost ($)	CIP Project Number	Construction Trigger	Priority
Risk and Renewal															
Years 1-5															
1.1	Pipe	Power Inn Rd	From 100 ft s/o Cantina Ct to Florin Rd	8	Replace	18	1,280	330	422,498	422,498	549,248	710,000	1-1 (Overlap)	Business Risk	Highest
1.2	Pipe	Perpindicular to Power Inn Rd	From Power Inn Rd to VendMart (VOS)	8	Replace	12	560	268	150,086	150,086	195,112	250,000	1-4 (Overlap), 1-22 (Partial Overlap)	Business Risk	Highest
2.1	Pipe	French Rd	From 50 n/o Danridge Dr to 140 ft n/o German Dr	8	Replace	12	1,590	268	426,138	426,138	553,979	720,000	1-21 (Overlap)	Business Risk	Highest
3.1	Pipe	Florin Perkins Rd	From 250 ft n/o Weyand Ave to 200 ft s/o Weyand Ave	8	Replace	12	460	268	123,285	123,285	160,271	210,000	1-13 (Partial Overlap)	Business Risk	Highest
3.2	Pipe	Weyand Ave	From Florin Perkins Rd to 1,640 ft e/o Florin Perkins Rd	8	Replace	12	1,650	268	442,218	442,218	574,884	750,000	1-14 (Overlap)	Business Risk	High
3.3	Pipe	Alley adjacent to Weyand Ave	950 ft from Florin Perkins Rd	8	Replace	12	470	268	125,965	125,965	163,755	210,000	1-15 (Overlap)	Business Risk	Medium
3.4	Pipe	Alley adjacent to Weyand Ave	1,180 ft from Florin Perkins Rd	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Not Applicable	Business Risk	Medium
3.5	Pipe	Alley adjacent to Weyand Ave	1,640 ft from Florin Perkins Rd	8	Replace	8	220	197	43,446	43,446	56,480	70,000	Not Applicable	Business Risk	Highest
4.1	Pipe	Alley adjacent to Reese Rd	From Reese Rd to railroad, 1,260 ft n/o Gerber Rd	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Not Applicable	Business Risk	Highest
4.2	Pipe	Alley adjacent to Reese Rd	From Reese Rd to parking lot fence, 780 ft n/o Gerber Rd	8	Replace	8	240	197	47,396	47,396	61,614	80,000	Not Applicable	Business Risk	Highest
4.3	Pipe	Reese Rd	Bounded by project 11.2 and 710 ft n/o Gerber Rd	8	Replace	12	70	268	18,761	18,761	24,389	30,000	1-16 (Partial Overlap)	Business Risk	Highest
End of years 1-5									*Subtotals:*	*2,032,822*	*2,642,669*	*3,430,000*			
Years 6-10															
5.1	Pipe	Diana Way	From Kara Dr to 275 ft s/o Vivian Ct	6	Replace	8	1,600	197	315,971	315,971	410,762	530,000	Not Applicable	Business Risk	Highest
5.2	Pipe	Kara Dr to Jerry Way	From Florin Road to Bruns Way	6, 8	Replace	8	1,830	197	361,392	361,392	469,809	610,000	Not Applicable	Business Risk	Highest
5.3	Pipe	Outside Right of Way	Area bounded by Kara Dr, Jerry Way, and Bruns Way	4, 6, 8	Replace	8	960	197	189,583	189,583	246,457	320,000	Not Applicable	Business Risk	Highest
5.4	Pipe	Oustide Right of Way	Within the ditch bounded by Kara Dr and Diana Way	6	Replace	8	790	197	156,011	156,011	202,814	260,000	Not Applicable	Business Risk	High
6.1	Pipe	Florin Rd	From Kingsley St to Precision Smog and Tune	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Not Applicable	Business Risk	Highest
6.2	Pipe	Kinglsey St	From Florin Rd	4	Replace	8	70	197	13,824	13,824	17,971	20,000	Not Applicable	Business Risk	High
6.3	Pipe	Simon St	From Florin Rd	2	Replace	8	380	197	75,043	75,043	97,556	130,000	Not Applicable	Business Risk	High
7.1	Pipe	Elaine Dr	From French Rd to Fletcher Fams Dr	8	Replace	8	2,350	197	464,082	464,082	603,307	780,000	Not Applicable	Business Risk	High
7.2	Pipe	Hayward Dr	From Elaine Dr to Danridge Dr	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Not Applicable	Business Risk	High
7.3	Pipe	Danridge Dr	From French Rd to Alden Way	8	Replace	8	770	197	152,061	152,061	197,679	260,000	Not Applicable	Business Risk	Highest
7.4	Pipe	Branbury Way	From Elaine Dr to Danridge Dr	8	Replace	8	1,000	197	197,482	197,482	256,726	330,000	Not Applicable	Business Risk	Medium
End of years 6-10									*Subtotals:*	*2,158,477*	*2,806,020*	*3,640,000*			
Years 11+															
8.1	Pipe	Outside Right of Way	Surrounding truck yard, French Rd bounded by Elaine Dr and Danridge Dr	8	Replace	8	1,450	197	286,349	286,349	372,253	480,000	Not Applicable	Business Risk	High
9.1	Pipe	McCurdy Ln	Florin Creek to 430 ft n/o Florin Creek	2, 3	Replace	8	570	197	112,565	112,565	146,334	190,000	Not Applicable	Business Risk	High
9.2	Pipe	Oustide Right of Way	From 320 ft n/o Florin Creek, bounded by McCurdy Ln and Tokay Ave	4	Replace	8	320	197	63,194	63,194	82,152	110,000	Not Applicable	Business Risk	High
10.1	Pipe	Gerber Rd	From Glacken Way to El Terraza Dr	8	Replace	8	610	197	120,464	120,464	156,603	200,000	Not Applicable	Business Risk	High
10.2	Pipe	Glacken Way	From Napier Way to Gerber Rd	8	Replace	8	810	197	159,960	159,960	207,948	270,000	Not Applicable	Business Risk	Medium
10.3	Pipe	Napier Way	From 150 ft w/o Glacken Way to Skybrook Ln	8	Replace	8	1,310	197	258,701	258,701	336,312	440,000	Not Applicable	Business Risk	Medium
10.4	Pipe	El Terraza Dr	From Napier Way to Gerber Rd	8	Replace	8	800	197	157,986	157,986	205,381	270,000	Not Applicable	Business Risk	Medium
10.5	Pipe	Fairlawn Ct	From El Terraza Dr	8	Replace	8	340	197	67,144	67,144	87,287	110,000	Not Applicable	Business Risk	Medium
10.6	Pipe	Theodore Ave	From Glacken Way to El Terraza Dr	8	Replace	8	590	197	116,514	116,514	151,469	200,000	Not Applicable	Business Risk	Medium
11.1	Pipe	Bruns Way	From Kara Dr to 125 ft e/o Dave St	6	Replace	8	650	197	128,363	128,363	166,872	220,000	Not Applicable	Business Risk	High
11.2	Pipe	Dave St	From Bruns Way to Judette Ave	6	Replace	8	870	197	171,809	171,809	223,352	290,000	Not Applicable	Business Risk	Medium
11.3	Pipe	Judette Ave	From Diana Way to Dave St	4, 6	Replace	8	1,370	197	270,550	270,550	351,715	460,000	Not Applicable	Business Risk	Medium
11.4	Pipe	Kara Dr	From Judette Ave to Mills Gap Way	8	Replace	8	350	197	69,119	69,119	89,854	120,000	Not Applicable	Business Risk	High
11.5	Pipe	Diana Way	From 275 ft s/o Vivan Ct to Judette Ave	6	Replace	8	960	197	189,583	189,583	246,457	320,000	Not Applicable	Business Risk	Medium
11.6	Pipe	Outside Right of Way	From 375 ft w/o Diana Way to Diana Way Well	3, 8	Replace	8	550	197	108,615	108,615	141,200	180,000	Not Applicable	Business Risk	Medium
12.1	Pipe	Soutbreeze Dr and Eastbreeze Cir	From Gerber Rd to 2nd intersection of Southbreeze Dr and Eastbreeze Cir	6, 8	Replace	8	2,110	197	416,687	416,687	541,693	700,000	Not Applicable	Business Risk	Medium
End of years 11+									*Subtotals:*	*2,697,603*	*3,506,883*	*4,560,000*			
											Total	**11,630,000**			

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3/3/2026

Notes:

1. Baseline construction costs plus 30% to account for unforeseen events and unknown conditions.
2. Estimated construction cost plus 30% to cover other costs including: engineering design, project administration (developer and City staff), construction management and inspection, and legal costs.
3. Construction costs estimated using September 2025 ENR CCI of 13928

CHAPTER 9 – WATER QUALITY CONSIDERATIONS

This chapter was prepared by MNS Engineers Inc. and documents the water quality monitoring regulations, special monitoring requirements, and current monitoring and frequency.

9.1 OVERVIEW

The Florin County Water District (FCWD) was formed on October 19, 1959, to provide a centralized water supply for the Old Florin Town area in unincorporated south Sacramento County. From its inception, FCWD has relied almost entirely on groundwater rather than surface water imports. State records describe FCWD as a community water system with groundwater as its primary source since 1976, and FCWD's own materials note that all water is produced from 10 production wells spread across roughly 2,668 acres. FCWD's state records also show that the system serves 7,831 people through 2,630 connections (SWRCB, 2025).

The wells tap the South American Subbasin of the Central Valley (Basin) aquifer system, a thick sequence of interbedded sands and silts that underlies the Florin area. Regional hydrogeologic investigations show a groundwater level range of 60–80 feet below ground surface near Florin Road and Power Inn Road, with municipal wells screened substantially deeper—around 170-290 feet below ground—so that production zones are separated from shallower contaminated intervals. This pattern is evident in a State Water Board case closure for a leaking underground storage tank at Power Inn Road, which documented shallow petroleum impacts but no detections in the nearby public supply well that had been monitored since 2002 (SWRCB, 2010). This case illustrates how FCWD and other local purveyors have historically depended on deeper municipal wells to protect drinking water quality in an urbanized setting.

Current state records list active wells at Diana Way, Fletcher Farms, Florin Road, French Road, Kara, McComber, Power Inn, Reese, Reese 02, and Weyand, along with three treatment facilities associated with these wells and three emergency interties (two with California American Water's Parkway system and one with the Sacramento County Water Agency).

Recent Basin-wide groundwater planning documents provide an overview of how FCWD fits into the larger regional picture. Modeling work for the Cosumnes–South American (CoSANA) effort estimates that FCWD's water supply averages roughly a few thousand

acre-feet per year (AFY), which remains 100 percent groundwater-dependent, while some neighboring agencies have shifted toward blended surface-water supplies (Woodard and Curran, 2021). According to the Basin Sustainability Plan, one FCWD monitoring point (Kara Well) may currently be offline pending installation of a filtration unit before it can be returned to service. FCWD is experiencing evolving water-quality issues as new Maximum Contaminant Levels (MCLs) are promulgated and regulations are added. Some treatment schemes are being evaluated at the Basin level due to these emerging concerns (NDGSA, 2024).

Despite its small size, FCWD wells are now part of a heavily monitored groundwater basin with formal sustainable management criteria for water levels and water quality. Basin-wide reporting indicates that groundwater elevations in 2024 remained above minimum thresholds in the majority of representative monitoring wells and that nitrate and salinity objectives were generally met, suggesting that the underlying aquifer system on which FCWD relies is, at present, managed within sustainable bounds.

Together, these records show a system that has consistently been reliant on local groundwater, with a wellfield that has gradually evolved through well additions, abandonments, interties, and new treatment needs as the Florin area urbanized and regulatory expectations increased.

9.2 REGULATORY COMPLIANCE OVERVIEW

As a system, FCWD (CA PWS ID: CA3410033) is categorized as a small public water system serving fewer than 10,000 residents. The following section outlines regulatory frameworks applicable to Florin and summarizes FCWD's performance and compliance status.

9.2.1 Total Coliform Rule (TCR) & Revised Total Coliform Rule (RTCR)

The Total Coliform Rule (TCR) requires routine sampling of the distribution system to detect the presence of total coliforms and E. coli. California's revised TCR (effective July 1, 2021) replaces the former MCL with a treatment technique (TT) requirement based on the identification and correction of sanitary defects.

FCWD RTCR Compliance Notes:

- No total coliform or E. coli violations were reported in the datasets reviewed.
- Compliance requires maintenance of a current bacteriological sample siting plan and readiness for Level 1 or Level 2 assessments if triggered.

9.2.2 Groundwater Rule (GWR)

This rule mandates sanitary surveys, source monitoring, and corrective actions when microbial indicators are detected. FCWD's wells are subject to GWR provisions due to their groundwater source type.

FCWD GWR Compliance Notes:

- No recent total coliform detections were found in the data reviewed, indicating good sanitary conditions at the wells.
- Each well must be sampled for total coliform annually, even if chlorination treatment is provided.

9.2.3 Lead and Copper Rule (LCR & LCRR)

The Lead and Copper Rule (LCR) requires public water systems to monitor lead and copper levels at consumers' taps every 3 years, implement corrosion control measures, and replace lead service lines when action levels are exceeded. The LCR Revisions (LCRR), effective October 16, 2024, add further requirements for service line inventories, school testing, and enhanced sampling.
Under the LCRR, all community and non-transient non-community systems must:

- Complete and submit a full lead service line inventory by October 16, 2024
- Notify consumers of the presence of lead, galvanized, or unknown lines by November 15, 2024

FCWD LCRR Compliance Status

- Tap Sampling Results: No elevated lead or copper levels were identified in the data reviewed.
- Monitoring Violation: The system received a formal notice of violation (NOV) dated November 18, 2025, for failure to complete or report required follow-up or routine tap monitoring under the LCR for the 2023–2025 compliance period.
    - Details of the Violation Received in 2025:
        - Violation Type: Monitoring and Reporting; FCWD failed to collect the required samples by the due date in the monitoring year for 2025.
        - Enforcement Action: Notice of Violation Issued

9.2.4 Hexavalent Chromium Rule

California's reinstated MCL for hexavalent chromium (10 µg/L) became enforceable in October 2024, with compliance due by 2027–2028 depending on system size.
Table 9.1 provides a current overview of FCWD's compliance with the hexavalent chromium limits. FCWD is currently showing no exceedances, but the McComber Well

Table 9.1 Hexavalent Chromium Results (MCL is 10 ug/L)

Water System Master Plan

Florin County Water District

Well Name	2023	2024	2025	Average	Max
Diana Well	**6.7**			6.7	6.7
Fletcher Farms Well	4.8	5.6	**6.1**	5.5	6.1
Florin County Well		3	**5.8**	5	6.2
Florin Road Well				6.7	6.7
Kara Well				6.3	6.3
McComber Well			**8.5**	8.17	8.5
Power Inn Well			**7.6**	7.3	7.6
Reese Well 1		**7.9**		6.9	7.9
Reese Well 2			**6.7**	6.7	6.7
Weyland Well 10			**7.5**	7.5	7.5

Note:

3/2/2026

1. All Units are ug/L and Highest Values in Bold

has an average value of 8.17 ug/L and a high sample result of 8.5 ug/L. All of the sampled wells are above 50 percent of the MCL on average.

9.2.5 Arsenic Rule

Arsenic is a naturally occurring element that can enter drinking water supplies through erosion of natural deposits or from industrial and agricultural activities. Historically, the U.S. EPA set the arsenic MCL at 50 µg/L, but this was reduced to 10 µg/L in 2001 to better protect public health based on evidence linking long-term exposure to increased risks of cancer, skin lesions, and cardiovascular effects. California adopted the same standard and continues to require routine arsenic monitoring to ensure compliance, particularly in groundwater-dependent systems where low levels of arsenic are common.

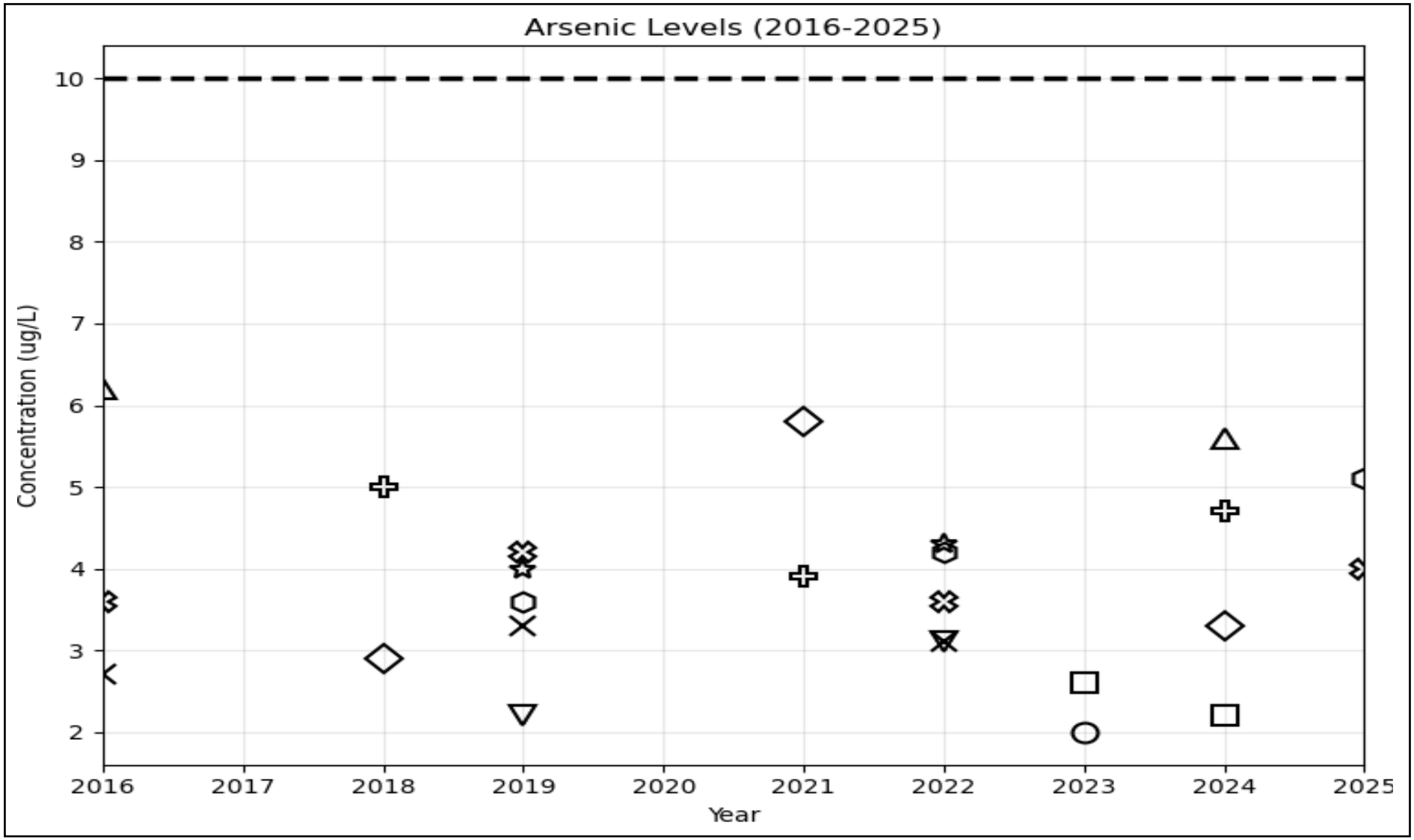
Table 9.2 presents arsenic concentrations (µg/L) at ten wells in Florin County Water District from 2019 to 2025. All reported values remain below the current MCL of 10 µg/L, with the highest levels observed at Florin County Well (historic peak of 6.2 µg/L in 2016) and Reese Well 2 (5.1 µg/L). Most other wells exhibit average arsenic concentrations between 2 and 4.5 µg/L, indicating consistent low-level presence system-wide. Although no values currently exceed regulatory limits, the persistence of arsenic in multiple wells underscores the importance of ongoing monitoring and possible blending or treatment planning to maintain long-term compliance. Figure 9.1 shows the current values detected in the FCWD wells.

9.2.6 PFAS Monitoring and Limits

Both the EPA and California have set new rules for PFAS. The comparison of the two sets of regulations follows in Table 9.3.

Overview of PFAS Regulations

The U.S. EPA's regulation of PFAS was driven by an extensive body of scientific evidence showing that these "forever chemicals" are highly persistent, bioaccumulative, and linked to serious health effects, including cancer, liver and kidney damage, thyroid disruption, and developmental impacts in children. In its April 10, 2024, National Primary Drinking Water Regulation (NPDWR), EPA established enforceable MCLs of 4 ppt for PFOA and PFOS, and 10 ppt for PFNA, PFHxS, and GenX (HFPO-DA) with a hazard index for certain mixtures. The rule is based on EPA's statutory obligation under the SDWA to set limits "as close to the public health goal as feasible," considering treatment and cost. This action was justified by EPA's finding that no level of exposure to PFOA and PFOS is considered safe, and the regulated levels reflect both health risk and feasibility of reliable measurement and treatment.



LEGEND

- Diana Well
- Fletcher Farms Well
- Florin County Well
- Florin Road Well
- Kara Well
- Mccomber Well
- Power Inn Well
- Reese Well 1
- Reese Well 2
- Weyland Well 10
- MCL 10 ug/L

December 12, 2025

Figure 9.1
Arsenic Values (ug/L) Compared to MCL of 10 ug/L
Water System Master Plan
Florin County Water District

Table 9.2 Arsenic Results (MCL is 10 ug/L)

Water System Master Plan

Florin County Water District

Well Name	2019	2020	2021	2022	2023	2024	2025	Average	Max
Diana Well					2			2	2
Fletcher Farms Well					**2.6**	2.2		2.4	2.6
Florin County Well						**5.6**		5.9	6.2
Florin Road Well			**5.8**			3.3		4	5.8
Kara Well	2.2			**3.1**				2.65	3.1
McComber Well	**3.3**			3.1				3.03	3.3
Power Inn Well	4			**4.3**				4.15	4.3
Reese Well 1			3.9			**4.7**		4.53	5
Reese Well 2	3.6			4.2			**5.1**	4.3	5.1
Weyland Well 10	**4.2**			3.6			4	3.85	4.2

Note:

1. All Units are ug/L and Highest Historical Values in Bold

Table 9.3 PFAS Limits for EPA and California

Water System Master Plan

Florin County Water District

PFAS Compound	EPA (2024 Final Rule)	California (as of 2024) (NL = Notification Level / RL = Response Level)	
PFOA	4 ppt (MCL)	NL: 5.1	RL: 10
PFOS	4 ppt (MCL)	NL: 6.5	RL: 10
PFHxS	10 ppt (MCL)	NL: 20	RL: 30
PFNA	Hazard Index (HI=1)	NL: 10	RL: 60
HFPO-DA (GenX)	10 ppt (MCL)	NL: 5	RL: 300
PFBS	Hazard Index (HI=1)	NL: 500	RL: 5000

In California, the Division of Drinking Water (DDW) and OEHHA have undertaken parallel rule-making to implement these PFAS limits. OEHHA adopted public health goals (PHGs) of 0.007 ng/L for PFOA and 1 ng/L for PFOS on April 5, 2024. California's statutory rule (Health and Safety Code 116365) requires that primary MCLs be set as close to the PHGs as technically and economically feasible. In this way, the EPA sets its limits, and California must adopt an equivalent or lower MCL. The state's rule-making record emphasizes that widespread detection of PFAS in both groundwater and surface supplies, and the likelihood of public exposure (especially via small systems), warrants enforceable standards and monitoring.

