Final

October 2015

CITY OF AUBURN WASHINGTON

Comprehensive Water Plan

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CITY OF AUBURN

COMPREHENSIVE WATER PLAN

October 2015

FINAL

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CITY OF AUBURN

COMPREHENSIVE WATER PLAN

2015

This Comprehensive Water Plan for the City of Auburn was prepared in accordance with WAC 246-290-100, under the direction of the following Registered Professional Engineer:

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CITY OF AUBURN

Comprehensive Water Plan
Final

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ACRONYMS & ABBREVIATIONS

AACE	American Association of Cost Estimators
AC	asbestos-cement
ACC	Auburn City Code
ac-ft/year	acre-foot per year
ADD	average day demand
AFY	acre feet per year
AI	Aggressive
Algona	City of Algona
AMI	Advanced Metering Infrastructure
APWA	American Public Works Association
ASR	aquifer storage and recovery
AWC	Association of Washington Cities
AWWA	American Water Works Association
BCA	Bilateral Compliance Agreement
Bonney Lake	City of Bonney Lake
BPS	booster pump station
Cascade	Cascade Water Alliance
ccf	Centum cubic feet
CCI	Construction Cost Index
CCPP	Calcium Carbonate Precipitation Potential
CCR	Consumer Confidence Report
CCT	Corrosion Control Treatment
CDBG	Community Development Block Grant
CDPW	Community Development & Public Works
CEMP	Comprehensive Emergency Management Plan
CERB	Community Economic Revitalization Board
CEU	continuing education units
cfs	cubic feet per second
cfm	cubic feet per minute
CFP	Capital Facilities Plan
City	City of Auburn
CIP	Capital Improvement Program
CMP	Coliform Monitoring Plan

CPR	Conservation Planning Requirements
CSCSL	Confirmed and Suspected Contaminate Sites
CWD	Covington Water District
CWSP	Coordinated Water System Plan
D	Distribution improvements
DBPR	Disinfectants and Disinfection Byproducts Rule
DBP	disinfection byproducts
DHS	Department of Homeland Security
DI	ductile-iron
DNS	determination of non-significance
DOH	Department of Health
DSL	distribution system leakage
DWSRF	Drinking Water State Revolving Fund
Ecology	Department of Ecology
ENR	Engineering News Record
EOC	Emergency Operation Center
EPS	extended period simulation
ERU	equivalent residential unit
EWE	Energy and Water Efficiency
FEMA	Federal Emergency Management Agency
ft/s	feet per second
G	general improvements
gal/ERU	gallons per equivalent residential unit
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
GMA	Growth Management Act
G.O.	General Obligation
GWMP	Ground Water Management Plan
GWR	Groundwater Rule
GWUI	groundwater under the influence of surface water
HAA5	haloacetic acids
HGL	hydraulic grade line
HPC	heterotrophic plate count

hp	horsepower
IA2	Interlocal Agreement 2
IA3	Interlocal Agreement 3
ICS	Incident Command System
IDSE	Initial Distribution System Evaluation
IGEA	Investment Grade Efficiency Audit
LCRMR	Lead and Copper Rule Minor Revisions
LFC	Local Facilities Charge
LIDs	Local Improvement Projects
LRAAs	locational running annual averages
LR	Larson Ratio
LSI	Langelier
LUD	Lakehaven Utility District
MAG	electromagnetic
MCL	maximum contaminant level
MCLGs	maximum contaminant level goals
M/DBP	Microbial/Disinfection By-Product
MDD	maximum day demand
MDRLs	maximum disinfectant residual level
MFR	multifamily residential
MG	million gallon
mgd	million gallons per day
MG/year	million gallons per year
MIT	Muckleshoot Indian Tribe
M&O	Maintenance and Operations
MRSC	Municipal Research and Services Center of Washington
MSDS	Material Safety Data Sheets
NIMS	National Incident Management System
NOM	Natural Organic Matter
O&M	Operations & Maintenance
OSHA	Occupational Safety and Health Administration
PAA	potential annexation areas
PGG	Pacific Groundwater Group
PHD	peak hour demand