At Diana Way Well, both PFOA (10 ng/L) and PFOS (11 ng/L) exceed the EPA's 2024 MCL of 4 ng/L. All other PFAS compounds detected remain below current regulatory thresholds. Several other PFAS, such as PFNA, PFHxA, and PFPeA, may have been detected, but do not currently have federal MCLs and are still being monitored for potential risk as documented on **Table 9.1**.

In the Kara Well, both PFOA (11 ng/L) and PFOS (5.4 ng/L) exceed the EPA's 2024 MCL of 4 ng/L. These exceedances may trigger future treatment evaluation and public notification requirements if confirmed through routine monitoring. as documented on **Table 9.5**.

At Reese Well 02, PFOA was detected at 7.45 ng/L, exceeding the EPA's MCL of 4 ng/L. Other PFAS compounds, including PFHxA and PFHpA, were also detected but are not currently subject to federal MCLs as documented on **Table 9.6**.

At Florin Road Well, PFOA was detected at 4.23 ng/L, just above the EPA's 2024 MCL of 4 ng/L. PFHxA and PFHpA were also present but are not currently regulated with enforceable MCLs as documented on **Table 9.7**.

Overall Florin PFAS Compliance Notes:

Given the PFAS detections at Diana Way Well, Kara Well, Reese Well 02, and Florin Road Well, all of which show PFOA and/or PFOS concentrations exceeding the EPA's 2024 MCL of 4 ng/L, FCWD will need to prepare for targeted PFAS mitigation to remain in regulatory compliance. Although current detections do not yet trigger treatment mandates, the system should begin evaluating response actions, such as confirmatory monitoring, public notification, and the development of a PFAS compliance plan, before the 2027–2029 implementation deadlines.

To address these exceedances, water systems typically rely on treatment technologies proven effective for PFAS removal, such as:

Table 9.4 Diana Way Well PFAS Results

Water System Master Plan

Florin County Water District

Well Name	PFAS Compound	Avg Detected (ng/L)	MCL (ng/L) (EPA 2024)	Exceeds EPA MCL?
Diana Way Well	PFBA	2.8	NA	NA
Diana Way Well	PFBS	2.4	NA	No
Diana Way Well	PFHpA	7.2	NA	NA
Diana Way Well	PFHxA	7	NA	NA
Diana Way Well	PFNA	3.7	10	No
Diana Way Well	PFOA	10	4	**Yes**
Diana Way Well	PFOS	11	4	**Yes**
Diana Way Well	PFPeA	5.7	NA	NA

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Table 9.5 Kara Well PFAS Results

Water System Master Plan

Florin County Water District

Well Name	PFAS Compound	Avg Detected (ng/L)	MCL (ng/L) (EPA 2024)	Exceeds EPA MCL?
Kara Well	PFOA	11	4	Yes
Kara Well	PFOS	5.4	4	Yes

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Table 9.6 Reese Well 02 PFAS Results

Water System Master Plan

Florin County Water District

Well Name	PFAS Compound	Avg Detected (ng/L)	MCL (ng/L) (EPA 2024)	Exceeds EPA MCL?
Reese Well 02	PFOA	7.45	4	Yes
Reese Well 02	PFHxA	6.35	NA	NA
Reese Well 02	PFHpA	9.1	NA	No

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Table 9.7 Florin Road Well PFAS Results

Water System Master Plan

Florin County Water District

Well Name	PFAS Compound	Avg Detected (ng/L)	MCL (ng/L) (EPA 2024)	Exceeds EPA MCL?
Florin Road Well	PFOA	4.23	4	Yes
Florin Road Well	PFHxA	4.85	NA	No
Florin Road Well	PFHpA	4.27	NA	No

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- Granular Activated Carbon (GAC) – widely used and effective, particularly for long-chain PFAS like PFOA and PFOS.
- Anion Exchange (IX) – uses specialized resins that selectively remove PFAS compounds and often provide higher efficiency than GAC, especially for short-chain variants.
- Reverse Osmosis (RO) – a pressure-driven membrane process capable of removing nearly all PFAS, though it's typically costlier and produces a brine waste stream that requires disposal.

Florin's next steps should include bench-scale testing or pilot studies to determine the most cost-effective and operationally feasible treatment method for its specific water chemistry and PFAS profile.

9.2.7 Manganese Current and Upcoming Monitoring and Limits

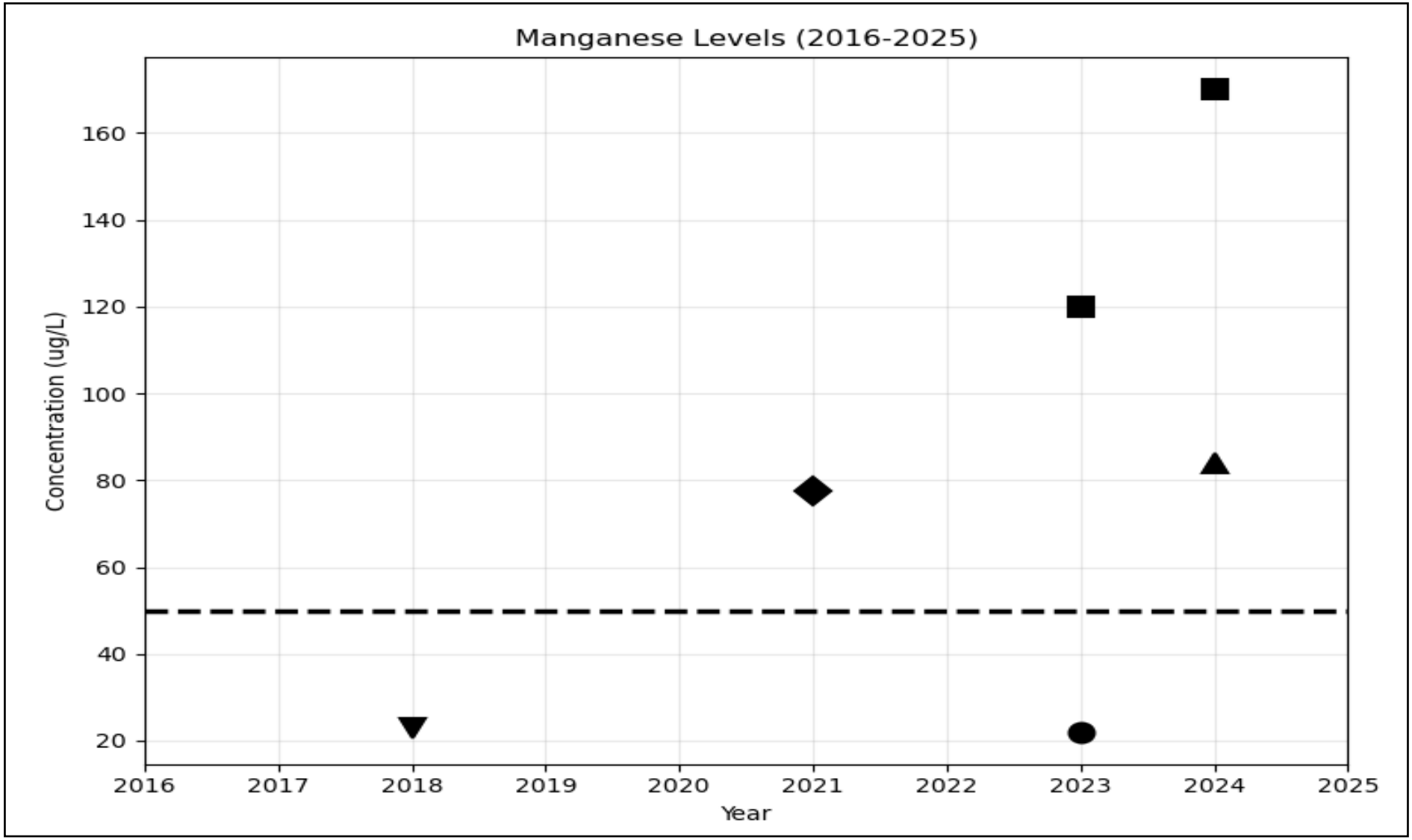
California currently regulates manganese with a secondary MCL of 50 µg/L for aesthetics and a health-based notification level of 500 µg/L, but has not adopted a separate primary MCL.

- Current Secondary MCL: 50 µg/L (aesthetic)
- Current Notification Level: 500 ug/L (health based)

Figure 9.2 shows manganese concentrations from 2016 to 2025 across five Florin County wells: Fletcher Farms Well (120 and 170 µg/L), Florin County Well (85 µg/L), and Florin Road Well (78 µg/L) all exceed the secondary standard, while Reese Well 1 and Diana Well stay below about 25 µg/L. Although all results are well below the health-based advisory levels, repeated exceedances of the secondary MCL indicate an elevated risk of staining, taste complaints, and distribution-system deposition, justifying continued monitoring and potential future iron/manganese treatment at the higher-manganese wells. In addition, if manganese enters the distribution system consistently over time, it can lead to black water as it oxidizes and adheres to the system's piping. When pressure and flow fluctuate, it may be dislodged, allowing much higher concentrations of manganese to become suspended. Managing manganese at the source is generally the best practice, especially where distribution water quality concerns have arisen.

9.2.8 Nitrate Monitoring

Nitrate has an acute MCL of 10 mg/L. Quarterly monitoring is required for sources exceeding 5 mg/L. Currently, FCWD has no wells that indicate a near-MCL exceedance. Although nitrate has been an issue in the area, the FCWD wells are likely too deep to be impacted by surface-level contamination. The nitrate monitoring results are documented on **Figure 9.3**.



LEGEND

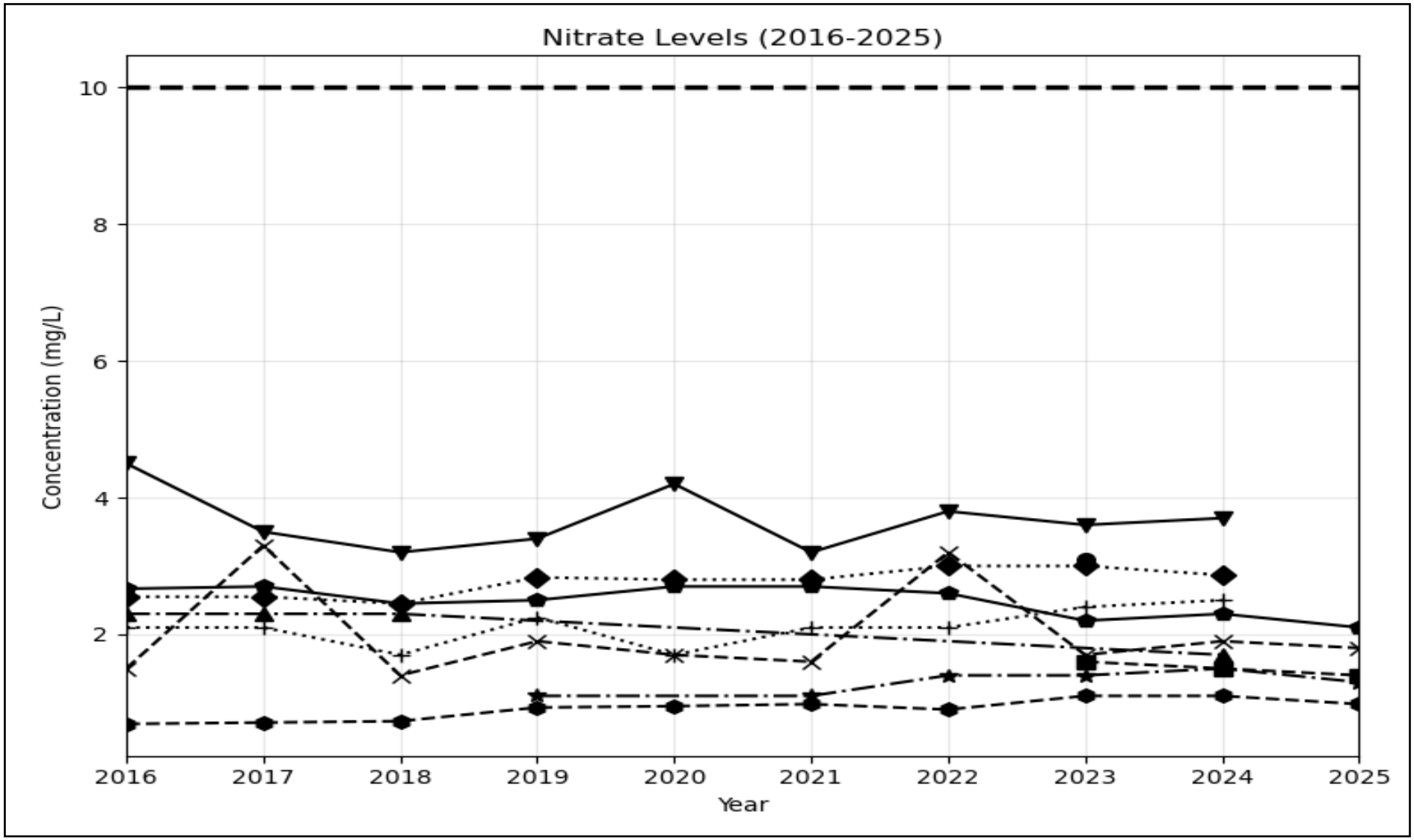
- Diana Well
- Fletcher Farms Well
- Florin County Well
- Florin Road Well
- Reese Well 1
- MCL 50 ug/L

December 12, 2025

Figure 9.2

Manganese Monitoring Results in Comparison to SMCL (50 ug/L) / MCL (300 ug/L)

Water System Master Plan
Florin County Water District



LEGEND

- Diana Well
- Fletcher Farms Well
- Florin County Well
- Florin Road Well
- Kara Well
- Mccomber Well
- Power Inn Well
- Reese Well 1
- Reese Well 2
- Weyland Well 10
- MCL 10.0

December 12, 2025

Figure 9.3

Nitrate Monitoring Results (mg/L) in Comparison to MCL (10 mg/L as N)

Water System Master Plan
Florin County Water District

9.2.9 Disinfection Byproduct (DBP) Monitoring

Disinfection byproducts (DBPs) are chemical compounds that form when disinfectants used in water treatment, such as chlorine or chloramine, react with naturally occurring organic matter in the source water. Two primary groups of DBPs regulated in drinking water are Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s). TTHMs include chemicals such as chloroform, bromodichloromethane, dibromochloromethane, and bromoform, while HAA5s consist of five haloacetic acid compounds commonly found in treated water.

DBPs are monitored at designated points within the distribution system, specifically at locations where DBP formation is expected to be highest and where water has the longest residence time (i.e., farthest from the source). Monitoring frequency depends on system size and population served, but community water systems using chemical disinfection are required to collect quarterly samples for both TTHMs and HAA5s. California enforces MCLs of 80 µg/L for TTHMs and 60 µg/L for HAA5s due to their long-term health risks, including potential links to cancer and reproductive issues.

Florin DBP Compliance Notes:

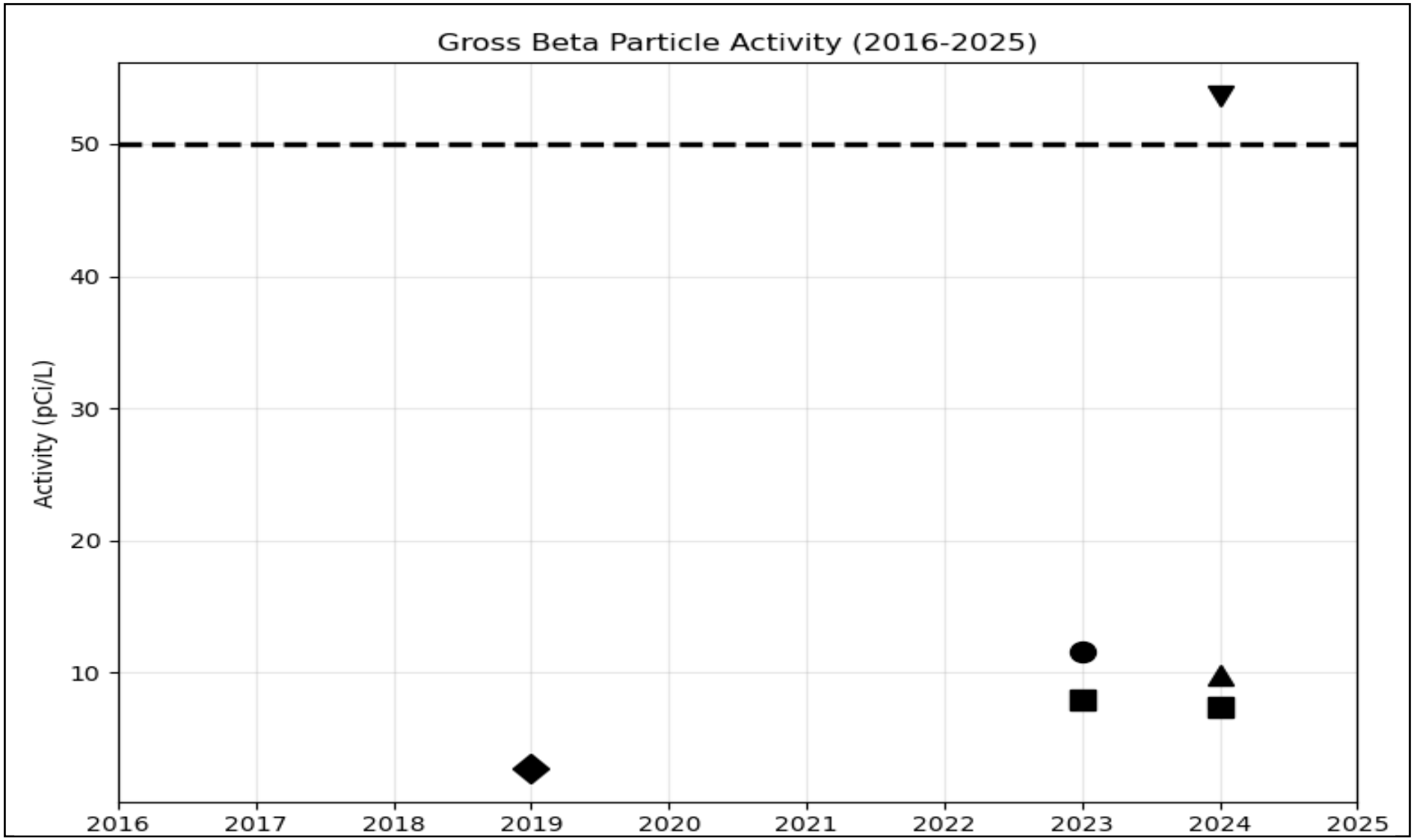
- No TTHM or HAA5 exceedances reported.
- A DBP monitoring violation was registered in 2008

9.2.10 Gross Beta Particle Activity

Under the federal Radionuclides Rule, beta- and photon-emitting radionuclides are regulated using a dose-based MCL of 4 mrem/year, not a single activity concentration. In practice, systems monitor Gross Beta Particle Activity as a screening tool: if the running annual average of gross beta, after subtracting naturally occurring potassium-40, is ≤ 50 pCi/L, the water is presumed to comply with the 4 mrem/year MCL. If the screening value exceeds 50 pCi/L, the system must perform follow-up radionuclide speciation and calculate the combined dose from the individual radionuclides to determine proper compliance with the beta/photon standard. California's Title 22 follows this same framework, using 50 pCi/L as a screening level that triggers further investigation rather than automatic treatment. **Figure 9.4** documents the Gross Beta Particle monitoring results.

FCWD Compliance Status for Gross Beta

In the Florin County Water District's data, Reese Well 1 is the only well with Gross Beta Particle Activity above the 50 pCi/L screening level, with a result of 53.6 pCi/L in 2024; all



LEGEND

- Diana Well
- Fletcher Farms Well
- Florin County Well
- Power Inn Well
- Reese Well 1
- MCL 50 pCi/L

December 12, 2025

Figure 9.4

Gross Beta Monitoring Results for Well in FCWD in Units of Picocuries per Liters (pCi/L)

Water System Master Plan
Florin County Water District

other wells with gross beta measurements, Diana Well, Fletcher Farms Well, Florin County Well, and Power Inn Well, remain below this threshold. Florin's immediate regulatory obligation is to collect additional samples and perform radionuclide speciation at Reese Well 1. FCWD then must calculate the resulting dose to confirm whether the 4 mrem/year beta/photon MCL is met. If specific radionuclides (e.g., strontium-90 or other regulated beta emitters) are present at levels that push the dose above the MCL, appropriate small-system treatment options would include anion exchange or reverse osmosis, potentially combined with blending or reduced reliance on Reese Well 1.

9.3 POTENTIAL TREATMENT PROCESSES FOR WELLS WITH MCL EXCEEDANCES

This section summarizes potential treatment needs for wells where iron and manganese have historically exceeded or approached their secondary standards. Table 9.8 highlights which sources are most likely to require future iron/manganese treatment if current trends continue.

9.3.1 Possible Treatment for Iron (Fletcher Farms, Florin Road, Reese 1, Weyland 10)

For the iron peaks seen in FCWD wells (up to 1,700 µg/L at Reese well 1 and >1,000 µg/L at Fletcher Farms), the standard, most cost-effective approach is oxidation followed by filtration. In practice, that usually means adding an oxidant (chlorine, permanganate, or aeration) to convert dissolved ferrous iron (Fe^{2+}) into particulate ferric iron (Fe^{3+}), then removing it with a pressure filter (sand/anthracite) or manganese greensand unit. For a system like FCWD, this could be done at the wellhead or possibly with multiple wells manifolded into a shared filter train.

NOTE: Although exceedances for iron were observed in the listed wells, each of the most recent sample results is non-detect (ND), and therefore treatment is neither required nor recommended for those wells at this time.

9.3.2 Possible Treatment for Manganese (Fletcher Farms, Florin County, Florin Road, Reese 1, Weyland 10)

Manganese treatment is usually designed together with iron, because the chemistry and equipment are almost identical. At the observed manganese peaks (up to 560 µg/L at Weyland Well) the same oxidation–filtration process is standard, often using greensand or catalytic media that are specifically developed for manganese removal. The key difference from iron is that manganese often needs a bit more oxidant and tighter pH control to fully convert Mn^{2+} to a filterable solid. So, a realistic future treatment scenario

Table 9.8 Sources with Secondary MCL Exceedances

Water System Master Plan

Florin County Water District

Well Name	Analyte	MCL (unit)	Max Sample Result (Year)	Most Recent Sample (Year)
Fletcher Farms Well	iron	300 ug/L	1300 µg/L (2011)	<30 µg/L (ND)(2026)
Fletcher Farms Well	manganese	50 ug/L	170 µg/L (2024)	<10 µg/L (ND) (2026)
Florin County Well	manganese	50 ug/L	84 µg/L (2024)	84 µg/L (2024)
Florin Road Well	iron	300 ug/L	970 µg/L (2021)	<30 µg/L (ND) (2024)
Florin Road Well	manganese	50 ug/L	140 µg/L (2021)	<10 µg/L (ND) (2024)
Reese Well 1	iron	300 ug/L	1700 µg/L (2012)	<30 µg/L (ND) (2026)
Reese Well 1	manganese	50 ug/L	200 µg/L (2011)	<10 µg/L (ND) (2026)
Weyland Well 10	iron	300 ug/L	350 µg/L (2013)	<30 µg/L (ND) (2025)
Weyland Well 10	manganese	50 ug/L	560 µg/L (2013)	<10 µg/L (ND) (2025)

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for Florin is a combined Fe/Mn removal system at the wells with the highest manganese (especially Weyland 10 and Fletcher Farms), sized so it can keep manganese consistently below both the new primary and the secondary standards.

NOTE: Although exceedances for manganese were observed in the listed wells, each of the most recent sample results is non-detect (ND), and therefore treatment is neither required nor recommended for those wells at this time.

9.4 SOURCE WATER PROTECTION

The water system sources its water from the wells listed in **Table 9.9**. Efforts to protect source water include watershed management, pollution control measures, and collaboration with local authorities to minimize contamination risks. A source water assessment was conducted for several of the Florin groundwater sources. The results of these assessments found the following potential susceptibilities, and which are documented on **Table 9.9.**

9.5 REGIONAL GROUNDWATER QUALITY

Groundwater supplying the Diana Way, Fletcher Farms, Florin Road, French Road, Reese, Power Inn, McComber, and Kara wells is drawn from the Basin, an alluvial aquifer system influenced by decades of agricultural and urban land use. Basin-scale monitoring summarized in the Basin Annual Report for Water Year 2024–2025 shows areas of degraded groundwater quality, primarily related to elevated nitrate and increasing specific conductance (a proxy for salinity/TDS) in portions of the basin. Although most public-supply wells continue to meet primary drinking water standards, the regional data indicate that nitrate concentrations in some areas approach or exceed the 10 mg/L (as N) MCL, and that salinity is trending upward in corridors influenced by irrigated agriculture and return flows.

In addition to nitrate and salinity, the regional monitoring record documents localized exceedances of naturally occurring metals, including arsenic, iron, and manganese, in both shallow and intermediate-depth wells (NDGSA, 2024). While many detections remain below primary MCLs, these metals can become mobilized under reducing geochemical conditions, particularly where historic irrigation, organic-rich sediments, or septic leachate have altered groundwater chemistry.

Manganese is of particular interest because it is regulated in California by a 50 ug/L secondary MCL for aesthetic concerns (discoloration and staining), and the State Water Board has also established a 500 ug/L health-based notification level due to potential neurotoxic effects at high exposure levels (SWRCB, 2025). State guidance notes that

systems with manganese above the notification level are expected to notify local agencies and are encouraged to inform customers, and that source removal is recommended at ten times the notification level (SWRCB, 2025). These policies highlight the need for ongoing monitoring and, where necessary, treatment or blending to address manganese in affected sources.

In FCWD the production wells are located within an urbanized setting that overlies this broader groundwater regime. Potential contributors to nitrate and salinity include historic and ongoing irrigated agriculture, landscape irrigation return flows, and legacy septic systems in the surrounding area, while urban land uses introduce additional risks from sewer collection systems, stormwater infiltration, auto-related facilities, and small industrial or commercial operations. In response, the water system continues to monitor for nitrate, salinity, metals (including manganese), and volatile organic compounds and to create a plan for wellhead treatment where necessary to ensure that water entering the distribution system meets all applicable primary and secondary drinking water standards.

Table 9.9 Sources of Drinking Water and Potential Modes of Contamination

Water System Master Plan

Florin County Water District

Source Name	Potential Sources of Contamination
Diana Well	High- and medium-density housing, sewer collection systems, parks and irrigated landscaping, roads and streets, urban stormwater runoff
Fletcher Farms Well	High- and medium-density housing, schools and parks, irrigated landscaping, septic systems (where present), sewer collection systems, roads and streets, urban stormwater runoff
Florin Road Well	Gas stations, auto repair and body shops, commercial and retail centers, sewer collection systems, roads and streets, urban stormwater runoff
French Road Well	Irrigated crops, agricultural drainage, agricultural and irrigation wells, septic systems, rural housing, roads and streets
Reese Well 01	Repair shops, fleet, truck and bus terminals, contractor or government agency storage yards, warehouses and light industrial facilities, sewer collection systems, roads and streets, urban stormwater runoff
Reese Well 02	Repair shops, fleet, truck and bus terminals, contractor or government agency storage yards, warehouses and light industrial facilities, sewer collection systems, roads and streets, urban stormwater runoff
Power Inn Well	Industrial and manufacturing facilities, fleet, truck and bus terminals, repair shops, gas stations, railroads and major roadways, sewer collection systems, urban stormwater runoff
McComber Well	High- and medium-density housing, schools and parks, irrigated landscaping, septic systems (where present), sewer collection systems, roads and streets, urban stormwater runoff
Kara Well	High- and medium-density housing, small commercial uses, irrigated landscaping, septic systems (where present), sewer collection systems, roads and streets, urban stormwater runoff

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CHAPTER 10 – ADVANCED METERING INFRASTRUCTURE PROJECT

Florin County Water District (FCWD) is planning on implementing a system-wide advanced metering infrastructure (AMI) technology. AMI technology allows water meters to be read remotely. With this capability of offering near real-time data, AMI enables customers and staff to view up-to-date water usage at any time during the billing cycle.

10.1 EXISTING FCWD METERED AND NON-METERED ACCOUNTS

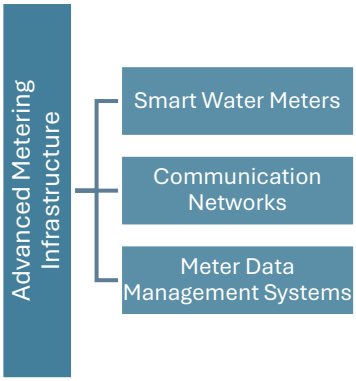
FCWD has approximately 2,405 metered and non-metered accounts. Approximately 300 non-residential accounts are metered, while the residential accounts do not currently have a meter. The metered accounts, and the size of the meter, as well as its status, are documented on Table 10.1. The purpose of the Advanced Metering Project is to install meters for all residential accounts, as well as replace the existing non-residential meters.

10.2 ADVANCED METERING INFRASTRUCTURE

This section provides a brief definition of Advanced Metering Infrastructure, as well as listing its major benefits.

10.2.1 What is AMI?

Advanced Metering Infrastructure is a system that consists of smart water meters, communication networks, and meter data management systems.



- The smart water meters collect consumption data from customers
- The communication networks provide two-way link between the smart meters and the utility
- The meter data management systems (MDMS) collect, store and process the data.

Readings are typically performed at 15-minute intervals, depending on the specific meter model and transmitted to the computer system one or more times per day. Once the data reaches the MDMS, data is stored and available to be extracted for further analysis or billings to clients.

Table 10.1 AMI Systems Used by Adjacent Agencies

Water System Master Plan

Florin County Water District

Water District	Total Connections	AMI Vendors	Notes
City of Sacramento Water	142,946	Badger Meter ORION SE Nicor End MIU	
California American Water	65,033	Neptune R900	
Tokay Park Water Company	200	-	No relevant AMI information; 200 connections in total.
SCWA	~59000	-	
Elk Grove Water District	~12,890	Sensus SmartPoint (Xylem)	The District anticipates transitioning to AMI within the next 5 - 10 years (2020 UWMP Report).
Golden State Water Company	16,252	-	
Sacramento Suburban Water District	47,199	Badger Beacon/Sensus(Xylem)	
City of Folsom WD	22,061	Badger (cellular)	One of the first SAC districts to implement AMI, had full integration of radio MIU now is switching to a badger cellular version
Fair oaks WD	14,390	Neptune	
Citrus Heights WD	19,991	-	currently conducting pilots on AMI
Carmichael WD	~11,700	-	Currently utilizes Neptune Nsight drive-by AMR but not two way AMI
San Juan WD	10,670	-	SJWD has been deploying AMR technology but also considering AMI system.
Orange Vale WC	5,682	-	Automated Meter Reading (AMR) devices are replacing current meters, but not two way AMI.
Rio Linda/Elverta	4,621	-	There was a AMI loan related to RLECWD, but did not mention what AMI the District procured.

10.2.2 Benefits of AMI

AMI benefits both FCWD and the customers. AMI benefits FCWD by minimizing the potential for missed or inaccurate reads, thus providing faster and more reliable service to customers. AMI benefits customers through more accurate billing, early leak detection, and monitoring and control over water usage.

- **Eliminates estimated bills:** AMI provides accurate, real-time data, ensuring customers pay only for what they use and removing human error from manual readings.
- **Faster leak detection:** AMI can detect continuous usage patterns that indicate a leak, potentially saving customers hundreds of dollars by alerting them sooner to problems like an undetected toilet leak.
- **Improved service:** AMI enables faster customer service for account changes and quicker resolution of billing questions because data is available almost immediately.
- **Better understanding of usage**: Customers can access data about their consumption, helping them understand why their bills may fluctuate from month to month.
- **Management tools**: Many AMI systems provide online portals or apps that allow customers to monitor their usage.
- **Increased privacy**: AMI eliminates the need for meter readers to access customers' property, which increases customers' privacy and security.

10.3 CURRENT AMI USED BY ADJACENT AGENCIES

Some of the major vendors that are considered by water agencies for AMI implementation include Sensus (a Xylem brand), Badger Meter, and Neptune. This task included a brief survey of adjacent Sacramento area agencies, and the selected AMI brand identified, as documented in Table 10.2. The survey indicates that agencies selected from these 3 major AMI vendors: Sensus, Badger, and Neptune.

10.4 PRELIMINARY COST OF AMI IMPLEMENTATION FOR FCWD

As part of this task, we researched potential estimated cost of AMI implementation in FCWD. The costs typically include the following items:

Table 10.2 Meter Count Report

Water System Master Plan

Florin County Water District

Meter Size	Installed	Inspected	Active
Metered Connections			
1"	147	129	147
1 ½"	44	36	44
2"	77	67	77
3"	19	17	19
4"	5	4	5
6"	6	4	6
Subtotal	**298**	**257**	**298**
Unmetered Connections			
Unmetered	N/A	N/A	2,107
Total			**2,405**

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- Smart Water Meters
- 520M SmartPoint
- Sensus Analytics and RNI software
- Installation and integration SA/RNI
- Command Link II
- M420B Base station
- 60’ Tower and Hardware Installation

High level estimate suggests that the costs can range from $1.7M to $3.0M, in addition to a recommended another 20% contingency to account for unforeseen installation issues. It should be noted that the $1.7M estimate is based on a detailed quote provided by Sensus and included in **Appendix C**.

CHAPTER 11 – CAPITAL IMPROVEMENT PROGRAM

This chapter provides a summary of the recommended domestic water system improvements to mitigate existing capacity deficiencies and to accommodate general plan buildout. The chapter also presents the cost criteria and methodologies for developing the Capital Improvement Program. Finally, a capacity allocation analysis, usually used for cost sharing purposes, is also included.

11.1 COST ESTIMATE ACCURACY

Cost estimates presented in the capital improvement program were prepared for general master planning purposes and, where relevant, for further project evaluations. The final costs of a project will depend on several factors including the specific project scope of work, costs of labor and material, and market conditions during construction.

AACE International (Association for the Advancement of Cost Engineering, International) has defined five estimate classes for general construction based on the maturity level of the project scope definition. These estimate classes are extracted from the *AACE International Recommended Practice No. 56R-08, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Building and General Construction Industries (Rev. August 2020)* and briefly summarized as follows:

Estimate Class	Description	Data Availability and Percent Accuracy
Class 5	This classification is also known as an order of magnitude estimate and is generally intended for long-range capital planning and master plans. This estimate is not supported with detailed engineering data about the specific project, and its accuracy is dependent on historical data and cost indices	The data is 0% to 2% complete and includes the location and proposed project. It is generally expected that this estimate would be accurate within -30 percent to +50 percent.
Class 4	This classification is also known as a schematic design or feasibility estimate and prepared based on limited information and used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval	The data is 1% to 15% complete and includes preliminary site plans, utilities, and a design criteria report. It is generally expected that this estimate would be accurate within -20 percent to +30 percent

Class 3	This classification is also known as a budget or basic engineering phase estimate and is prepared to form the basis for budget authorization, appropriation, and/or funding	The data is 10% to 40% complete and includes the site civil information. It is generally expected that this estimate would be accurate within -15 percent to +20 percent
Class 2	This classification is also known as detailed or design development estimate and generally prepared to form a detailed contractor control baseline and used as a bid estimate to establish contract value.	The data is 30% to 70% complete and includes the complete design information. It is generally expected that this estimate would be accurate within -10 percent to +15 percent
Class 1	This classification is also known as a final or pre-construction estimate and is prepared for discrete parts of the project and used by subcontractors for bids, or by owners for check estimates.	The data is 70% to 100% complete and includes the engineering and design documentation for the project and complete execution and commissioning plans. It is generally expected that this estimate would be accurate within -5 percent to +10 percent

Costs developed in this study should be considered “Class 5” and have an expected accuracy range of **-30 percent** and **+50 percent**.

11.2 COST ESTIMATE METHODOLOGY

Cost estimates presented in this chapter are opinions of probable construction and other relevant costs developed from several sources including cost curves, Akel experience on other master planning projects, and input from FCWD staff. Where appropriate, costs were escalated to reflect the more current ENR (formerly Engineering News Record) Construction Cost Index (CCI). The ENR CCI is a cost estimating tool updated weekly, used by engineers to gauge the current cost for new construction.

This section documents the unit costs used in developing the opinion of probable construction costs, the Construction Cost Index, and markups to account for construction contingency and other project related costs.

11.2.1 Unit Costs

The unit cost estimates used in developing the CIP are summarized in **Table 11.1**. The unit costs are intended for developing the Class 5, Order of Magnitude estimates, and do not account for site specific conditions, changes in labor or material costs during the time of construction, final project scope, implementation schedule, detailed utility and topography surveys, investigation of alternative routings for pipes, and other various

Table 11.1 Unit Costs

Water System Master Plan
Florin County Water District

Pipelines	
Pipe Size (in)	**Cost** ($/lineal foot)
8	$197
10	$223
12	$268
14	$300
16	$322
18	$330
20	$355
24	$423
30	$529
36	$593

AKEL ENGINEERING GROUP, INC.

9/16/2025

Notes:

1. Construction costs estimated using September 2025 ENR CCI of 13928

factors. The CIP included in this report accounts for construction and project-related contingencies as described in this chapter.

11.2.2 Construction Cost Index

Costs estimated in this study are adjusted utilizing the ENR CCI, which is widely used in the engineering and construction industries.

The costs in this Water System Master Plan were calculated using a 20-FCWD national average ENR CCI of 13,928, reflecting a date of September 2025.

11.2.3 Construction Contingency Allowance

Knowledge about site-specific conditions for each proposed project is limited at the master planning stage; therefore, construction contingencies were used. In the absence of bid tabulations, the estimated construction cost includes a **30 percent** contingency allowance to account for unforeseen events and unknown field conditions.

11.2.4 Project Related Costs

The capital improvement costs also account for project-related costs, comprising engineering design, project administration (developer and FCWD staff), construction management and inspection, and legal costs. In the absence of bid tabulations, the project related costs were estimated by applying an additional **30 percent** to the estimated construction costs.

11.3 CAPITAL IMPROVEMENT PROGRAM

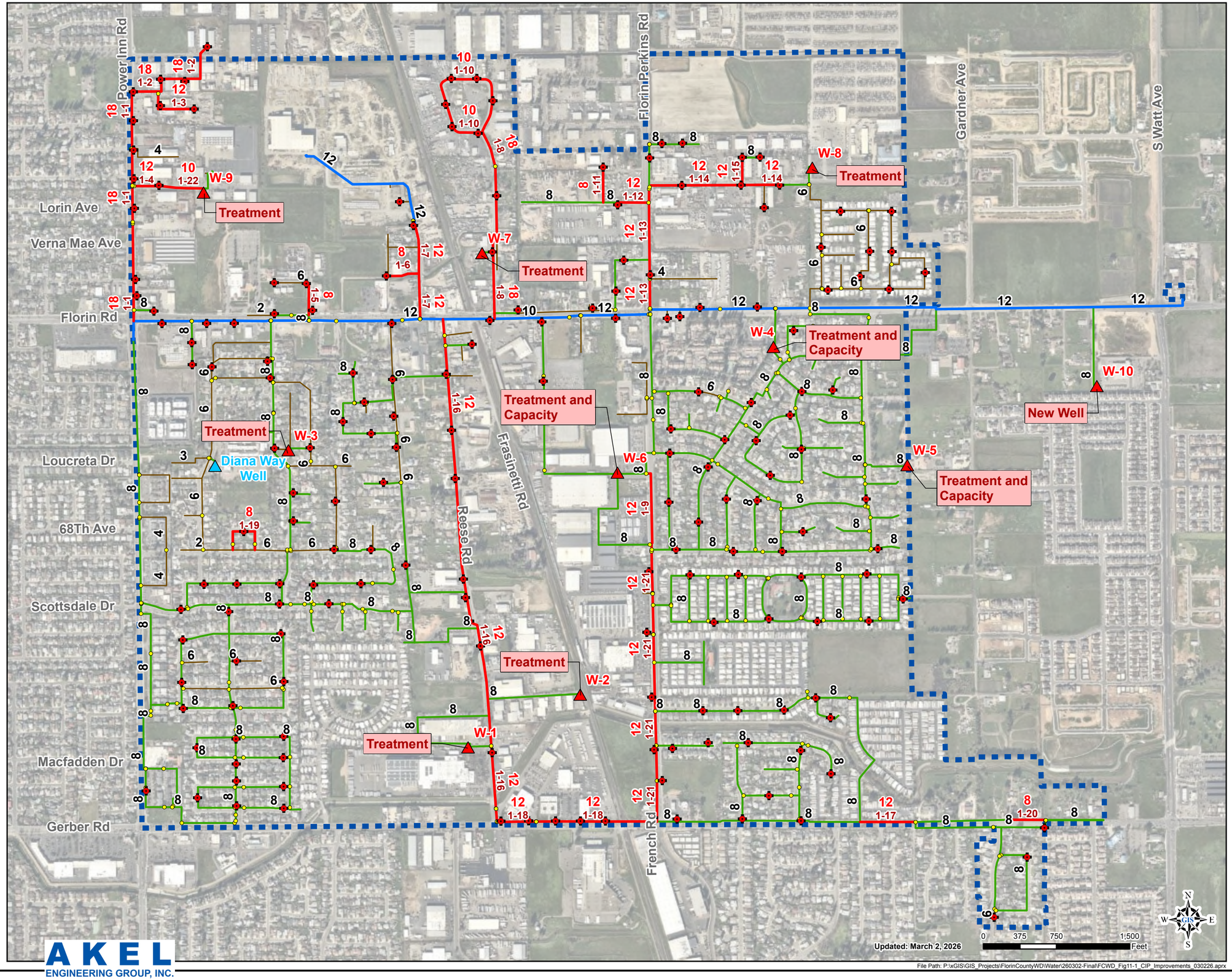
This section documents the capital improvement program, including estimated costs and recommended construction phasing.

11.3.1 Capital Improvement Costs

The Capital Improvement Program costs for the projects identified in this master plan for mitigating existing deficiencies and for servicing general plan buildout are summarized on Table 11.2. The Capital Improvement Program lists the type of improvement, location, cost, construction triggers, suggested phasing, and cost sharing.

Each improvement was assigned a unique coded identifier associated with the improvement type and is summarized graphically on the following figures:

- Figure 11.1 displays the locations, and reference numbers for the capacity improvements for fire flow and supply.