PHG	public health goal
PIC	Forest Villa Manor
PI	Parcel Insight
Plan	Comprehensive Water Plan
PLC	Programmable Logic Controller
PNR	Public Notification Rule
PR	pressure reducing
Project ID	identification number
PRV	pressure reducing valve
psi	pounds per square inch
PSRC	Puget Sound Regional Council
PS	pump stations
PUD	Planned Unit Development
PWB	Public Works Board
Qaw	White River Alluvium
Qd	Vashon Recessional Deltaic Deposits
Qom	Osceola Mudflow
Qua	Undifferentiated Alluvium
Qu	Undifferentiated Glacial and Interglacial Deposits
R	storage improvement
R5	Residential 5 DU/Acre
RAA	running annual average
RWSA	Retail Water Service Area
RWSS	Regional Water Supply System
S	supply improvement
SCADA	supervisory control and data acquisition
SDC	Standard Development Charge
SDS	Safety Data Sheets
SDWA	Safe Drinking Water Act
SEATAC	Seattle-Tacoma International Airport
SEPA	State Environmental Policy Act
SFR	Single-family Residential/Duplex
SMP	Standard Monitoring Program
SOC	Synthetic Organic Chemical

SOS	Save our Streets
SSS	System-Specific Study
SWTR	Surface Water Treatment Rule
TCR	Total Coliform Rule
TPU	Tacoma Public Utility
TTHM	total trihalomethanes
UCM	Unregulated Contaminant Monitoring
UDF	Unidirectional Flushing
ULID	Utility Local Improvement District
USEPA	United States Environmental Protection Agency
VA	Vulnerability Assessment
VFD	variable frequency drive
VOC	volatile organic compound
WAC	Washington Administrative Code
WCIA	Washington Cities Insurance Authority
WD#111	King County Water District #111
WETRC	Washington Environmental Training Resource Center
WFI	Water Facilities Inventory
WHPA	Wellhead Protection Areas
WHP	Wellhead Protection
WHPP	Wellhead Protection Plan
WISHA	Washington Industrial Safety and Health Act
WSSIP	Water System Security Improvement Plan
WUE	Water Use Efficiency

ES.1 INTRODUCTION

This executive summary presents a brief overview of the City of Auburn (City) Comprehensive Water Plan (Plan) including the need for this Plan and proposed improvements for anticipated future growth. The City initiated this Plan recognizing the importance of planning, developing, and financing water system facilities to provide reliable and efficient service for existing customers and to serve anticipated growth. The Plan is designed to meet state, county, and local requirements. It complies with the requirements of the Washington State Department of Health (DOH) as set forth in the Washington Administrative Code 246-290-100, Water System Plan.

This Plan contains timeframes that are the intended framework for future funding decisions. However, these timeframes are estimates and may change depending on factors involved in the processing, project work, and availability of funding. The framework does not represent actual commitments by the City.

ES.2 PLANNING CONSIDERATIONS

The City's Retail Water Service Area (RWSA) boundaries were initially defined through both the South King County and Pierce County coordinated water-system planning process. The RWSA boundary includes areas within the City limits and potential annexation areas (PAA) as shown on Figure ES.1.

Several water purveyors adjoin the City of Auburn RWSA, as shown in Figure ES.2. These include the cities of Algona, Bonney Lake, Kent, Pacific, and Sumner. Also included are the Covington Water District (CWD), Lakehaven Utility District (LUD), Water District #111 (WD#111), Highline Water District (HWD), and the Muckleshoot Indian Tribe (MIT). Since the last Plan (adopted in 2012), minor adjustments to the boundary with Bonney Lake in Pierce County have been agreed upon in principal. Council approvals of the new boundaries are expected in 2015.

Interties provide a tool that water utilities use to move water between systems to meet supply needs, to increase reliability and to respond to emergencies. The City maintains wholesale supply interties with three adjacent water systems: Algona, CWD, and WD#111. The City also has emergency interties with LUD, WD#111, and the cities of Bonney Lake, Kent, and Pacific.