Legend

System Improvements

- Wells
- Fire Flow Improvements

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Figure 11.1
CIP Improvements
Water System Master Plan
Florin County Water District

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Table 11.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Itemized Cost Estimate												Improvement Priority		CIP and R&R Improvement Overlap	% Benefit		Cost Sharing	
Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs						Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority		Existing Users	Future Users	Existing Users ($)	Future Users ($)
				Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)										
Existing Deficiencies / Fire Flow Improvements																			
1-1	Pipe	Power Inn Rd	From approx. 450 ft s/o 53rd Ave to Florin Rd	8/12	Replace	18	2,360	330	778,981	778,981	1,012,676	1,320,000	Fire Flow Deficiency	A - Moderate	Yes, RR-1.1	100%	0%	1,320,000	0
1-2	Pipe	Power Inn Rd / ROW	From approx. 380 ft s/o Junipero St to Junipero St	8	Replace	18	1,200	330	396,092	396,092	514,920	670,000	Fire Flow Deficiency	C - Very Low	Yes RR-1.2	100%	0%	670,000	0
1-3	Pipe	Alley b/w Junipero St and Florin Rd	From approx. 290 ft e/o Power Inn Rd to approx. 650 ft e/o Power Inn Rd	8	Replace	12	550	268	147,406	147,406	191,628	250,000	Fire Flow Deficiency	A - Moderate	-	100%	0%	250,000	0
1-4	Pipe	Public Parking Lot e/o Power Inn Rd	From Power Inn Rd to approx. 270 ft e/o Power Inn Rd	8	Replace	12	280	268	75,043	75,043	97,556	130,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	130,000	0
1-5	Pipe	Bacchini Ave	From Florin Rd to approx. 15 ft s/o Augusta Way	6	Replace	8	320	197	63,194	63,194	82,152	110,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	110,000	0
1-6	Pipe	Alley n/o Florin Rd	From Mc Curdy Ln to Tokay Ave	6	Replace	8	320	197	63,194	63,194	82,152	110,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	110,000	0
1-7	Pipe	Tokay Ave	From approx. 970 ft n/o Florin Rd to Florin Rd	8	Replace	12	970	268	259,971	259,971	337,962	440,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	440,000	0
1-8	Pipe	McComber St	From Florin Rd to approx. 1,915 ft n/o Florin Rd	8/10	Replace	18	1,980	330	653,552	653,552	849,618	1,100,000	Fire Flow Deficiency	B - Low	-	100%	0%	1,100,000	0
1-9	Pipe	French Rd	From approx. 180 ft s/o Elaine Dr to approx. 55 ft n/o Danridge Dr	-	New	12	790	268	211,729	211,729	275,247	360,000	Fire Flow Deficiency	A - Moderate	-	100%	0%	360,000	0
1-10	Pipe	McComber St Loop	Loop between Florin Rd and Rovana Circle	8	Replace	10	1,860	223	415,417	415,417	540,042	700,000	Fire Flow Deficiency	B - Low	-	100%	0%	700,000	0
1-11	Pipe	Alley b/w McComber St and Florin Perkins Rd	From approx. 420 ft s/o Specialty Circle to approx. 1,130 ft n/o Florin Rd	6	Replace	8	370	197	73,068	73,068	94,989	120,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	120,000	0
1-12	Pipe	Alley b/w Specialty Circle and Florin Rd	From approx. 320 ft w/o Florin Perkins Rd to Florin Perkins Rd	8	Replace	12	330	268	88,444	88,444	114,977	150,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	150,000	0
1-13	Pipe	Florin Perkins Rd	From Weyand Ave to Florin Rd	8	Replace	12	1,240	268	332,334	332,334	432,034	560,000	Fire Flow Deficiency	B - Low	Yes, RR-3.1	100%	0%	560,000	0
1-14	Pipe	Weyand Ave	From Florin Perkins Rd to approx. 1,350 ft e/o Florin Perkins Rd	8	Replace	12	1,350	268	361,815	361,815	470,360	610,000	Fire Flow Deficiency	B - Low	Yes, RR-3.2	100%	0%	610,000	0
1-15	Pipe	Alley b/w Gardner Ave and Florin Perkins Rd	From Weyand Ave to approx. 280 ft n/o Weyand Ave	8	Replace	12	280	268	75,043	75,043	97,556	130,000	Fire Flow Deficiency	C - Very Low	Yes, RR-3.3	100%	0%	130,000	0
1-16	Pipe	Reese Rd	From Florin Rd to Gerber Rd	6/8	Replace	12	5,230	268	1,401,698	1,401,698	1,822,208	2,370,000	Fire Flow Deficiency	A - Moderate	Yes, RR-4.3	100%	0%	2,370,000	0
1-17	Pipe	Gerber Rd	From Millbrook Cr to Lakewood Rd	8	Replace	12	570	268	152,766	152,766	198,596	260,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	260,000	0
1-18	Pipe	Gerber Rd	From Reese Rd to French Rd	8	Replace	12	1,650	268	442,218	442,218	574,884	750,000	Fire Flow Deficiency	B - Low	-	100%	0%	750,000	0
1-19	Pipe	Tommy Circle	Loop b/w Diana Way and Kara Drive	2	Replace	8	610	197	120,464	120,464	156,603	200,000	Fire Flow Deficiency	C - Very Low	-	100%	0%	200,000	0
1-20	Pipe	Gerber Rd	From approx. 100 feet e/o Southbreeze Dr to approx. 500 ft w/o Tamarindo Bay Dr	2	Replace	8	370	197	73,068	73,068	94,989	120,000	Fire Flow Deficiency	B - Low	-	100%	0%	120,000	0
1-21	Pipe	French Rd	From approx. 55 ft n/o Danridge Dr to Gerber Rd	8	Replace	12	2,860	268	766,512	766,512	996,465	1,300,000	Fire Flow Deficiency	A - Moderate	Yes, RR-2.1	100%	0%	1,300,000	0
1-22	Pipe	Public Parking Lot e/o Power Inn Rd	From approx. 270 ft e/o Power Inn Rd to Power Inn Well	8	Replace	10	460	223	102,738	102,738	133,559	170,000	Fire Flow Deficiency	C - Very Low	Yes, RR-1.2	100%	0%	170,000	0
									Subtotal - Existing Deficiencies			**11,930,000**						**11,930,000**	**0**
Supply Wells																			
W-1	Treatment	Reese #1 Well	PFAs Treatment for the Reese #1 Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-2	Treatment	Reese #2 Well	PFAs Treatment for the Reese #2 Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-3	Treatment	Kara Well	PFAs Treatment for the Kara Well							800,000	1,040,000	1,350,000	PFOA MCL exceeded	Highest		100%	0%	1,350,000	0
W-4	Treatment + Capacity	Florin Well	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	PFOA MCL exceeded	Highest		100%	0%	2,200,000	0
W-5	Treatment + Capacity	Fletcher	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	Existing Capacity Deficiency	High		100%	0%	2,200,000	0
W-6	Treatment + Capacity	French	Increase capacity by drilling deeper and adding PFAs treatment.							1,300,000	1,690,000	2,200,000	Existing Capacity Deficiency	High		100%	0%	2,200,000	0
W-7	Treatment	Mc Comber	PFAs Treatment for the Mc Comber Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0
W-8	Treatment	Weyand	PFAs Treatment for the Weyand Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0

Table 11.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Itemized Cost Estimate												Improvement Priority		CIP and R&R Improvement Overlap	% Benefit		Cost Sharing	
Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs						Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority		Existing Users	Future Users	Existing Users ($)	Future Users ($)
				Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)										
W-9	Treatment	Power Inn	PFAs Treatment for the Power Inn Well							800,000	1,040,000	1,350,000	Future PFAs treatment	Long Term		100%	0%	1,350,000	0
W-10	Well	USPS Well	Re-Drill the USPS Well and include PFAs Treatment							2,500,000	3,250,000	4,230,000	Future Supply Requirement	Future		0%	100%	0	4,230,000
											Subtotal - Wells	**18,930,000**					**14,700,000**	**4,230,000**
Renewal and Replacement Budgets (10-Year Horizon)																			
RR-1	**5-Year Pipeline Renewal and Replacement Program with an annual budget of $600,000 / year (2026-2030)**																		
1.1	Pipe	Power Inn Rd	From 100 ft s/o Cantina Ct to Florin Rd	8	Replace	18	1,280	330	422,498	422,498	549,248	710,000	Business Risk	Highest	Yes, FF 1-1	100%	0%	710,000	0
1.2	Pipe	Perpendicular to Power Inn Rd	From Power Inn Rd to Vend Mart (VOS)	8	Replace	12	560	268	150,086	150,086	195,112	250,000	Business Risk	Highest	Yes, FF 1-4 & 1-22	100%	0%	250,000	0
2.1	Pipe	French Rd	From 50 n/o Danridge Dr to 140 ft n/o German Dr	8	Replace	12	1,590	268	426,138	426,138	553,979	720,000	Business Risk	Highest	Yes, 1-21	100%	0%	720,000	0
3.1	Pipe	Florin Perkins Rd	From 250 ft n/o Weyand Ave to 200 ft s/o Weyand Ave	8	Replace	12	460	268	123,285	123,285	160,271	210,000	Business Risk	Highest	Yes, 1-13	100%	0%	210,000	0
3.2	Pipe	Weyand Ave	From Florin Perkins Rd to 1,640 ft e/o Florin Perkins Rd	8	Replace	12	1,650	268	442,218	442,218	574,884	750,000	Business Risk	High	Yes, 1-14	100%	0%	750,000	0
3.3	Pipe	Alley adjacent to Weyand Ave	950 ft from Florin Perkins Rd	8	Replace	12	470	268	125,965	125,965	163,755	210,000	Business Risk	Medium	Yes, 1-15	100%	0%	210,000	0
3.4	Pipe	Alley adjacent to Weyand Ave	1,180 ft from Florin Perkins Rd	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Business Risk	Medium	-	100%	0%	80,000	0
3.5	Pipe	Alley adjacent to Weyand Ave	1,640 ft from Florin Perkins Rd	8	Replace	8	220	197	43,446	43,446	56,480	70,000	Business Risk	Highest	-	100%	0%	70,000	0
4.1	Pipe	Alley adjacent to Reese Rd	From Reese Rd to railroad, 1,260 ft n/o Gerber Rd	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Business Risk	Highest	-	100%	0%	320,000	0
4.2	Pipe	Alley adjacent to Reese Rd	From Reese Rd to parking lot fence, 780 ft n/o Gerber Rd	8	Replace	8	240	197	47,396	47,396	61,614	80,000	Business Risk	Highest	-	100%	0%	80,000	0
4.3	Pipe	Reese Rd	Bounded by project 11.2 and 710 ft n/o Gerber Rd	8	Replace	12	70	268	18,761	18,761	24,389	30,000	Business Risk	Highest	Yes, 1-16	100%	0%	30,000	0
									Year 1-5 Subtotal:	2,032,822	2,642,669	3,430,000							
									Subtotal (w/o FF CIP Imps)	323,870	421,031	550,000							
RR-2	**5-Year Pipeline Renewal and Replacement Program with an annual budget of $600,000 / year (2031-2035)**																		
5.1	Pipe	Diana Way	From Kara Dr to 275 ft s/o Vivian Ct	6	Replace	8	1,600	197	315,971	315,971	410,762	530,000	Business Risk	Highest	-	100%	0%	530,000	0
5.2	Pipe	Kara Dr to Jerry Way	From Florin Road to Bruns Way	6, 8	Replace	8	1,830	197	361,392	361,392	469,809	610,000	Business Risk	Highest	-	100%	0%	610,000	0
5.3	Pipe	Outside Right of Way	Area bounded by Kara Dr, Jerry Way, and Bruns Way	4, 6, 8	Replace	8	960	197	189,583	189,583	246,457	320,000	Business Risk	Highest	-	100%	0%	320,000	0
5.4	Pipe	Outside Right of Way	Within the ditch bounded by Kara Dr and Diana Way	6	Replace	8	790	197	156,011	156,011	202,814	260,000	Business Risk	High	-	100%	0%	260,000	0
6.1	Pipe	Florin Rd	From Kingsley St to Precision Smog and Tune	6	Replace	8	230	197	45,421	45,421	59,047	80,000	Business Risk	Highest	-	100%	0%	80,000	0
6.2	Pipe	Kinglsey St	From Florin Rd	4	Replace	8	70	197	13,824	13,824	17,971	20,000	Business Risk	High	-	100%	0%	20,000	0
6.3	Pipe	Simon St	From Florin Rd	2	Replace	8	380	197	75,043	75,043	97,556	130,000	Business Risk	High	-	100%	0%	130,000	0
7.1	Pipe	Elaine Dr	From French Rd to Fletcher Farms Dr	8	Replace	8	2,350	197	464,082	464,082	603,307	780,000	Business Risk	High	-	100%	0%	780,000	0
7.2	Pipe	Hayward Dr	From Elaine Dr to Danridge Dr	8	Replace	8	950	197	187,608	187,608	243,890	320,000	Business Risk	High	-	100%	0%	320,000	0
7.3	Pipe	Danridge Dr	From French Rd to Alden Way	8	Replace	8	770	197	152,061	152,061	197,679	260,000	Business Risk	Highest	-	100%	0%	260,000	0
7.4	Pipe	Branbury Way	From Elaine Dr to Danridge Dr	8	Replace	8	1,000	197	197,482	197,482	256,726	330,000	Business Risk	Medium	-	100%	0%	330,000	0

Table 11.2 Capital Improvement Program

Water System Master Plan

Florin County Water District

Improvement Number	Type of Improv.	Alignment	Limits	Pipeline Improvements and Appurtenances Costs: Existing Diam. (in)	New/ Replace/ Connection	Diam. (in)	Length (ft)	Unit Cost ($)	Pipe Cost ($)	Baseline Constr. Cost ($)	Estimated Constr. Cost[3] ($)	Capital Improv. Cost ($)	Construction Trigger	Priority	CIP and R&R Improvement Overlap	% Benefit: Existing Users	% Benefit: Future Users	Cost Sharing: Existing Users ($)	Cost Sharing: Future Users ($)
								Year 5-10 Subtotal:		2,158,477	2,806,020	3,640,000							
											Subtotal - R&R	**4,190,000**						**4,190,000**	**0**
Advanced Metering Infrastructure																			
A-1	AMI Water Meter Implementation											2,100,000				100%	0%	2,100,000	0
A-2	Annual Maintenance Cost (10-yr Horizon, $35,000 per year)											350,000				100%	0%	350,000	0
											Subtotal - AMI	**2,450,000**						**2,450,000**	**0**
Miscellaneous (10-Year Horizon)																			
M-1	Water Master Plan Updates ($150,000 Every 5 years)											300,000				100%	0%	300,000	0
M-2	Water Rate Study Updates ($50,000 Every 5 years)											100,000				100%	0%	100,000	0
											Subtotal - Miscellaneous	**400,000**						**400,000**	**0**
Capital Improvement Program Summary																			
												Subtotal - Fire Flow Deficiencies	**11,930,000**					**11,930,000**	**0**
												Fire Flow Priorities: Priority A	5,600,000					5,600,000	
												Fire Flow Priorities: Priority B	3,840,000					3,840,000	
												Fire Flow Priorities: Priority C	2,490,000					2,490,000	
												Subtotal - Supply Wells	**18,930,000**					**14,700,000**	**4,230,000**
												Supply Well Priorities: Highest	6,250,000					6,250,000	
												Supply Well Priorities: High	4,400,000					4,400,000	
												Supply Well Priorities: Long Term/ Future	8,280,000					4,050,000	4,230,000
												Subtotal - 10Yr R&R Program	**4,190,000**					**4,190,000**	**0**
												Subtotal - AMI	**2,450,000**					**2,450,000**	**0**
												Subtotal - Miscellaneous	**400,000**					**400,000**	**0**
												Total	**37,900,000**					**33,670,000**	**4,230,000**

AKEL ENGINEERING GROUP, INC.

12/16/2025

Notes:

1. Baseline construction costs plus 30% to account for unforeseen events and unknown conditions.
2. Estimated construction cost plus 30% to cover other costs including: engineering design, project administration (developer and City staff), construction management and inspection, and legal costs.
3. Construction costs estimated using September 2025 ENR CCI of 13928

- Figure 11.2 graphically shows the renewal and replacement pipeline projects and groups.

11.3.2 Recommended Improvement Groupings

The recommended improvements are listed on Table 11.2. Each improvement includes a general description of the street alignment and limits as well as existing pipe diameter and length.

The Capital Improvement Program generally includes the following types of improvements:

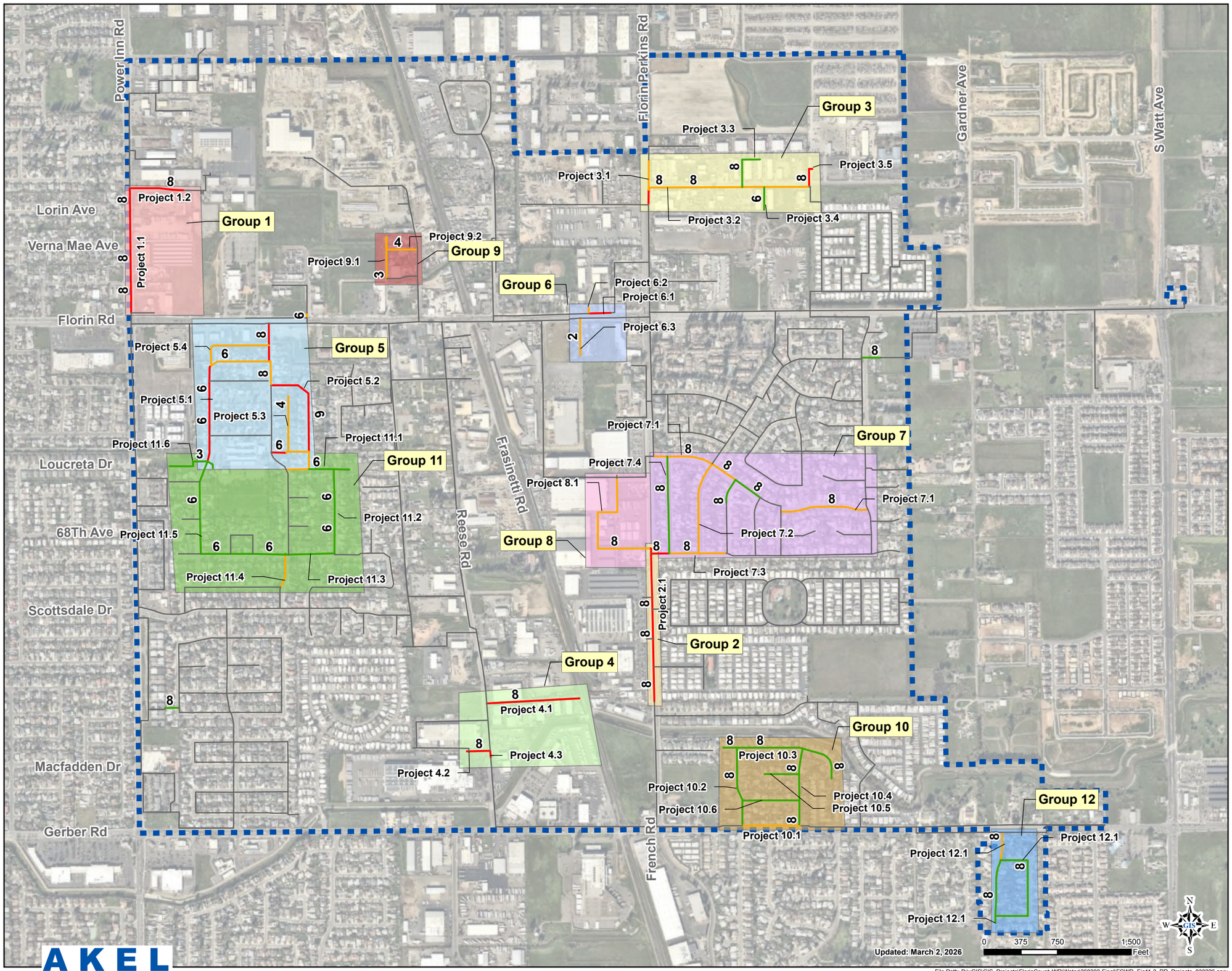
- **Replacement Pipeline, Existing Fire Flow Capacity Deficiency.** This improvement is intended as a replacement to an existing pipeline along the same alignment to mitigate an existing system deficiency.
- **Replacement Pipeline, Renewal and Replacement Program.** This improvement is intended as a replacement to an existing pipeline along the same alignment to as part of the R&R plan.
- **Well Improvements, Capacity and Treatment.** These improvements are to enhance the existing well field capacity and mitigate water quality issues
- **Advance Metering Infrastructure**. This improvement is for the implementation and annual maintenance of installing AMI water meters.
- **Miscellaneous Budget Items**. This line item is for future master plan and water rate study updates (10-year horizon).

The opinion of probable construction costs, for the projects included in this master plan, are based on the pipe unit costs summarized on Table 11.1. It is assumed that any replacement pipes will be in the same alignment as the existing pipe. However, this study recommends an investigation of the alignment during the pre-design stage of each project.

11.3.3 Construction Priorities

The capacity improvements are identified and categorized based on their urgency to mitigate existing deficiencies and to serve future growth. The construction priorities for each improvement as described as follows:

The capital costs are generally distributed according to FCWD's historical capability for budgeting construction of new domestic water infrastructures. FCWD is capable of



Legend

Improvement Priority

- Highest
- High
- Medium
- Other

Improvement Groupings

- Group 1
- Group 2
- Group 3
- Group 4
- Group 5
- Group 6
- Group 7
- Group 8
- Group 9
- Group 10
- Group 11
- Group 12

Water Purveyors

- Florin County Water District

Figure 11.2
Renewal and Replacement Projects
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\FCWD_Fig11-2_RR_Projects_030226.aprx

allocating larger resources based on the necessity of the projects and will perform updated reassessments as necessary.

The CIP has been divided into different priorities based on the type and severity of deficiencies, as follows:

- **Priority 1 - Highest:** This priority includes improvements to the wells for treatment to bring wells back online that are inactive due to water quality concerns.
- **Priority 2 - High:** This priority includes well improvements to increase capacity to mitigate supply deficiencies.
- **Priority 3 - Moderate:** This priority includes fire flow capacity improvements to mitigate fire flow deficiencies that are greater than 50% of the requirement.
- **Priority 4 - Low:** This priority includes fire flow capacity improvements to mitigate fire flow deficiencies that are between 40-50% of the requirement.
- **Priority 5 – Very Low:** This priority includes fire flow capacity improvements to mitigate fire flow deficiencies that are within 40% of the requirement.
- **Priority 6 – Long Term or Future:** This priority includes future PFAs treatment for each well as required based on water quality testing and for the future re-drill of the USPS well for future demands.

The capital costs are generally distributed according to the FCWD's historical capability for budgeting construction of new domestic water infrastructure.

11.3.4 Recommended Cost Allocation Analysis

Capacity allocation analysis is needed to identify improvement funding sources, and to establish a nexus between development impact fees and improvements needed to service growth. The capacity allocation analysis, for the proposed improvements was based on the peak flows from existing customers compared to peak flows from the buildout scenario. In compliance with the provisions of Assembly Bill AB 1600, the analysis differentiates between the project needs of servicing existing users and for those required to service anticipated future demands.

Table 11.2 lists each improvement and separates the cost by responsibility between existing and future users. The cost responsibility is based on model parameters for existing and future land use and may change depending on the nature of development.

11.3.5 Recommended Condition and Risk Assessment Improvements

The projects recommended in the Condition and Risk Assessment are intended to replace or refurbish the existing assets that are close to or have exceeded their useful life. The results of this analysis will assist FCWD in managing and maintaining the existing water pipeline infrastructure.

The recommended projects were designated as either condition improvements or operations and maintenance recommendations; their costs are summarized on **Table 11.2**. These recommendations were determined as a result of the risk assessment and are intended to mitigate or determine the condition of extreme and high-risk water infrastructure within the FCWD's service area. In order to facilitate the prioritization of the projects included in the risk analysis, each project has been prioritized based on its risk score and condition.

It should be noted that the improvement project prioritization is intended to be used for planning purposes only. Specific on-site conditions, available funds, and other factors should be taken into consideration when preparing to schedule and construct the projects included in the condition and risk assessment.

APPENDICES

APPENDIX A

Criteria Survey

Table 1 Fire Flow Requirement Survey

Water Master Plan

Florin County Water District

City	General Industrial
City of Santa Rosa	General Industrial: 2,500 gpm for 4 hrs School: 2,500 gpm for 4 hrs Commercial: 2,500 gpm for 3 hrs Multi-Family Residential: 2,500 gpm for 2 hrs Single Family Residential: 1,500 gpm for 2 hrs
Del Paso Manor Water District	Single Family Residential: 1,500 gpm for 2 hrs
City of Galt	General Industrial: 3,000 gpm for 3 hrs Commercial: 3,000 gpm for 3 hrs Single Family Residential: 1,500 gpm @ 2 hrs
Sacramento County Water Agency	General Industrial: 3,000 gpm for 3 hrs Single Family Residential: 1,500 gpm @ 2 hrs
City of Sacramento	General Industrial: 4,000 gpm for 4 hrs Civic/Institutional: 4,000 gpm for 4 hrs Commercial: 3,000 gpm for 3 hrs Multi-Family Residential: 2,500 gpm for 2 hrs Single Family Residential: 1,500 gpm for 2 hrs
City of Folsom Water	School: 4,000 gpm for 4 hrs Commercial/industrial: 3,000 gpm @ 3 hrs
City of Lincoln	Multi-Family Residential: 2,500 gpm for 2 hrs Single Family Residential: 1,500 gpm for 2 hrs
Rio Linda/ Elverta Community Water District	General Industrial: 4,000 gpm for 4 hrs Commercial: 3,000 gpm for 2 hrs Single Family Residential: 1,500 gpm for 2 hrs
Florin County Water District (Recommendation)	General Industrial: 3,000 gpm for 3 hrs Commercial: 2,000 gpm for 3 hrs Single Family Residential: 1,500 gpm for 2 hrs

8/7/2025

Table 2 Storage Criteria Survey

Water Master Plan

Florin County Water District

Title 22 Requirements			
4 hours of Peak Hour Demand (which is approximately 25% of MDD) plus the largest Fire Flow.			
Agency	**Operational**	**Fire**	**Emergency**
City of Santa Rosa	25% of MDD	Largest FF multiplied by duration	2.0 x ADD
Del Paso Manor Water District	20% of MDD	4,000 gpm for 4 hrs	-
City of Galt	25% of MDD	3,000 gpm for 3 hrs	50% of MDD
SCWA - Zone 40	4 hours of peak hour demand	3,000 gpm for 3 hours at each storage facility	1/3 ADD
Stone Beetland (Sacramento)	-	4,500 gpm for 4 hrs	-
City of Folsom Water	25% of MDD	largest FF multiplied by 4 hrs	75% of MDD
City of Lincoln	50% of ADD	-	-
Rio Linda/ Elverta Community Water District	PHD x 4 hrs	largest FF multiplied by duration	25 % of MDD
Florin County Water District (Recommendation)	25% of MDD	Largest Fire Flow multiplied by duration	25% of MDD

3/3/2026

Table 3 Supply Criteria Survey

Water Master Plan

Florin County Water District

Title 22 Requirements	
Section 64554 requires that public water systems demonstrate the ability to meet Maximum Day Demand (MDD) and Peak Hour Demand (PHD) using source capacity, storage, or emergency connections. - Systems with Storage: Supply = Maximum Day Demands - System without Storage: Supply = Largest of Peak Hour Demands or Maximum Day Demand plus Fire Flow	
Agency	**Minimum Supply Capacity**
Santa Rosa	Normal: - w Storage: MDD + PHD - w/o Storage: PHD FF: - w Storage: MDD + FF - w/o Storage MDD + FF
Del Paso Manor WD	MDD
Zone 40	MDD
Galt	MDD + largest well
Folsom	MDD
Florin County Water District (Recommendation)	**Well Firm Capacity = Larger of 1) Peak Hour Demands or 2) Maximum Day Demand + Fire Flow**

Table 4 System Pressure Criteria Survey

Water Master Plan

Florin County Water District

Industry Standards	
Title 22 and American Water Works Association Manual on Computer Modeling and Water Distribution System (AWWA M-32)	Standards require that new development must maintain the service pressures greater than or equal to 40 psi. Existing system: 35 psi
National Fire Protection Association (NFPA), California Waterworks Standards, and California Fire Code	Minimum pressure during fire flows is 20 psi

Agency	Minimum Pressure MDD/PHD	Maximum Pressure	Fire Flow Residual Pressure
City of Santa Rosa	MDD: 40 psi PHD: 35 psi	120 psi	20 psi
Del Paso Manor Water District	MDD, PHD: 40 psi	80 psi	20 psi
Sacramento County Water Agency	40 psi	90 psi	20 psi (at location and 10 psi elsewhere)
SCWA - Zone 40	40 psi	90 psi	-
City of Galt	MDD: 40 psi PHD: 35 psi		20 psi
Stone Beetland (Sacramento)	ADD: 30 psi MDD + FF: 20 psi PHD: 30 psi	ADD: 80 psi	20 psi
SCWA - Zone 50	MDD: 40 psi	90 psi	20 psi
City of Sacramento	MDD, PHD: 35 psi	-	20 psi
City of Folsom Water	MDD: 40 psi PHD: 30 psi for existing, 40 psi for new development	-	20 psi
City of Lincoln	PHD: 40 psi Design Standard: 50 psi	Design Standard: 130 psi	20 psi
Rio Linda/ Elverta Community Water District	MDD: 40 psi PHD: 30 psi	MDD: 70 psi	20 psi
Florin County Water District (Recommendation)	**MDD: 40 psi PHD: 35 psi**	**80 psi**	**20 psi**

3/3/2026

Table 5 Pipeline Performance Criteria Survey

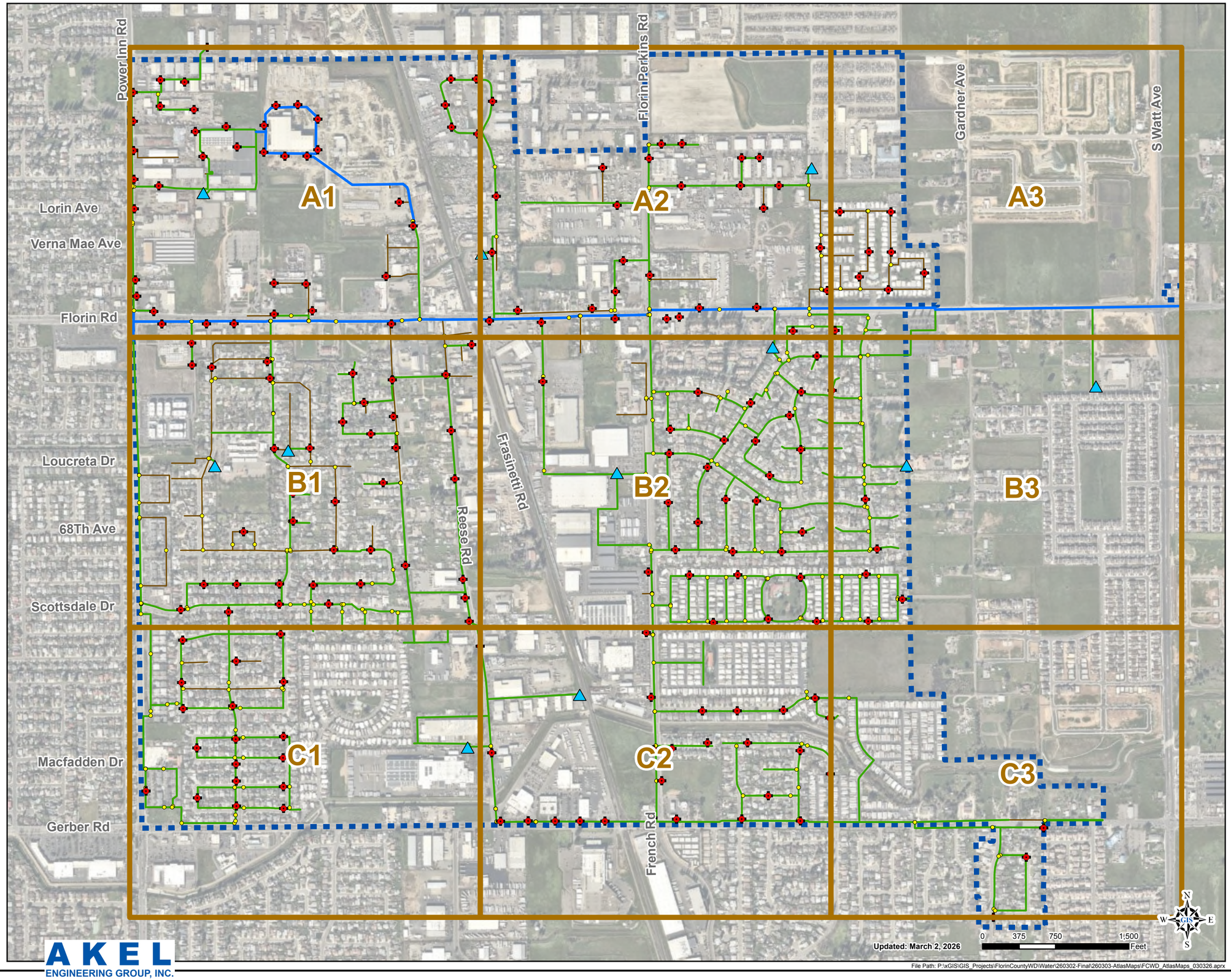
Water Master Plan

Florin County Water District

Agency	MDD/PHD Max Velocity	Fire Flow Max Velocity
City of Santa Rosa	if dia >= 16 in: 5 ft/s if dia < 16 in: 8 ft/s	10 ft/s
Del Paso Manor Water District	ADD: 3 ft/s MDD: 5 ft/s PHD: 7 ft/s	Target: 10 ft/s Allowed: 13 ft/s
Sacramento County Water Agency	PHD: 7 ft/s or 5 ft/kft	10 ft/s
SCWA Zone 40	7 ft/s (except for short reaches) or 5 ft/kft	-
City of Galt	8 ft/s	-
Stone Beetland (Sacramento)	PHD: 7 ft/s	10 ft/s
City of Sacramento	>=16 inch dia: 7 ft/s <16 inch dia: 5 ft/s	-
City of Folsom Water	MDD: 7 ft/s PHD: 10 ft/s	-
City of Lincoln	MDD: 7 ft/s PHD: 10 ft/s	10 ft/s
Rio Linda/ Elverta Community Water District	MDD: 6 ft/s PHD: 7 ft/s	10 ft/s
Florin County Water District (Recommendation)	**5 ft/s**	**-**

APPENDIX B

Atlas Maps



Legend

- Atlas Map Extent

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

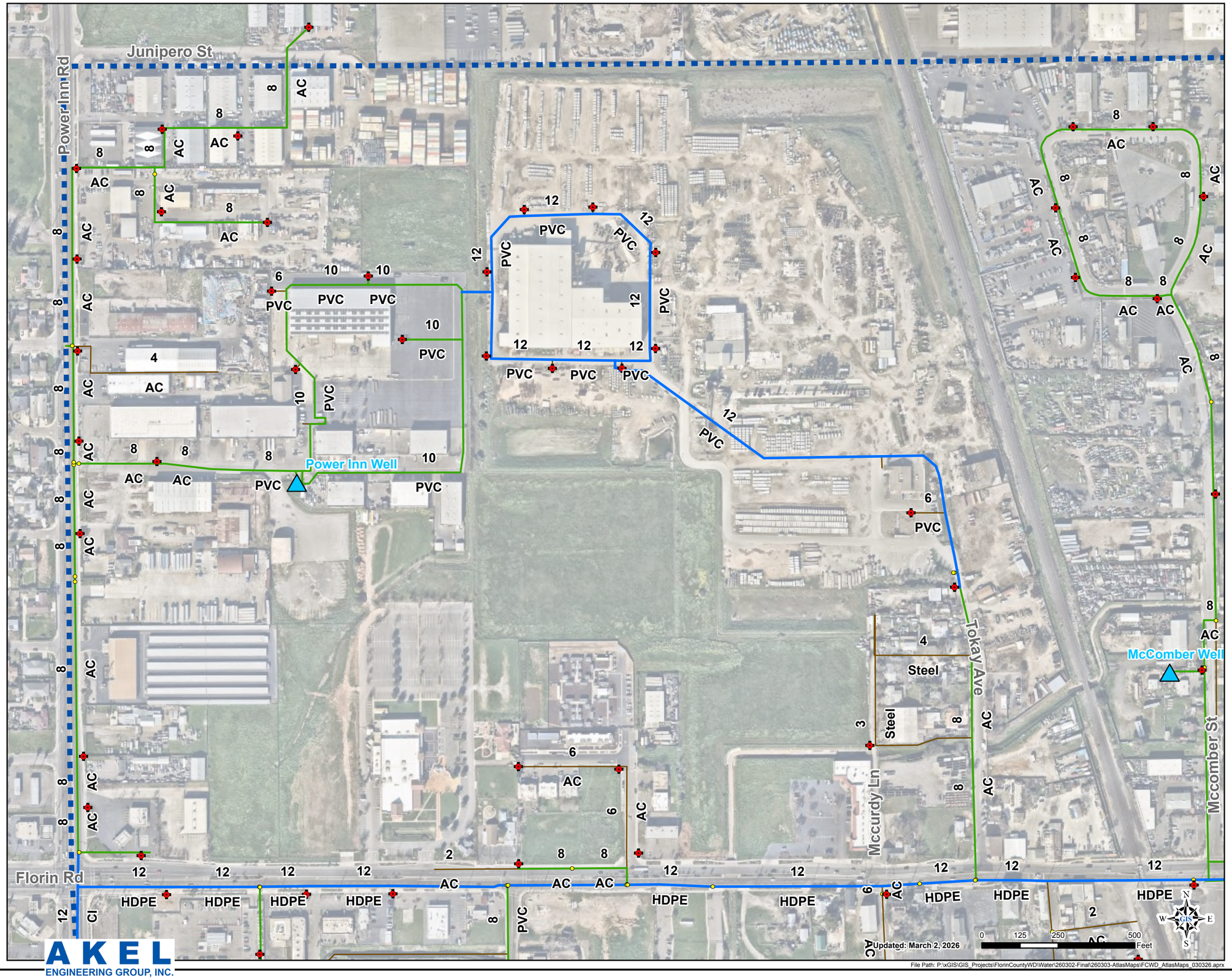
Water Purveyors

- Florin County Water District

Figure 1
Atlas Keymap
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx



Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

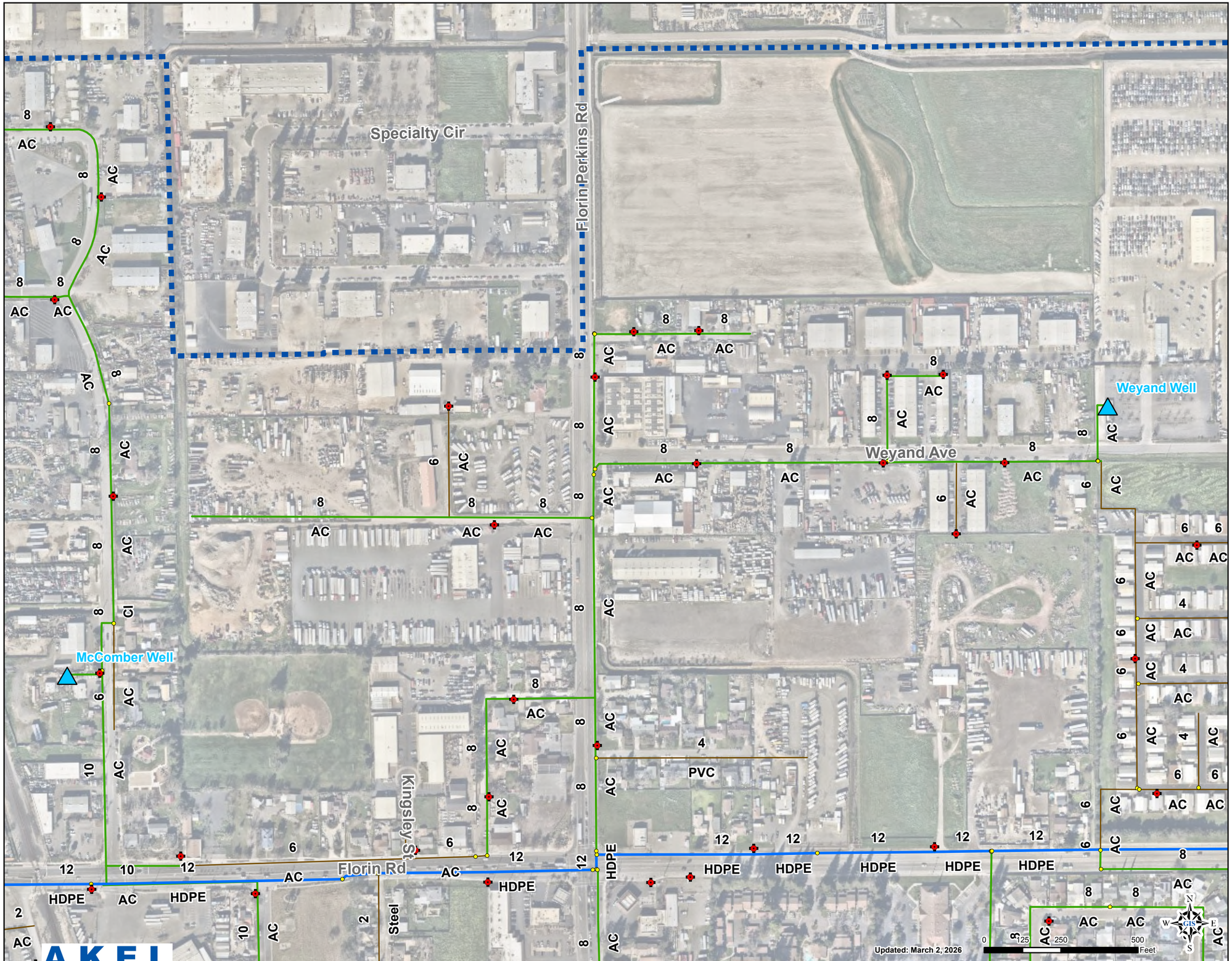
Water Purveyors

- Florin County Water District

Detail A1
Atlas Detail
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx



Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

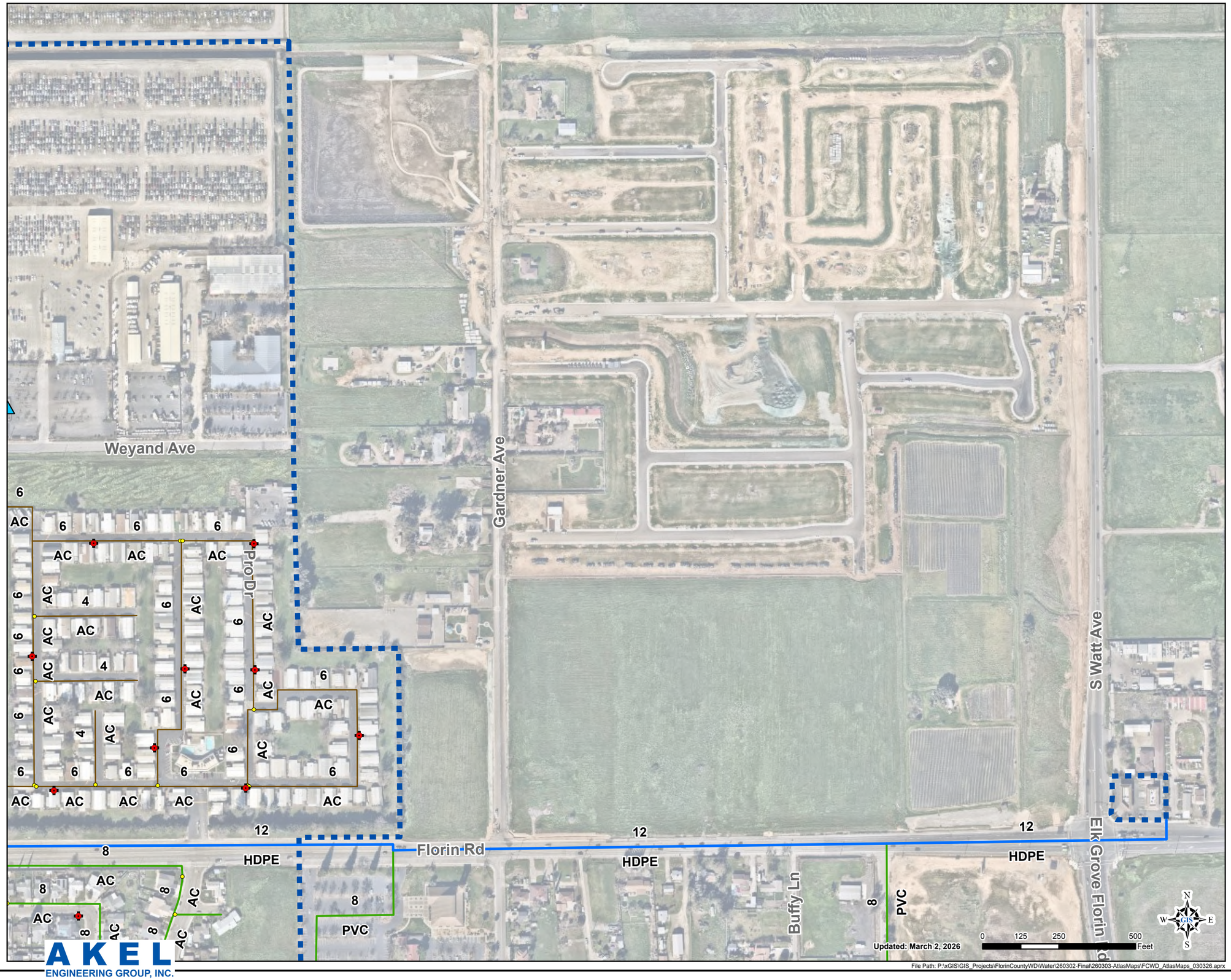
- Florin County Water District

Detail A2
Atlas Detail
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT
INCORPORATED OCT. 19, 1959
CALIFORNIA

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx



Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

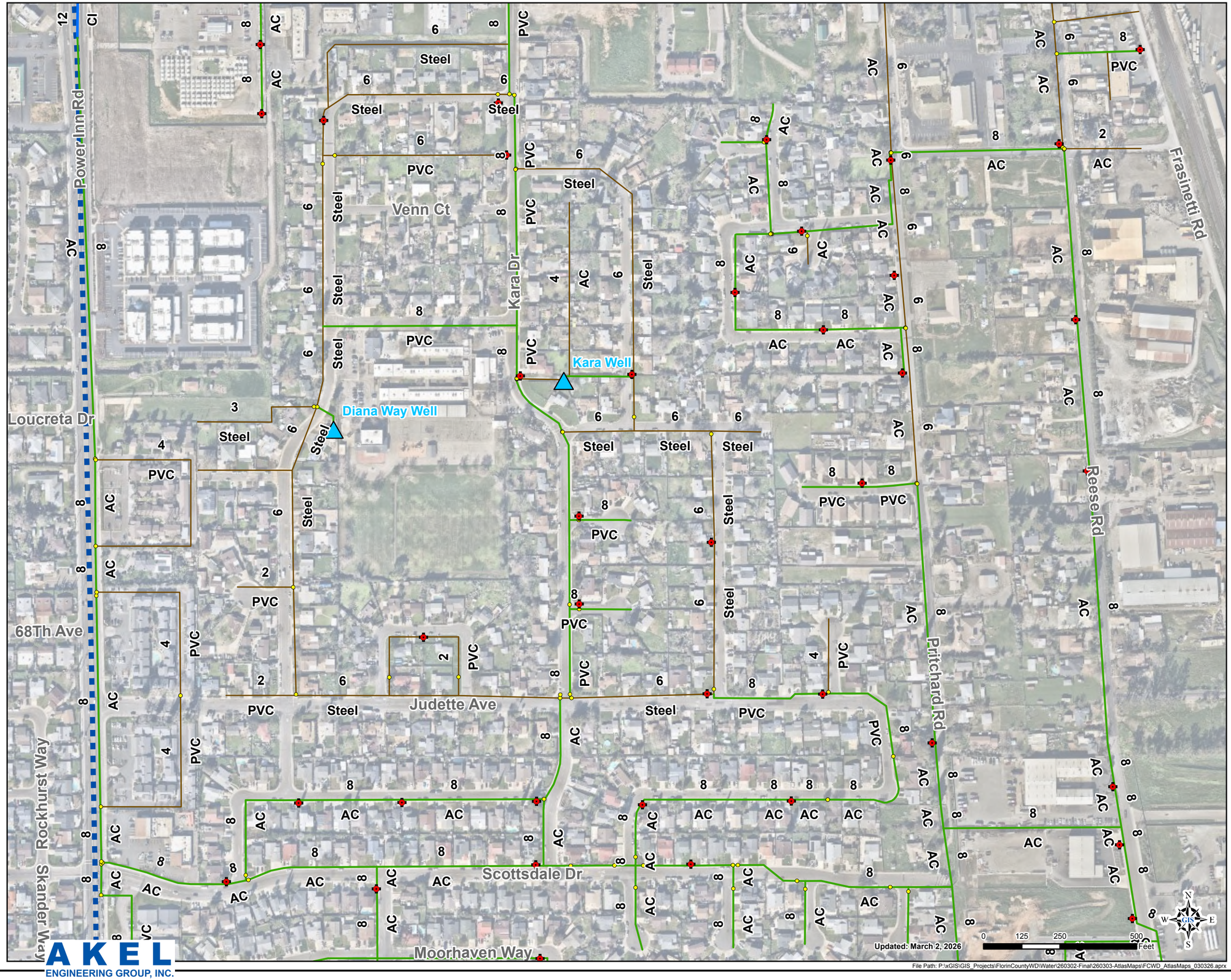
Detail A3
Atlas Detail
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT * INCORPORATED * OCT. 19, 1959 * CALIFORNIA

AKEL ENGINEERING GROUP, INC.