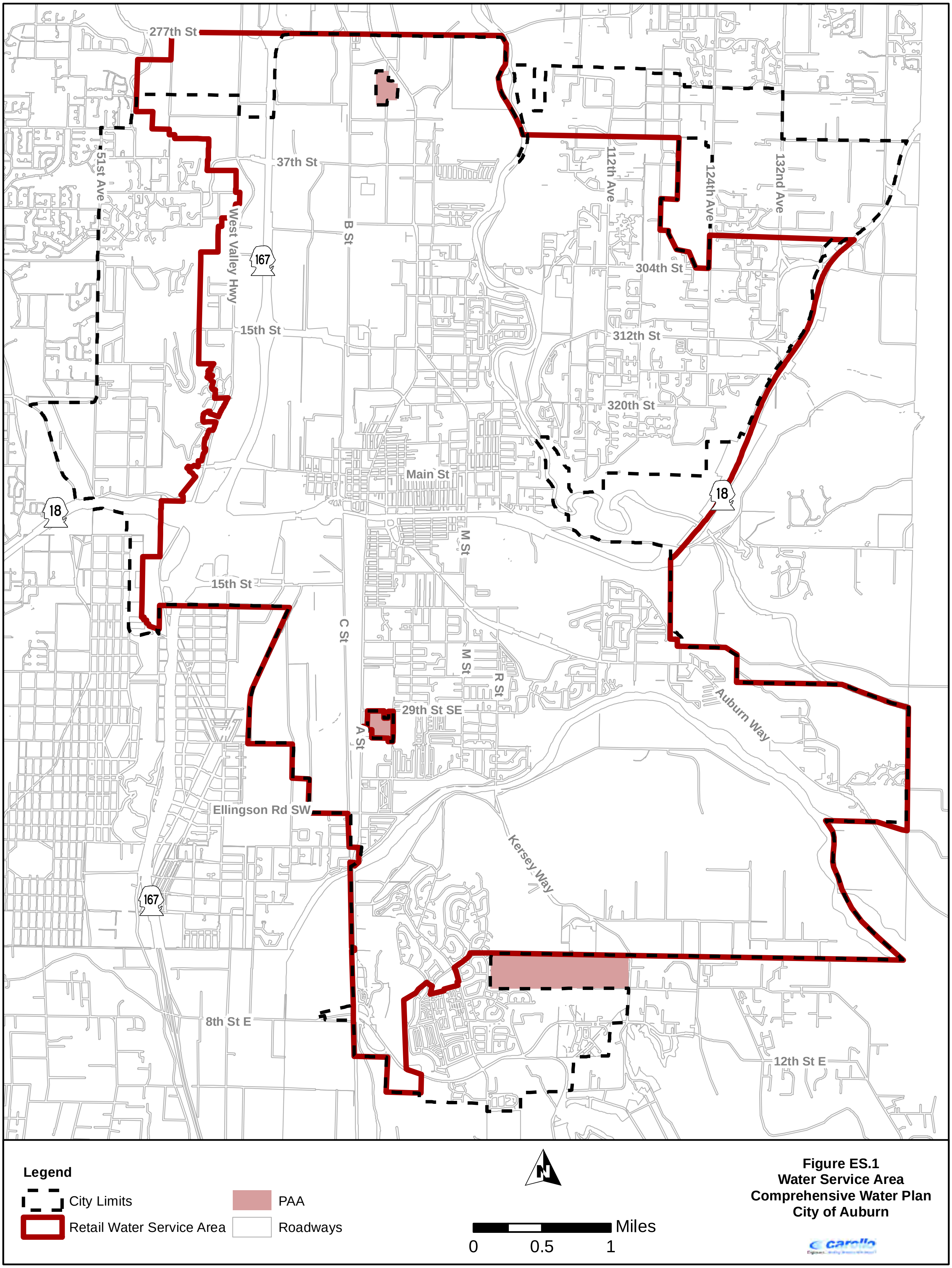

Figure ES.1
Water Service Area
Comprehensive Water Plan
City of Auburn

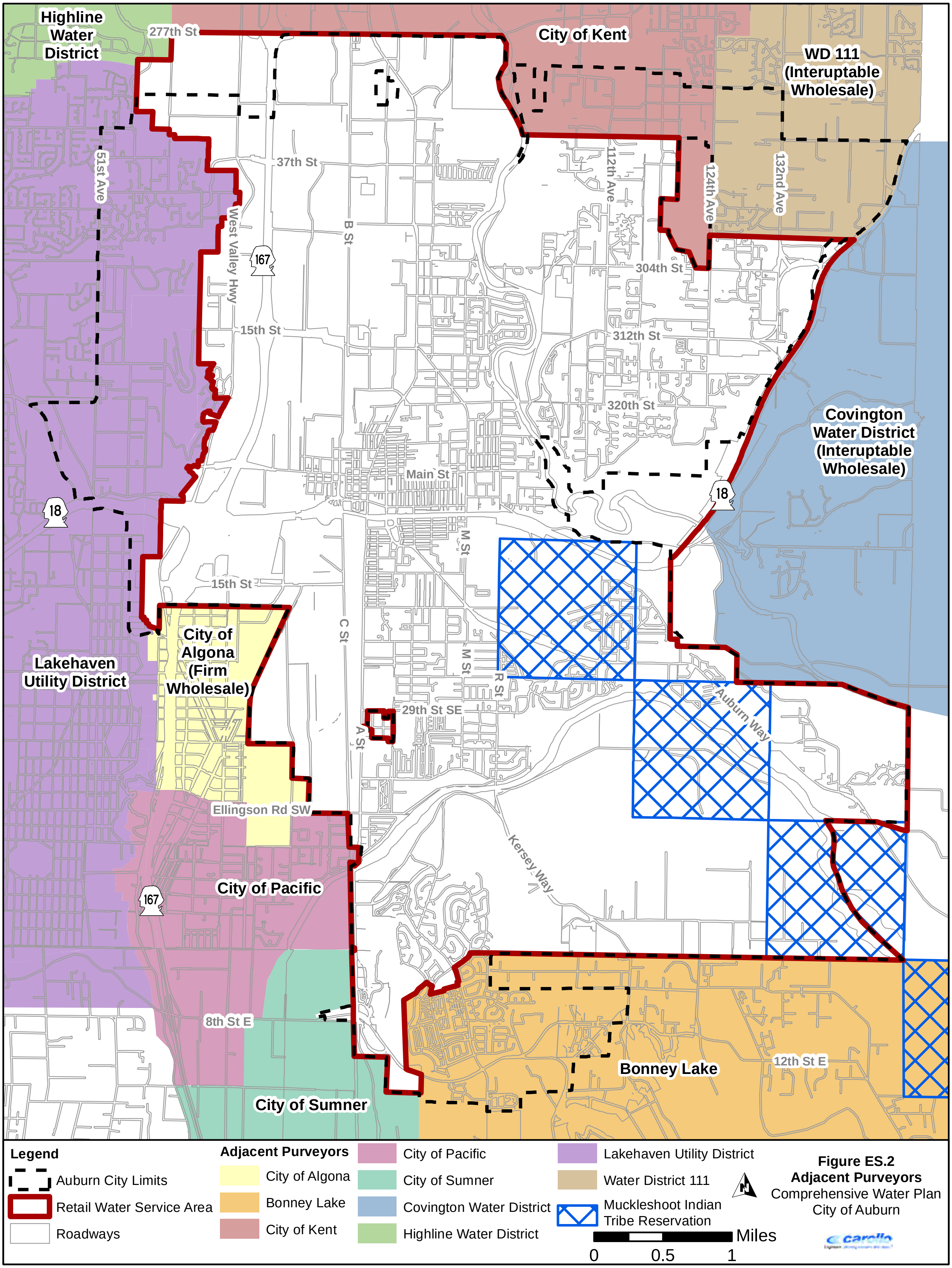

Figure ES.2
Adjacent Purveyors
Comprehensive Water Plan
City of Auburn

ES.3 POLICIES AND CRITERIA

City policies are established in order to support a vision or mission and to provide a framework for the design, operation, and ongoing well being of the City's water utility. The policies establish consistency and to ensure that adequate levels of service are provided throughout the system. The policies also provide documentation to current water-system customers, as well as those considering service from the City.