Updated: March 2, 2026

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx



Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Detail B1
Atlas Detail
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

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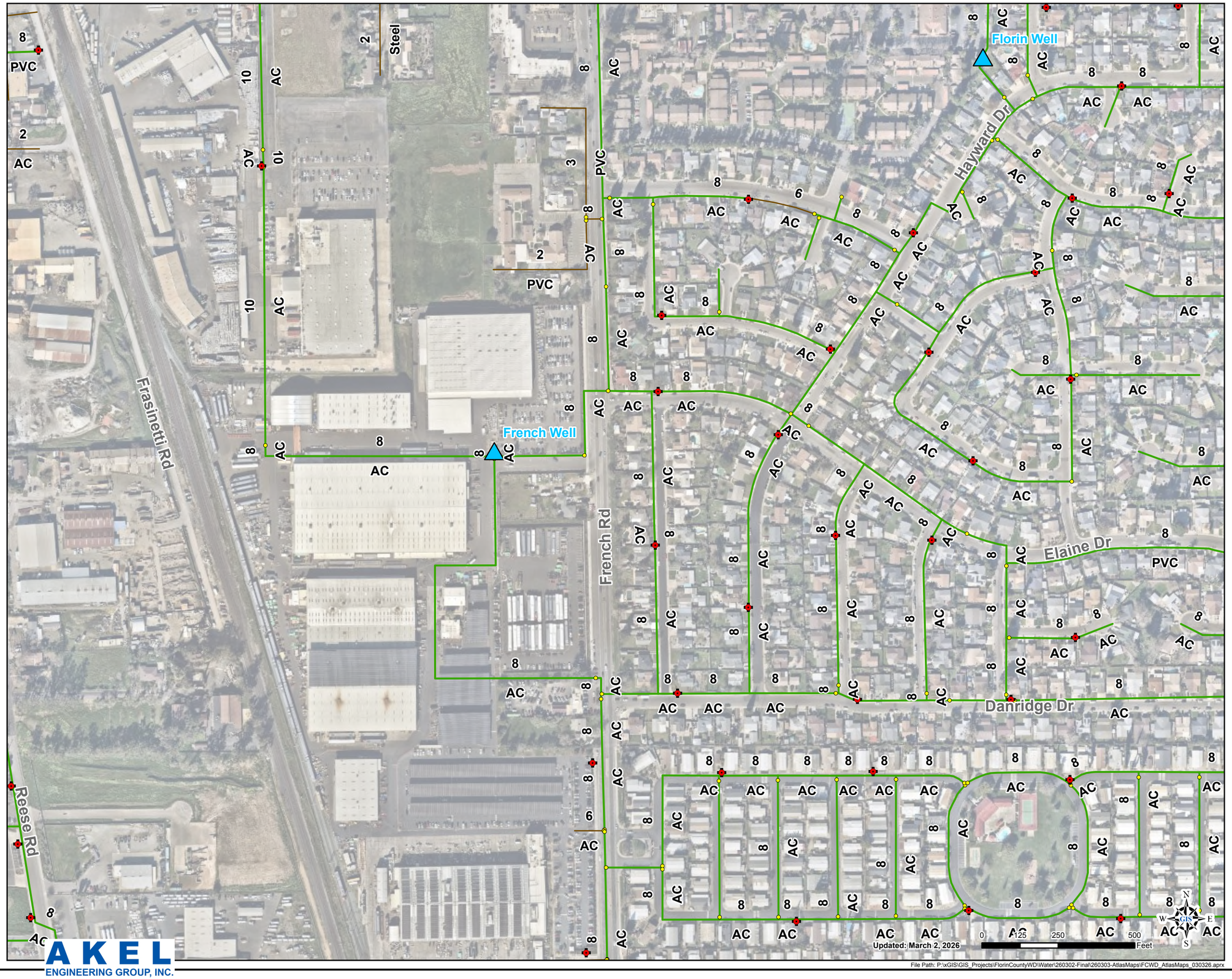


Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

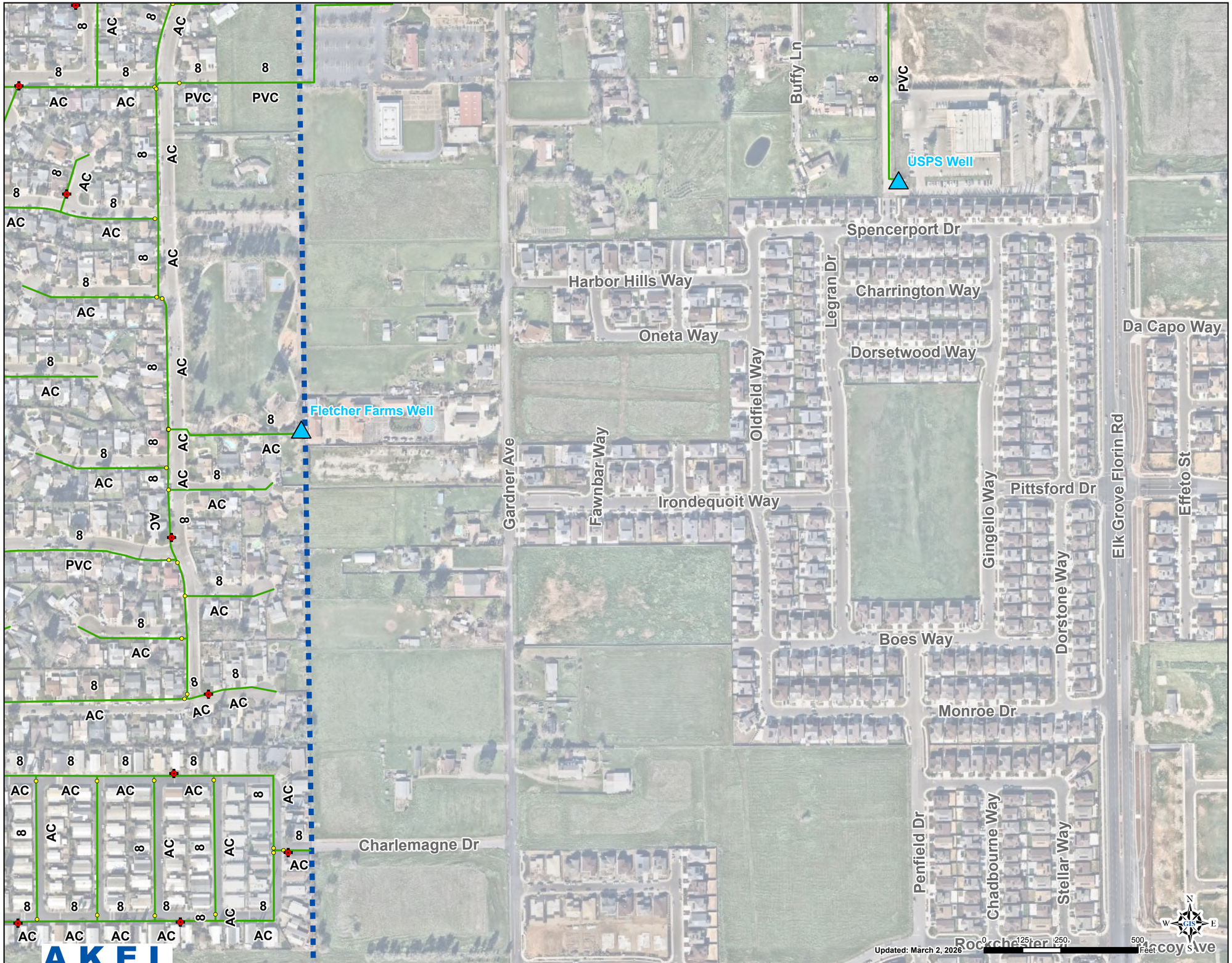
Water Purveyors

- Florin County Water District

Detail B2
Atlas Detail
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx



Updated: March 2, 2026

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AKEL ENGINEERING GROUP, INC.

Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

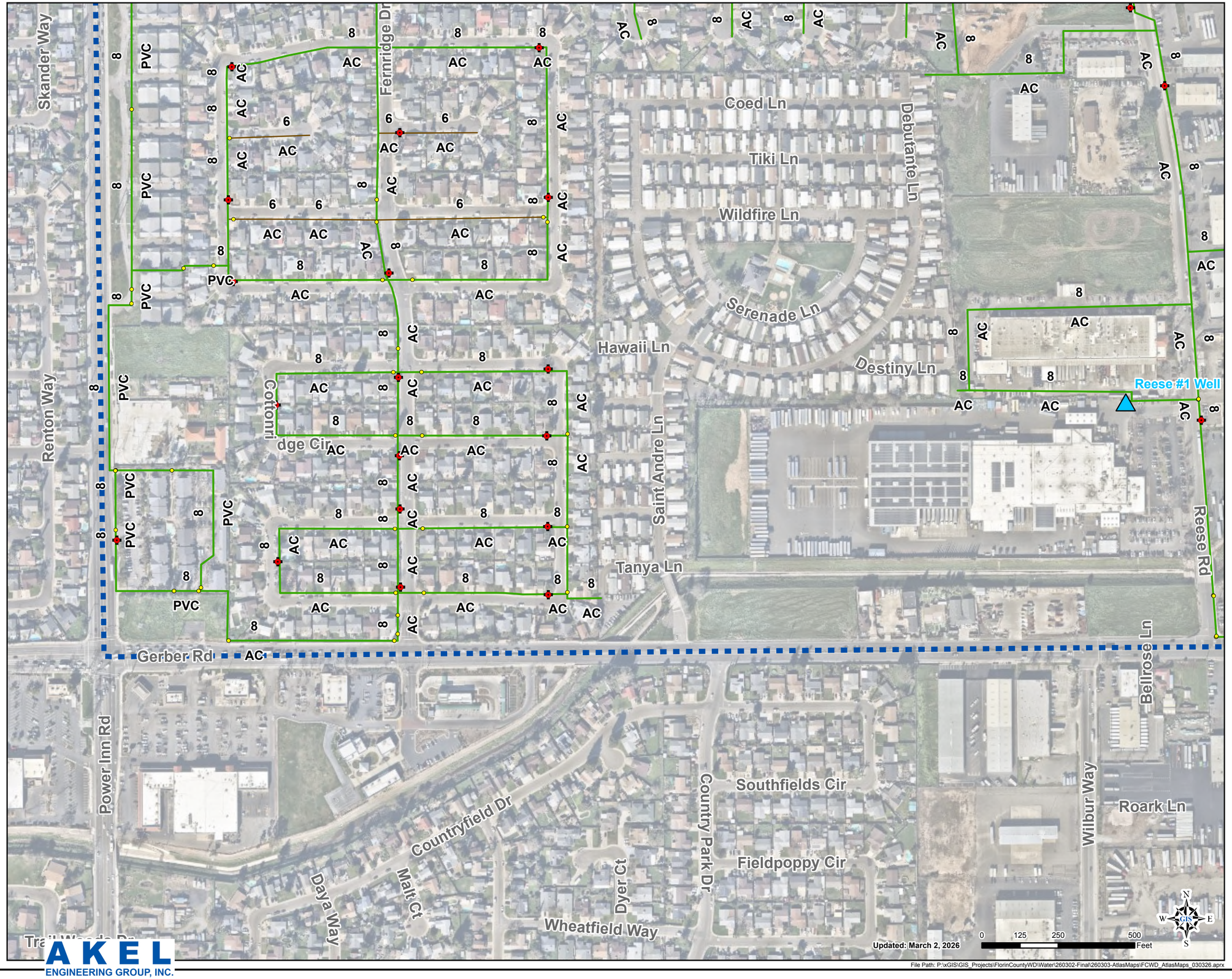
- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Detail B3
Atlas Detail
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT — INCORPORATED OCT. 19, 1959 — CALIFORNIA



Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Detail C1
Atlas Detail
Water System Master Plan
Florin County Water District

AKEL ENGINEERING GROUP, INC.

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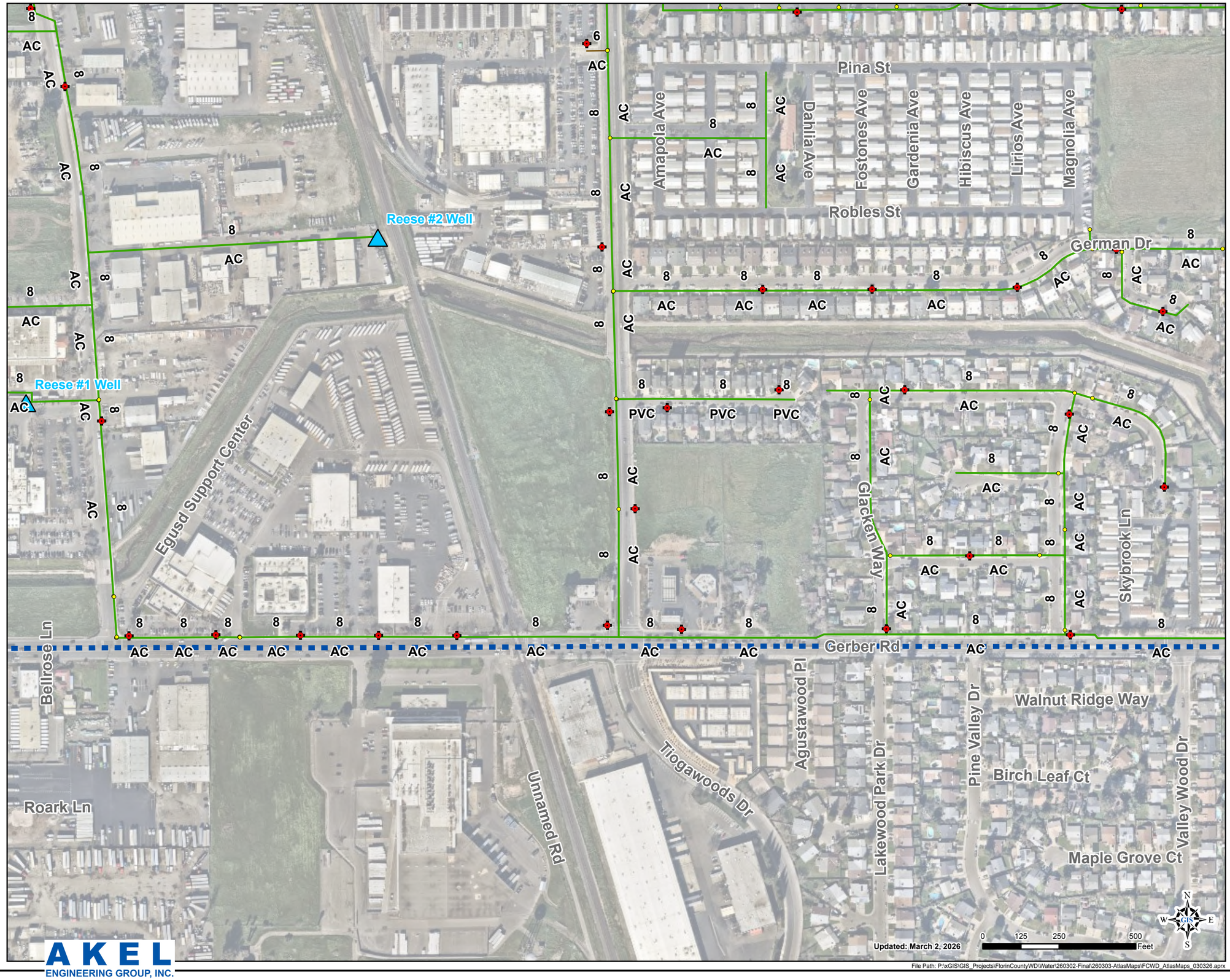

Legend

Existing System

- Wells
- Fire Hydrant
- System Valve

Pipes by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger

Water Purveyors

- Florin County Water District

Detail C2
Atlas Detail
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT * INCORPORATED * OCT. 19, 1999 * CALIFORNIA

AKEL ENGINEERING GROUP, INC.

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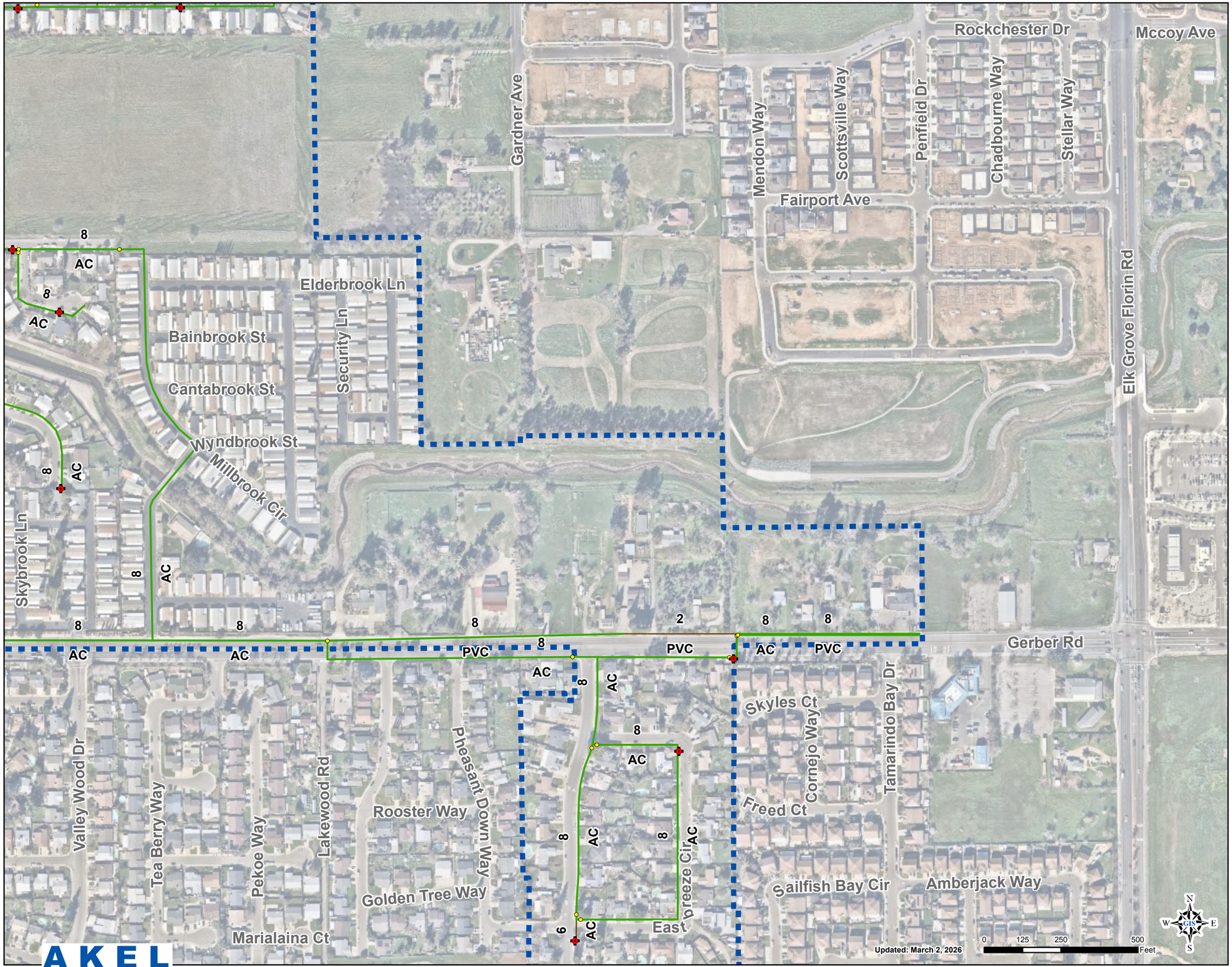

Legend

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Pipes by Diameter

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Water Purveyors

- Florin County Water District

Detail C3
Atlas Detail
Water System Master Plan
Florin County Water District

FLORIN COUNTY WATER DISTRICT INCORPORATED OCT. 19, 1959 CALIFORNIA

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\FlorinCountyWD\Water\260302-Final\260303-AtlasMaps\FCWD_AtlasMaps_030326.aprx

APPENDIX C

Advanced Metering Infrastructure Cost Estimate

Sales Quote

November 10, 2025

Aqua-Metric Sales Company
Mike Bortoletto - Solutions Specialist
1060 National Drive #5. Sacramento, CA 95834
Phone: (916)668-4656 | Cell: (916)824-4552

Quote for: Florin County Water District - BUDGETARY
Attention: Edmond Leggette
Address: 7090 McComber St
City, State, ZIP: Sacramento, CA 95828
Phone: 916-383-0808
Email: edmond.l@florincountywd.org

Quantity	Description	Unit Price	Line Total
	AMI - Fixed Network Solution		
2187	1" iPerl Brass TRPL 1USG	$260.00	$568,620.00
44	1.5" Cordonel TRPL 1USG	$1,670.00	$73,480.00
77	2" Cordonel TRPL 1USG	$1,800.00	$138,600.00
19	3" Cordonel TRPL 1USG	$2,500.00	$47,500.00
5	4" Cordonel TRPL 1USG	$3,960.00	$19,800.00
6	6" Cordonel TRPL 1USG	$5,990.00	$35,940.00
2333	520M SmartPoint	$168.00	$391,944.00
1	Sensus Analytics and RNI Software	$40,700.00	$40,700.00
1	Installation and Integration SA/RNI	$3,500.00	$3,500.00
2	Command Link II	$650.00	$1,300.00
2	M420B BaseStation	$41,000.00	$82,000.00
2	Installation of 60' Tower and Hardware	$55,000.00	$110,000.00
	Annual Support Fee AMSC/SA After Year 1	$28,000.00	

TAXES AND FEES. All prices quoted are exclusive of federal taxes, state taxes, municipal taxes, tariffs, duties, and other government-imposed fees (collectively the "Taxes and Fees") related to the procurement, installation, and delivery of materials and equipment. Customer shall be liable for all applicable Taxes and Fees imposed upon the Goods purchased. Taxes and Fees will be added to each applicable invoice and are the responsibility of the Customer. If Customer is exempt from sales tax, Customer is required to provide all applicable tax exemption documentation at the time of purchase. Any changes in Taxes and Fees may result in adjustments to the final invoice accordingly.

Subtotal	$1,513,384.00
Tariff	$45,401.52
Shipping & Handling	
Sales Tax	$117,287.26
Total	**$1,676,072.78**

This quote for the product and services named above is subject to the following terms::

1. All quotes are subject to the Aqua-Metric Terms of Sale.
2. Quote is valid for thirty days.
3. Freight allowed on single orders exceeding $85,000.00.
4. Net Thirty Days to Pay
5. Returned product may be subject to a 25% restocking fee.
6. Sales Tax and/or Freight charges are approximated and may vary on final invoice.

SmartPoint 520M

Pit Set Module

The SmartPoint® 520M Pit Set Module is a radio transceiver that provides water utilities inbound and outbound access to water measurement and ancillary device diagnostics via radio signal. The SmartPoint 520M is designed for submersible, pit-set environments.

TouchCoupler Design

The SmartPoint 520M Module utilizes TouchCoupler, the patented Sensus inductive coupling communication platform, to interface with the encoded meter. With TouchCoupler, the SmartPoint 520M Module can connect to the meter using existing two wire AMR installations instead of requiring utilities to access the meter to install a new three-wire connection. This results in a fast, efficient and reliable connection at minimal cost.

Operation

With its migratable, two-way communication ability, the M-Series SmartPoint functions as a walk-by/drive-by endpoint, fixed-base endpoint, or combination of the two. This flexibility increases utility data collection capabilities and streamlines operations. The SmartPoint 520M Module receives input from the meter register and remotely sends data to a walk-by/drive-by or fixed-base collection device. The SmartPoint 520M Module easily migrates from walk-by/drive-by to fixed base by simply installing a Base Station.

In walk-by/drive-by mode, the SmartPoint 520M Module collects data and awaits an activation signal from the Vehicle Gateway Basestation (VGB) or Hand-Held Device (HHD). Upon signal receipt, it transmits readings, the meter identification number and any alarms.

As a fixed-base endpoint, the SmartPoint 520M Module interacts with one or more strategically placed Base Stations located in the utility service area. Top of the hour readings and other diagnostics are instantly forwarded to the Regional Network Interface (RNI)™ at time of transmission. The FlexNet® communication network provides unmatched reliability by using expansive tower receiver coverage of metering end points, data/message redundancy, failover backup provisions and operation on FCC primary use (unshared) RF spectrum.

Powerful Transmission, Flexible Platform

The SmartPoint® 520M Pit Set Module offers several advantages that control both deployment and lifetime operation costs. Its powerful, industry-leading two watt transmitter broadcasts over large distances and minimizes collection infrastructure. And after the SmartPoint is installed, its migratable, two-way system platform can be updated without requiring personnel to visit each meter and/or inconveniencing customers.

BENEFITS

- Easily receives input from either walk-by/drive-by or fixed-base collection device
- Controls both deployment and lifetime operation costs
- Compact installation that saves time, space and money - without reducing system performance
- Delivers a fast, efficient and reliable connection at minimal cost
- Minimizes new infrastructure investment
- Enables effective leak detection

SmartPoint 520M

Pit Set Module

Additional Smartpoint 520M Module Features

The SmartPoint 520M Module obtains hourly readings and can monitor continuous flow over a programmable period of time, alerting the utility to leak conditions. In addition, the SmartPoint stores up to 840 consumption intervals (35 days of hourly consumption), providing the utility with the ability to extract detailed usage profiles for consumer information and dispute resolution. The SmartPoint also incorporates a two-port design, allowing the utility to connect multiple registers and ancillary devices (such as acoustic monitoring) to a single SmartPoint. This results in a compact installation that saves time, space and money - without reducing system performance.

SPECIFICATIONS

Service	Pit set installation interfacing the utility meter to the Sensus FlexNet communication network. Unit requires 1.75" diameter hole in pit lid; fits pit lid thicknesses up to 1.75"
Physical characteristics	Width: 4.43" x Height: 5.09" x Depth: 3"
Weight	1.0 lbs/16.0 oz
Color	Black
Frequency range	900 – 950 MHz, 8000 channels X 6.25 kHz steps
Modulation	Proprietary Narrow Band
Memory	Non-Volatile
Power	Lithium Thionyl Chloride batteries
Approvals	US: FCC CFR 47: Part 24D, Part 101C, Part 15 Licensed operation Canada: Industry Canada (IC) RSS-134, RSS-119
Operating temperature	- 22° F to +185° F - 30° C to + 85° C
Options	Dual or single port availability; TouchCoupler only, wired only
Installation environment	100% condensing, water submersible
Compatibility	TouchCoupler and Wired Version: Sensus Encoder Registers, Badger ADE water registers, Master Meter AccuLinx, and Hersey Translator (approved TR/PL Lead) Wired Version Only: Elster Encoder (Sensus protocol), Neptune ARB VI (ProRead), Hersey Translator, Zenner PMN Nitro 01, McCrometer flowcom FC100-00M, and Kamstrup flowIQ 2100 Refer to the 510M/520M SmartPoint® Module Water Meter and Ancillaries Compatibility Quick Guide for the latest compatibility information.
Warranty	20 years – Based on six transmissions per day. Refer to Sensus G-500 for warranty.

xylem

Xylem.com | Sensus.com

SENSUS | 637 Davis Drive | Morrisville, NC 27560 | 800.638.3748

Metal iPERL Smart Water Meter

Electromagnetic Flow Measurement System

Sensus metal iPERL® smart water meters are designed to capture both lost water and lost revenue. The innovative magnetic technology delivers unmatched low flow registration and minimal pressure loss. With no moving parts, iPERL maintains its accuracy over a 20 year lifetime and is equipped with smart water alarms – delivering the intelligence you need to quickly resolve issues in the field.

FEATURES

- 5/8", 5/8" x 3/4", 3/4" and 1" sizes available in potable and reclaim versions
- 3/4" and 1" available in residential fire service (UL 327b)
- Starts registering flow as low as 0.03 gpm (0.007 m³/hr)
- Can be installed horizontally, vertically or diagonally
- Compatible with current Sensus AMI/AMR systems

BENEFITS

- Maximize investment with iPERL's electromagnetic technology, which delivers a 20-year accuracy warranty, with no required maintenance, and no loss in accuracy over 20 years
- Smart alarms detect issues such as leaks, reverse flow, empty pipe, etc.
- Improve low flow accuracy to drive additional revenue

Industry Leading Performance

The patented measurement technology of the iPERL water meter provides continuous and enhanced accuracy ranges at both low and high flows and perpetual accuracy over the life of the product. The iPERL meter has a 20-year accuracy warranty and a 20-year battery life guarantee. Over this 20-year lifespan, your iPERL will measure just as accurately as the day it was installed.

Construction

The iPERL body is comprised of lead-free bronze alloy with a composite polymer core. The iPERL uses a thermal polymer shell with the electronic register inside.

Electronic Register

The 9-digit hermetically-sealed electronic register with LCD display was designed to eliminate dirt, water, and moisture contamination in pit settings. The large, easy-to-read display includes AMI/AMR digits, direction of flow, units of measure, and empty pipe detection. The AMI/AMR digits and units of measure are fully programmable. The register also provides user-configurable data logging.

Solid State Electromagnetic Technology

By avoiding the use of a mechanical measuring element inside the flow tube, metering performance is linear over the entire flow range – ensuring no reduction in accuracy at any flow rate over the life of the meter. The iPERL meter uses our patented remanent magnetic field technology – requiring far less energy and delivering superior accuracy.

Tamperproof

The integrated construction of the iPERL water meter prevents removal of the register to obtain free water. The magnetic tamper and low field alarms will both indicate any attempt to tamper with the magnetic field of the iPERL meter. The meter communication alarm indicates a possible cut cable.

Alarms

Quick resolution of field issues is made possible with smart water alarms including leak detection, reverse flow, empty pipe, magnetic tamper, and low battery. When integrated with our FlexNet® communication network, remotely gathering and transmitting data has never been more reliable or profitable.

Metal iPERL Smart Water Meter

Electromagnetic Flow Measurement System

Smart Alarms

iPERL meters have many configurable smart alarms designed to protect your utility's investment, enhance customer service, and monitor/optimize distribution systems. These alarms include:

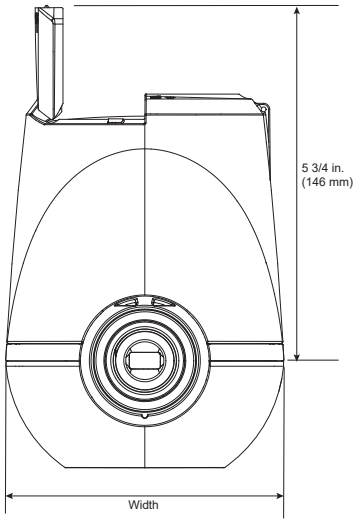
- Empty Pipe
  Detects the absence of water in the flow tube and sends an alert. Allows you to identify main breaks downstream and water shortages for quicker resolution to ensure water availability. This alarm can also indicate the water meter has been removed from service, or notify you of potential tamper.
- Tampering
  Detect magnetic interference to reduce apparent water losses and protect against unauthorized activities.
- Customer Leak
  Detect continual consumption of water over a period of time to indicate downstream leaks. This protects your utility, infrastructure and customers through alarm notifications that can reduce water loss and leak adjustment costs.
- Low Battery
  Replace your meters before they stop recording consumption through alerts indicating battery capacity to the meter or valve is running low.
- Reverse Flow
  Keep untreated water from re-entering your distribution system and deter tampering attempts through an alarm triggered when reverse flow is detected at the meter.

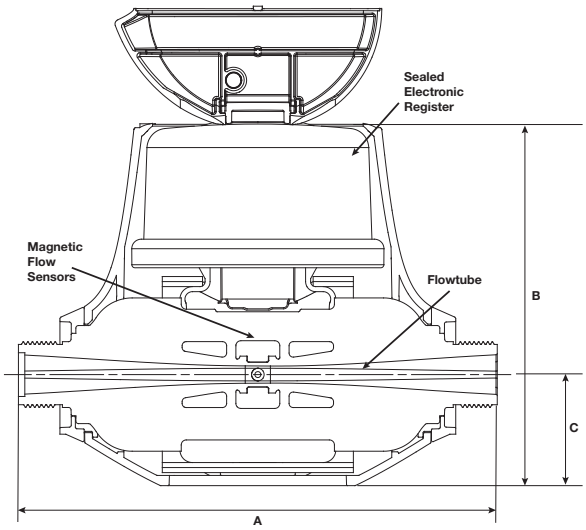
SPECIFICATIONS

Service	Measurement of potable and reclaim water, and Residential Fire Service (UL 327b). 0-100% humidity. Fully submersible. IP68+ rated.			
Temperature Ranges	Water operating: Ambient air operating: Storage air:	33 °F (0.55 °C) to 80 °F (26.7 °C) -22 °F (-30 °C) to 140 °F (60 °C) -30 °F (-34.4 °C) to 158 °F (70 °C)		
Starting Flow	5/8" (DN 15 mm) size: 0.03 gpm (0.007 m³/h)	5/8" x 3/4" (DN 15x20 mm) size: 0.03 gpm (0.007 m³/h)	3/4" (DN 20 mm) size: 0.03 gpm (0.007 m³/h)	1" (DN 25 mm) size: 0.11 gpm (0.025 m³/h)
Low Flow Range (±3%)	5/8" (DN 15 mm) size: >0.10 gpm (0.025 m³/hr) to <0.18 gpm (0.041 m³/hr)	5/8" x 3/4" (DN 15 mm) size: >0.10 gpm (0.025 m³/hr) to <0.18 gpm (0.041 m³/hr)	3/4" (DN 20 mm) size: >0.10 gpm (0.025 m³/hr) to <0.18 gpm (0.041 m³/hr)	1" (DN 25 mm) size: >0.3 gpm (0.068 m³/hr) to <0.4 gpm (0.09 m³/hr)
Normal Water Operating Flow Range (±1.5%)	5/8" (DN 15 mm) size: 0.18 to 25 gpm (0.04 to 5.7 m³/hr)	5/8" x 3/4" (DN 15x20 mm) size: 0.18 to 35 gpm (0.04 to 8.0 m³/hr)	3/4" (DN 20 mm) size: 0.18 to 35 gpm (0.04 to 8.0 m³/hr)	1" (DN 25 mm) size: 0.4 to 55 gpm (0.09 to 12.5 m³/hr)
Maximum Operating Pressure	5/8'', 5/8" x 3/4", and 3/4'' size: 200 psi (13.8 bar) 1'' size: 175 psi (12.1 bar)			
Measurement Technology	Solid state electromagnetic flow			
Register	Hermetically sealed, 9-digit programmable electronic register			
Capacity	10,000,000 gallons, 1,000,000 cubic feet or 100,000 m3 capacity			
Register Resolution	.01 gallons/imperial gallons, .001 cubic foot, or .0001 m3			
Conformance to Standards	Meets the requirements of NSF 61, Annex G and NSF 372. Exceeds the most current revision of AWWA Standard C-715.			
Materials	External housing – Thermal polymer Flowtube – Bronze alloy flowtube with a composite polymer internal core		Electrode – Silver/silver chloride Register cover – Hermetically sealed glass	

Metal iPERL Smart Water Meter

Electromagnetic Flow Measurement System





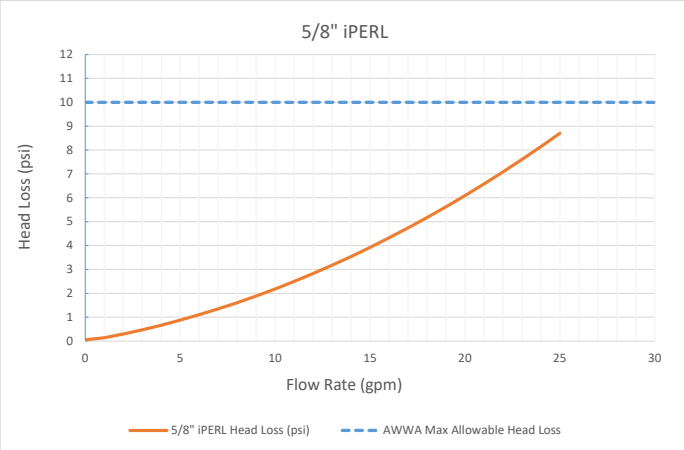
DIMENSIONS AND NET WEIGHTS

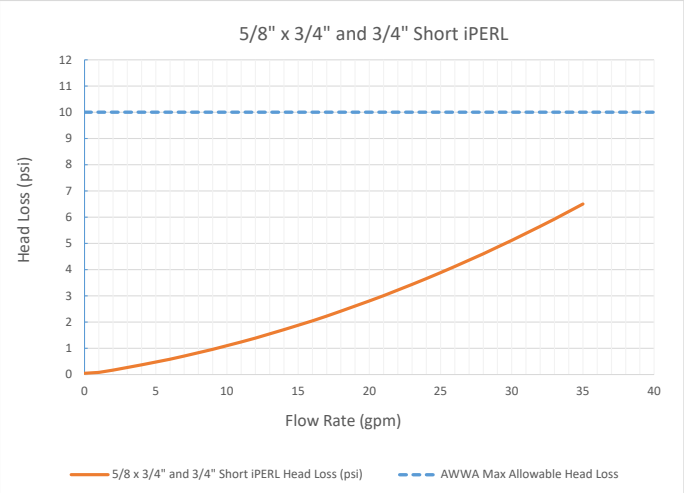
Meter Size	A	B	C	Spud Ends	NPSM Thread Size	Width	Net Weight
5/8″ (DN 15 mm)	7-1/2″ (190 mm)	6-1/10″ (155mm)	1-3/4″ (44 mm)	5/8″ (15 mm)	3/4″ (20 mm)	4-1/2″ (114 mm)	3.1 lb. (1.4 kg)
5/8″ x 3/4″ (DN 15mm x 20 mm)	7-1/2″ (190 mm)	6-1/10″ (155mm)	1-3/4″ (44 mm)	3/4″ (20 mm)	1″ (25 mm)	4-1/2″ (114 mm)	3.1 lb. (1.4 kg)
3/4″Short (DN 20 mm)	7-1/2″ (190 mm)	6-1/10″ (155 mm)	1-3/4″ (44 mm)	3/4″ (20 mm)	1″ (25 mm)	4-1/2″ (114 mm)	3.1 lb. (1.4 kg)
3/4″ (DN 20 mm)	9″ (229 mm)	6-1/10″ (155 mm)	1-3/4″ (44 mm)	3/4″ (20 mm)	1″ (25 mm)	4-1/2″ (114 mm)	3.2 lb. (1.45 kg)
1″ (DN 25 mm)	10-3/4″ (273 mm)	6-1/10″ (155 mm)	1-3/4″ (44 mm)	1″ (25 mm)	1-1/4″ (32 mm)	4-1/2″ (114 mm)	3.3 lb. (1.5 kg)

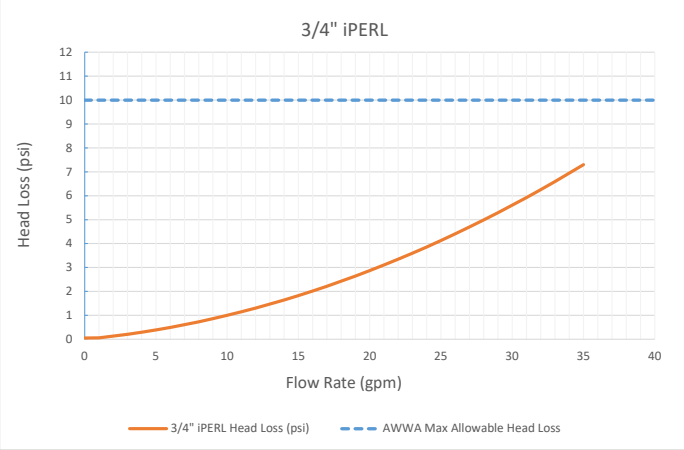
Metal iPERL Smart Water Meter

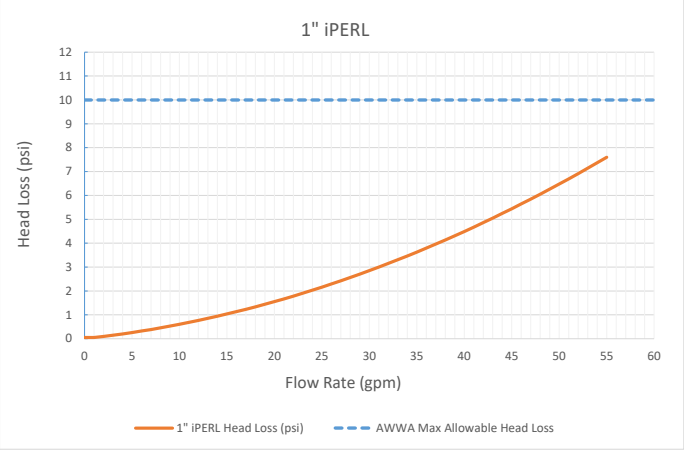
Electromagnetic Flow Measurement System

Head Loss Curves









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Cordonel

Ultrasonic C&I water meter

Cordonel® is an innovative ultrasonic C&I water meter with patented flow technology that measures low- to high-volume flow with unmatched accuracy. Equipped with pressure and temperature sensing, alarms, and data storage, it fills a critical need in commercial, industrial, and irrigation markets.

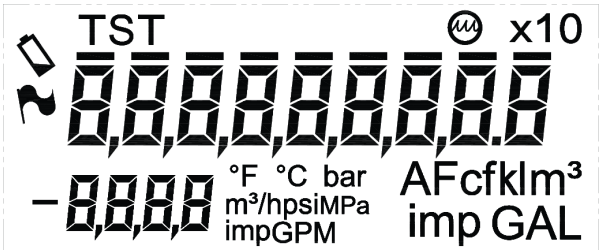
Superior accuracy

Cordonel's patented flow rate technology ensures that every drop of water passes through one of its three individual measuring paths. Cordonel's horizontal and vertical pipe orientations means no straight upstream and downstream pipe requirements; measurements are accurate even behind a 90-degree bend. With solid-state ultrasonic engineering and reliable readings over its 20-year battery life, Cordonel delivers accuracy unmatched in the industry.

Conformance to standards

The Cordonel Ultrasonic water meter meets and far exceeds the most recent revision of AWWA Standard C715 class I & II. Each meter is performance tested to ensure compliance. All Cordonel Ultrasonic water meters are NSF/ANSI Standard 61, Annex F and G approved latest standards.