The City's Plan establishes the following mission statement for the water utility:

> "The City will provide for the efficient, environmentally sound and safe management of the existing and future water system within Auburn's service area."

The policies included in this plan are developed specifically for the City's multi-source municipal water system (System Number 03350V). Table ES.1 summarizes key policies and criteria. The Plan summarizes policies and criteria relating to business practices, service area, operation and maintenance (O&M), financial, planning, environmental stewardship, and design and construction.

**Table ES.1 Service Area Policies Summary
Comprehensive Water Plan
City of Auburn**

Policy Name	Policy Statement
Business Practices	City desires to employ recognized best business practices which result in the efficient and cost effective operation of the utility. The City shall identify the key business functions within the utility and develop supporting best business practices for each. The utility will conduct a performance audit every six years in conjunction with its capital projects planning cycle to evaluate how well best business practices are being implemented and how effective they are.
Retail Service Area	The City will plan for and provide water service to all customers with firm contracts. As supply permits, the City may provide water to customers without firm contracts.
Conditions of Service	For areas outside the current City limits, but within the RWSA, the City shall condition service on agreement that development is in compliance with City development standards.
Service Extension	Extension of the water system should be allowed provided the area to be served is within the City's RWSA, the proposed development is consistent with adopted development policies, and associated City costs are reimbursed. Property owners shall be responsible for extending the water system through the full extent of their property as required by Auburn City Code.
Source of Supply	It is the City's goal to have sufficient system-wide supply facilities (including both permanent and emergency interties) to meet the maximum daily demand (MDD) of the entire system with any single active water supply source out of service.
Pump Stations	The City's goal is to have sufficient capacity to allow full service with any single pump out-of-service.

Table ES.1 Service Area Policies Summary Comprehensive Water Plan City of Auburn	
Policy Name	**Policy Statement**
Reservoir Storage	The City will provide sufficient storage volume so that each storage component (operational, equalizing, fire fighting and emergency) is provided separately, recognizing that a fire could occur during an emergency (supply or pump station out-of-service).
Fire Flow	The City has established a fire flow criterion of 1,500 gallons per minute (gpm) for all single-family residential areas of the City and 2,500 gpm for all multifamily residential and all other non-residential land use areas, except parks and open spaces within the City.
Hydrants	The maximum distance between fire hydrants in single-family use district zones shall be 600 feet. The maximum distance between fire hydrants in commercial, industrial, and apartment (including duplex) use district zones shall be 300 feet.
Dead-end Mains	Provisions shall be made wherever appropriate in any project for looping all dead-end or temporarily dead-end mains.
System Pressure	The City of Auburn has established an acceptable system pressure range of 35 to 80 pounds per square inch (psi) for all new facilities. During fireflow conditions, a minimum pressure of 20 psi is allowed.
Distribution System	Pipe velocities shall not exceed 8 feet per second in all water mains.
Water Use Efficiency Goals	The City will target a 1 percent reduction in equivalent residential unit value for each year until reaching a water use per Equivalent Residential Unit (ERU) of 172 gallons per day (gpd) per ERU.
Non-revenue water (water leakage)	The City will strive to maintain levels of water leakage for its distribution system at less than 10 percent.

ES.4 WATER REQUIREMENTS

The City's water requirements, or demand, was projected for each customer class (single-family residential/duplex, multifamily residential, commercial, manufacturing / industrial, schools, city accounts, and irrigation). Demand projections were expressed as Equivalent Residential Unit (ERU), average day demand (ADD), and maximum day demand (MDD). One ERU is defined as the average quantity of water beneficially used by one average, full-time, single-family residence per day. The quantity of water used by other customer classes, and by the whole system, can be expressed in terms of equivalent ERUs. The ADD is typically used in operational evaluations. The MDD represents the single largest day water demand during the year and is a key parameter for infrastructure sizing.