Display



Alarm is triggered

Low battery level is reached

TST System is set up in hydraulic testing mode

⊕⊖ Indicates positive or negative flow

FEATURES

- Advanced U0D0 capability - zero straight pipe requirements
- Installation in horizontal and vertical pipe orientations
- LCD for consumption, flow, temperature, pressure (optional) and status information
- NFC wireless interface for readout of the last volume reading
- Optional pulse output with programmable weights and widths
- Removable measuring chamber for 6" and larger meters
- 180 days of hourly consumption, pressure, and temperature data logging

BENEFITS

- Maintenance free
- No accuracy degradation
- Secure encrypted data transmission
- 20-year warranty in normal operating conditions

APPLICATIONS

- Residential, Irrigation, and Commercial
- AMI and AMR output
- Hot water measurement up to 122 °F
- High, low, and variable flow monitoring
- Leak detection
- Pulse output capability
- District Metering Area analysis

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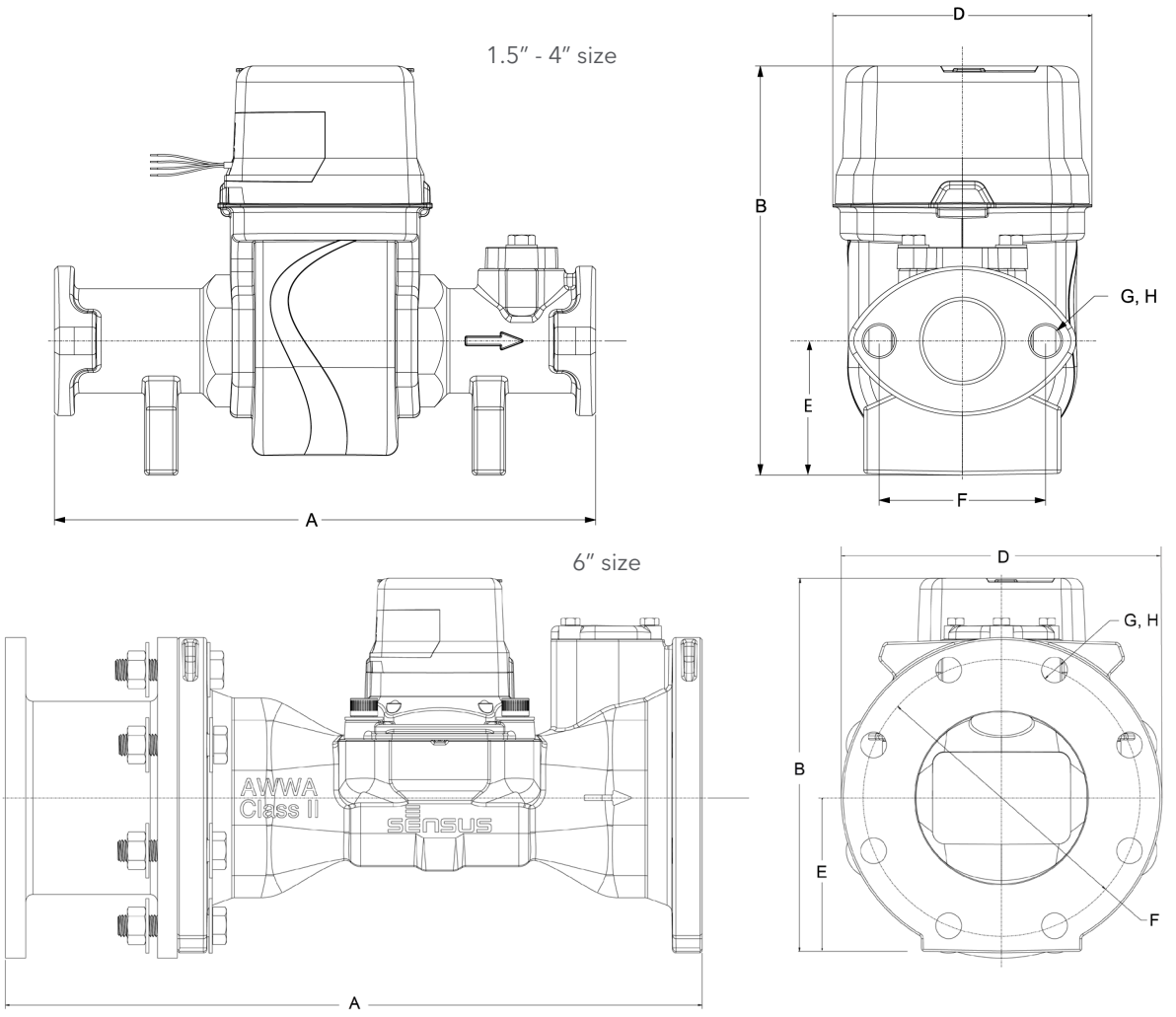
Ultrasonic C&I water meter



DIMENSIONS AND NET WEIGHTS

Size	A (lay length)	D (width)	B (Height)	E (Height to pipe axis)	F Bolt circle	G No. of bolts	H Bolt size	Net Weight
1.5″ (DN 40 mm)	13″ (330 mm)	6.22″ (158 mm)	9.6″ (244 mm)	3.15″ (80 mm)	4″ (102 mm)	2	5/8″	25.13 lb (11.4 kg)
2″ (DN 50 mm)	10″ (254 mm)	6.22″ (158 mm)	9.6″ (244 mm)	3.15″ (80 mm)	4.5″ (114 mm)	2	5/8″	23.81 lb (10.8 kg)
	15.25″ (387 mm)							27.78 lb (12.6 kg)
	17″ (432 mm)							28.89 lb (13.1 kg)
3″ (DN 80 mm)	17″ (432 mm)	7.87″ (200 mm)	10.8″ (275 mm)	3.74″ (95 mm)	6″ (152 mm)	4	5/8″	52.47 lb (23.8 kg)
	19″ (483 mm)							54.90 lb (24.9 kg)
4″ (DN 100 mm)	14″ (355 mm)	9″ (229 mm)	12.2″ (310 mm)	4.37″ (111 mm)	7.5″ (191 mm)	8	5/8″	51 lb (23.2 kg)
	20″ (508 mm)							74.96 lb (34.0 kg)
	23″ (584 mm)							79.81 lb (36.2 kg)
6″ (150 mm)	18″ (457 mm)	11" (280 mm)	12.874" (327 mm)	5.31" (135 mm)	9.5″ (241 mm)	8	3/4″	87.3 lb (39.6 kg)
	24″ (610 mm)	11" (280 mm)	12.874" (327 mm)	5.31" (135 mm)	9.5″ (241 mm)	8	3/4″	91.71 lb (41.6 kg)
	27″ (685 mm)	11" (280 mm)	12.874" (327 mm)	5.31" (135 mm)	9.5″ (241 mm)	8	3/4″	96.12 lb (43.6 kg)

Cordonel

Ultrasonic C&I water meter

SPECIFICATIONS

Service	Measurement of potable and reclaim water; IP68 Rated	
Temperature Ranges	Water operating: 33 °F (0.55 °C) to 122 °F (50 °C) Environmental: 14 °F (-10 °C) to 104 °F (40 °C)	
Starting Flow	1.5" (DN 40 mm): 0.05 gpm (0.012 m³/h) 2" (DN 50 mm): 0.05 gpm (0.012 m³/h) 3" (DN 80 mm): 0.15 gpm (0.033 m³/h)	4" (DN 100 mm): 0.24 gpm (0.054 m³/h) 6" (DN 150 mm): 0.48 gpm (0.109 m³/hr)
Low Flow (±3%)	1.5" (DN 40 mm): 0.18 gpm (0.04 m³/hr) 2" (DN 50 mm): 0.18 gpm (0.04 m³/hr) 3" (DN 80 mm): 0.44 gpm (0.10 m³/hr)	4" (DN 100 mm): 0.70 gpm (0.16m³/hr) 6" (DN 150 mm): 1.5 gpm (0.34 m³/hr)
Normal Water Operating Flow Range (±1.5%)	1.5" (DN 40 mm): 0.26 to 220 gpm (0.06 to 50 m³/hr) 2" (DN 50 mm): 0.26 to 220 gpm (0.06 to 50 m³/hr) 3" (DN 80 mm): 0.70 to 550 gpm (0.16 to 125 m³/hr)	4" (DN 100 mm): 1.14 to 1000 gpm (0.26 to 227 m³/hr) 6" (DN 150 mm): 2.4 - 2500 gpm (0.55 - 567.8 m³/hr)
Maximum Continuous Operation	1.5" (DN 40 mm): 220 gpm (50 m³/hr) 2" (DN 50 mm): 220 gpm (50 m³/hr) 3" (DN 80 mm): 550 gpm (125 m³/hr)	4" (DN 100 mm): 1000 gpm (227 m³/hr) 6" (DN 150 mm): 2500 gpm (567.8 m³/hr)
Maximum Intermittent Operation	1.5" (DN 40 mm): 220 gpm (50 m³/hr) 2" (DN 50 mm): 220 gpm (50 m³/hr) 3" (DN 80 mm): 550 gpm (125 m³/hr)	4" (DN 100 mm): 1000 gpm (227 m³/hr) 6" (DN 150 mm): 2500 gpm (567.8 m³/hr)
Pressure Loss	1.5" (DN 40 mm): 6.9 psi @ 160 gpm (0.48 bar @ 36 m³/hr) 2" (DN 50 mm): 4.3 psi @ 160 gpm (0.30 bar @ 36 m³/hr) 3" (DN 80 mm): 3.2 psi @ 400 gpm (0.22 bar @ 91 m³/hr)	4" (DN 100 mm): 6.4 psi @ 800 gpm (0.44 bar @ 182 m³/hr) 6" (DN 150 mm): 5.5 psi @ 1600 gpm (0.38 bar @ 363 m³/hr)
Maximum Operating Pressure	175 PSI (12.07 bar)	
Register	Fully electronic sealed register with programmable registration (Gal. /Cu.Ft./ Cu. Mtr. / Imp. Gal. / Acre Ft.) Programmable	
Test Ports	Stainless steel with optional NPT riser	
Flange Connections	U.S. ANSI B16.1 / AWWA Class 125	
NSF Approved Materials	Maincase: Epoxy coated ductile iron Measuring Transducers: High grade polymer Inner tube: High grade polymer, stainless steel	

Cordonel

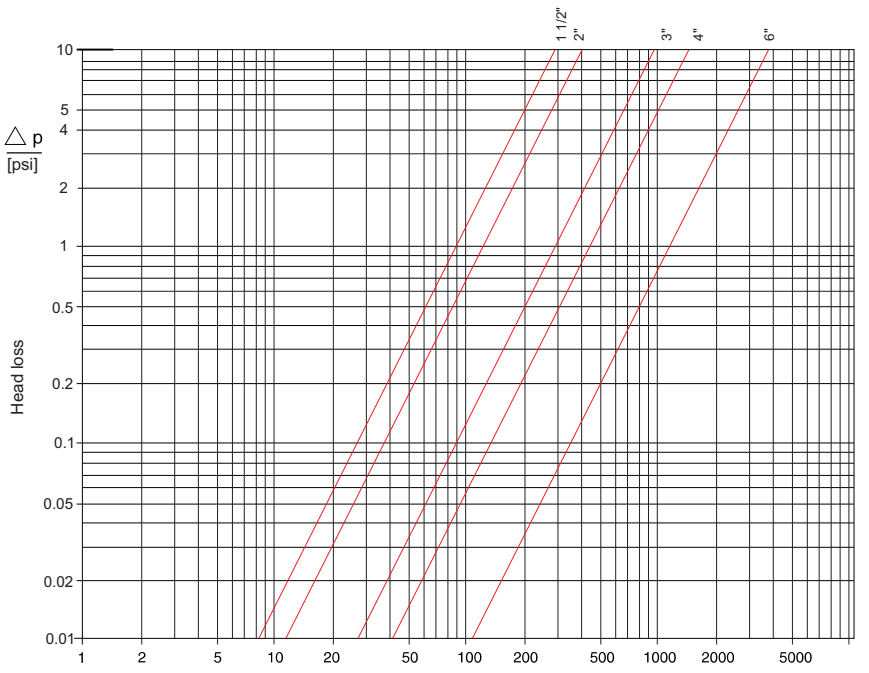
Ultrasonic C&I water meter

Smart Alarms

Cordonel meters have many configurable smart alarms designed to protect your utility's investment, enhance customer service, and monitor/optimize distribution systems. These alarms include:

- Empty Pipe
  Detects the absence of water in the flow tube and sends an alert. Allows you to identify main breaks downstream and water shortages for quicker resolution to ensure water availability. This alarm can also indicate the water meter has been removed from service, or notify you of potential tamper.
- Customer Leak
  Detect continual consumption of water over a period of time to indicate downstream leaks. This protects your utility, infrastructure and customers through alarm notifications that can reduce water loss and leak adjustment costs.
- Low Battery
  Replace your meters before they stop recording consumption through alerts indicating battery capacity to the meter or valve is running low.
- Reverse Flow
  Keep untreated water from re-entering your distribution system and deter tampering attempts through an alarm triggered when reverse flow is detected at the meter.
- High Flow
  Detect broken pipes and reduce property damage through an alert triggered by the detection of excessive flow rates.
- Pressure
  Get alerted when water pressure exceeds or falls below the pressure threshold to prevent potential disruptions of service. Standard in 3" and above; optional in 1.5" and 2"s.
- Temperature
  Get alerted when water temperature exceeds or falls below the temperature threshold so you can take action to better protect your meter and water network assets.

Typical Headloss Curve



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Sensus Analytics for Water

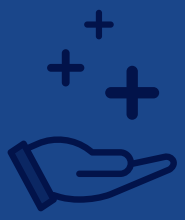
A superior network, intuitive software, incomparable results

Making your data insights simple, relevant and actionable

- Intuitive
- App-based
- Affordable
- Accessible
- Real-time analysis
- Scalable
- Integration-ready
- Secure

Delivering critical value to your organization

- Reduce costs
- Increase revenue
- Prevent outages
- Improve customer service
- Ensure safety
- Secure your grid
- Optimize asset health
- Increase productivity and efficiencies
- Fuel innovation



*Within the next three years, water utilities plan to expand their use of analytics by:

- **74%** **training** existing staff
- **45%** **purchasing** additional functionality in existing tools
- **43%** **purchasing** new tools
- **23%** **hiring** skilled staff
- **11%** **outsourcing** analytics

Sensus Analytics is at the heart of our smart utility technology

Core Applications:

Admin | Report Access | Billing Access | Device Access

Meter Insight | Alert Manager | Alarm Insight

Applications for Water Utilities:

Unbilled Insight | Acoustic Monitoring | Pressure Profile

Hidden Revenue Locator | Service Management

Unlock the full value of your smart meter data

- Precise usage, consumption, billing data
- Asset optimization
- Leak detection and management
- Pressure monitoring for leak detection
- Acoustic monitoring for leak detection
- Predictive and preventative maintenance
- Remote connect/disconnect
- Conservation
- Meter testing and replacement prioritization
- Non-revenue water reduction (including apparent losses)
- Customer engagement

For more information visit **sensus.com/WaterAnalytics**

*Source: *State of the market: Trends in the Use of Utility Analytics*, research by Utility Analytics Institute and Sensus, October 2018

YSB-10010-01

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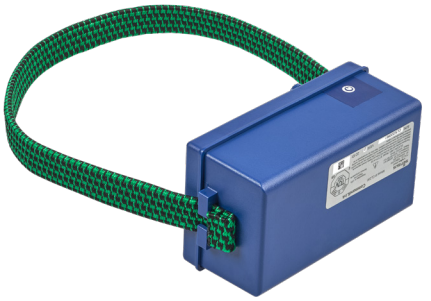
CommandLink® II

Wireless Interface



Seamless Communication

The CommandLink® II wireless interface provides access to a complete suite of functional controls within a gas, water or electric SmartPoint® transceiver. This Bluetooth® enabled device, coupled with a handheld, performs activations, deactivation, meter reads, on demand reads and can also readily audit the water, gas, or electric SmartPoint module.

CommandLink II provides instant access to any SmartPoint module's programmed and stored information. You can retrieve setup information, validate readings, and verify or reprogram settings for optimal performance.

The CommandLink II is a compact tool that is compatible with Sensus approved WIN mobile, WIN 10, Android and iOS programming devices.

FEATURES

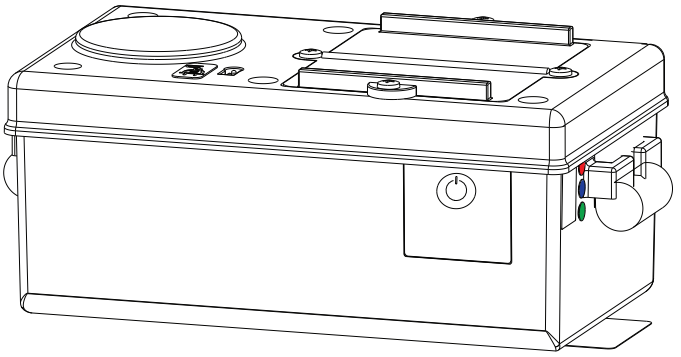
- Compact size
- Rechargeable batteries included
- Bluetooth enabled
- Built-in antenna

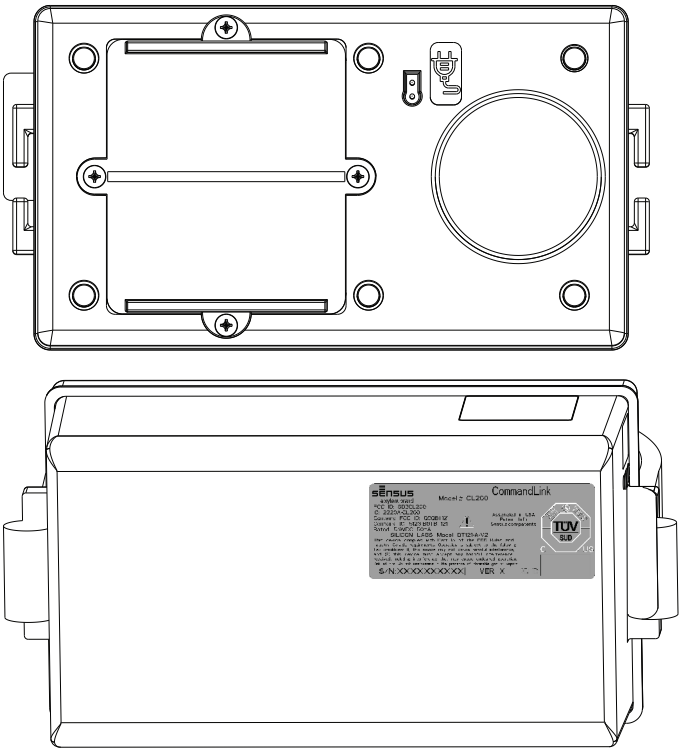
BENEFITS

- Interacts with SmartPoint water, gas, and electric modules
- Performs on-demand interrogation
- Retrieves and reprograms settings

CommandLink® II

Wireless Interface





Specifications

Case	High-impact, injection-molded plastic
Dimensions	4.7" L x 2.37" H x 2.41" W
Weight	16 oz.
Operating Temp.	32°F to 122°F
Shock Temp.	-20°F to 103°F
Charging Temp.	-32°F to 104°F
Relative Humidity	65 +/- 20%y
Dust	Meets procedures IP5X (MIL-STD 810F), Method 510.4
Warranty	One year
Compliance	Complies with FCC Part 15, 24, and 101. Complies with Industry Canada ICES-003.
Safety Certification	CAN/CSA C22.2 No. 62368-1:2014 UL 62368-1:2014 EN 62368-1:2014/A11:2017

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FlexNet M420B Base Station

Compact Point-to-Multipoint Base Station

The Sensus FlexNet® M420B Base Station offers a strategic communications option for public service providers with endpoints deployed in remote or densely populated areas.

The efficient transceiver can transmit and receive in a 200kHz band of spectrum. 200kHz enables more dedicated channels, resulting in higher network capacity, allowing more granular data and more channels of data. The Sensus FlexNet communication network delivers eight times the transmit power of competitive systems over primary-use licensed spectrum – ensuring reliability for mission critical applications.

The architecture enables reliable communication of status and usage information with fewer access points than other network architectures. These compact, efficient base stations fit in space-constrained environments and require no air conditioning.

Licensed Radio Spectrum

In North America, FCC/ISED protected primary-use spectrum avoids competition with other wireless services, interference from other radio devices and the risk of being taken over by emergency service providers.

Fewer Access Points

Our point-to-multipoint architecture directly connects base stations to endpoints over large geographic areas – greatly reducing the number of network backhaul connections as well as O&M costs.

Resilient Network Design

Sensus Base Stations continue to provide real time data during outages and emergencies because of eight hour plus battery backup – enabling better workforce management and faster service restoration.

Small Footprint

Flexible pole or wall-mounting options enable strategic deployment with a discreet appearance.

FEATURES

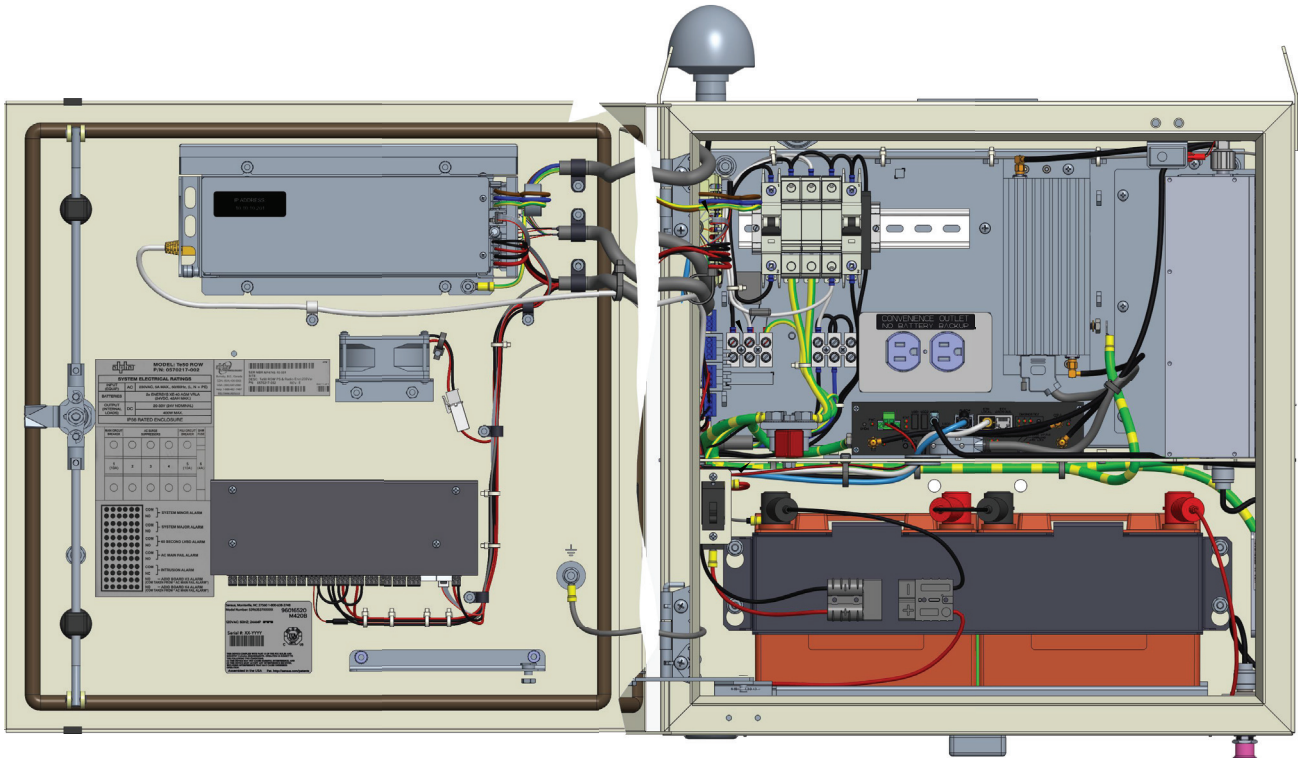
- GPS receiver for time synchronization
- Duplexer for single antenna
- IP-addressable power supply with hot-swap capability
- 8-hour battery backup
- Alarms and reporting capability
- Backhaul via Ethernet/IP
- Heated battery for cold weather environments
- Modular construction for easy serviceability

APPLICATIONS

- Two-way Advanced Meter Infrastructure (AMI)
- Distribution Automation (DA)
- Demand Response (DR)
- Home Area Networks (HAN)
- RNI 4.x or newer
- NCS 2.0
- Unified 3.x
- Micro Grid and Grid Edge

FlexNet® M420B Base Station

Compact Point-to-Multipoint Base Station



PROPERTIES

Receive bandwidth	200 KHz
Transceivers	Single
Spectrum	Licensed 900 MHz PCS/MAS
Duplexing	Thirty-two receivers
Applications	Single
Expandability	No
Compatibility	SNMP
FlexNet	RNI 4.x or newer Unified 3.x or newer NCS 2.0 or newer

ENCLOSURES - OUTDOOR - POLE/WALL MOUNT

Height	22″ (55.9 cm)
Width	22″ (55.9 cm)
Depth	10.5″ (26.7 cm)
Weight	150 lbs. (approx.)
Capacity	One transceiver
Temperature	-40° to +122° F (-40° to +50° C)
Voltage	120 VAC
Battery backup	8 hours
NEMA rating	4
Air conditioned	No

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