The City provided water to approximately 56,000 people through 13,910 retail accounts as of the end of 2013. Between 2008 and 2013 the average day demand (ADD) has ranged from 7.16 million gallons per day (mgd) in 2011 to 8.61 mgd in 2009 and averaged 7.74 mgd. The MDD has ranged from 11.43 mgd in 2011 to 14.36 mgd in 2009. From 2008 to 2013, the total number of connections increased by 6 percent, while the average annual total water consumed declined by approximately 10 percent. The decline was likely caused by multiple factors, including the economic downturn from 2008 to 2010, continued water use efficiency (WUE) activities, and higher water use efficiency in new and renovated homes and offices.

The total projected annual ADD and MDD, along with wholesale demands, are summarized in Table ES.2. Projected demands were developed based on projected customer accounts, which used demographic growth rates provided by the City, and the expected water use. The expected water use was based on historical information. The City has historically used the 75th percentile statistic in its demand projections to provide a factor of safety, without being overly conservative. For comparison purposes, the average water use can be expressed in relation to ERUs where water use per ERU was 195 gpd/ERU. The peak demands can be expressed as an MDD/ADD peaking factor, which is the relative magnitude of MDD compared to the ADD. The City's MDD/ADD peaking factor was 1.82.

Distribution system leakage (DSL) was also included in the demand projections. DSL represents the difference between production and documented water use (retail, wholesale, and authorized unmetered). State rules require that the three-year average of distribution leakage be maintained at less than 10 percent of the supply. The total 3-year rolling average DSL for 2000 through 2013 was between 5.6 percent and 9.7 percent of the total production, meeting the regulatory requirements. The City has chosen a planning value of 9.5 percent for DSL by using the 75th percentile of the historical data.

The City has wholesale agreements to sell water to the City of Algona, CWD, MIT, and WD#111. The current contract with Algona is a firm wholesale agreement to deliver 525,000 gallons of ADD and 1,114,000 gallons of MDD. The City also needs to plan for supply to the MIT future fish hatchery. An agreement dated from 1986 requires that the City provide the tribe with a firm average annual demand of 2.5 mgd from Coal Creek Springs and a firm maximum demand during the summer of 1.9 mgd.

The City's agreements with CWD and WD#111 is on an interruptible basis and requires the City to sell 2.5 mgd to CWD and 2.5 mgd to WD#111. CWD did not renew its purchase agreement in 2010; however, the City may provide supply per the Interlocal Agreement 2 upon request of CWD as determined by the City.

Table ES.2 ADD, MDD, and ERUs Summarized for Each Service Area with Wholesale
Comprehensive Water Plan
City of Auburn

Area	2015 (mgd)	2021 (mgd)	2025 (mgd)	2035 (mgd)
Lea Hill				
Average Day Demand, mgd	1.26	1.37	1.45	1.60
Maximum Day Demand, mgd	2.30	2.50	2.63	2.92
Equivalent Residential Units	5,829	6,343	6,687	7,411

Table ES.2 ADD, MDD, and ERUs Summarized for Each Service Area with Wholesale
Comprehensive Water Plan
City of Auburn

Area	2015 (mgd)	2021 (mgd)	2025 (mgd)	2035 (mgd)
Valley				
Average Day Demand, mgd	4.84	5.23	5.77	6.27
Maximum Day Demand, mgd	8.81	9.52	10.51	11.41
Equivalent Residential Units	22,370	24,169	26,677	28,964
Lakeland Hills				
Average Day Demand, mgd	0.38	0.43	0.46	0.49
Maximum Day Demand, mgd	0.69	0.78	0.83	0.89
Equivalent Residential Units	1,757	1,983	2,113	2,247
Academy				
Average Day Demand, mgd	0.69	0.71	0.74	0.79
Maximum Day Demand, mgd	1.26	1.29	1.35	1.44
Equivalent Residential Units	3,187	3,266	3,419	3,665
Total Retail Customers				
Average Day Demand, mgd	7.17	7.74	8.42	9.15
Maximum Day Demand, mgd	13.06	14.09	15.32	16.66
Equivalent Residential Units	33,142	35,761	38,897	42,287
Retail With Firm Wholesale (Algona)				
Average Day Demand, mgd	10.02	10.59	11.28	12.01
Maximum Day Demand, mgd	15.44	16.47	17.71	19.06
Retail With Firm & Interruptible Wholesale (CWD and WD#111)				
Average Day Demand, mgd	15.02	15.59	16.28	17.01
Maximum Day Demand, mgd	20.44	21.47	22.71	24.06

ES.5 EXISTING SYSTEM

The City owns and operates a multi-source municipal water system (DOH ID 03350V), which includes supply, treatment, storage, and distribution of potable water to residential, commercial, and wholesale customers. Service is provided to four major service areas, which are further divided into pressure zones as required by local topography. The major service zones and associated service elevations are summarized in Table ES.3.

Table ES.3 Service Area Elevations
Comprehensive Water Plan
City of Auburn

Service Area	Elevation Range, ft.
Valley	39 - 235
Lea Hill	58 - 513
Academy	171 – 444
Lakeland Hills	78 - 578

The City's four major service areas and the location of key elements of the water system are shown in Figure ES.3.

The City sources of supply include two springs, ten wells, and Tacoma wholesale water supply. Wells 1, 2, 3A, 3B, 4, 6, 7, Coal Creek Springs, and West Hill Springs provide water to the Valley service area, while Wells 5, 5A, and 5B provide water to the Lakeland Hills service area. Tacoma wholesale supplies are received through two interties: the B St NW Intertie in the Valley Service Area and the 132nd Ave SE Intertie in the Lea Hill Service Area.

The City operates and maintains pump stations to move water throughout the piping network and to provide water at the required service pressures. Pump stations supply water from the Valley Service Area to the Lea Hill, Academy, and Lakeland Hills Service Areas. Additionally, booster pump stations are used to supply high elevation areas in the Academy, Lea Hill, and Lakeland Hills Service Areas. The City also operates the Intertie Pump Station in Lea Hill Service Area to provide wholesale supplies to WD#111.

The City currently maintains a total of 15.8 million gallons (MG) of water storage in eight water reservoirs. Each of the City's service areas contains two reservoirs to aid in system operation and maintenance.

Water treatment in the City includes chlorination, corrosion control treatment (CCT), and metals removal. All wells, except Well 5, are equipped with some level of treatment. Water quality improvements have recently been completed at several sites to convert the current gas chlorination systems to hypochlorite. Hypochlorite systems are a safer way to operate disinfection facilities.

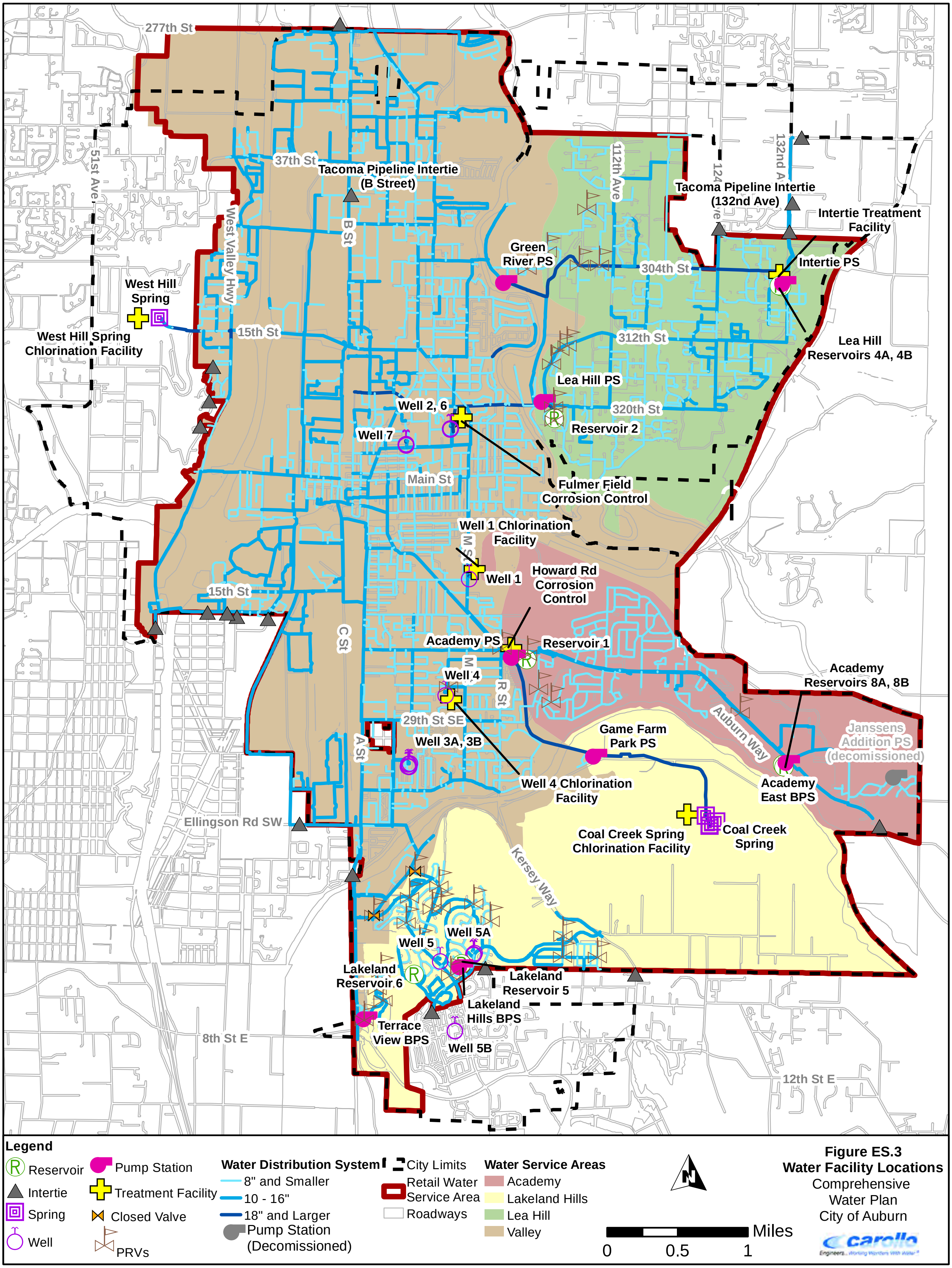

Figure ES.3
Water Facility Locations
Comprehensive
Water Plan
City of Auburn

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The City's water transmission and distribution system includes nearly 250 miles of pipeline. Pipe size varies from 4 to 24 inches, with predominance of 8- and 12-inch diameter pipe. The existing data shows that over 90 percent of the distribution system is ductile-iron (DI) pipe. Pipes made of asbestos-cement, steel, and concrete cylinder make up the remaining pipes in the system. In 2015, the last remaining asbestos-cement pipes in the water system will be replaced with DI pipe.

ES.6 WATER RESOURCES

The City currently holds certificated, primary water rights and claims with a total instantaneous flow (Qi) of 19,075 gpm (27.47 mgd) and an average annual flow (Qa) of 21,002 acre-foot per year (ac-ft/year) (18.75 mgd). The City's water rights are sufficient to supply the City through 2035; therefore, no new water rights applications are recommended.

The City's total instantaneous supply capacity is 14,686 gpm (21.15 mgd) and the total annual capacity is 17,104 ac-ft/year (15.02 mgd) mgd, based on the City's ability to pump from the existing system. The existing instantaneous supply capacity will be deficient starting in 2019. The City will need to provide a minimum additional supply of 2,100 gpm by the end of the planning period to address this deficiency. To meet the projected deficit, the City has developed a five-part water supply strategy as follows:

- Improve existing supply facilities: The source improvement strategy to meet the future demands includes improvements to Coal Creek Springs, manganese treatment of Well 7, and expansion of Howard Road CCT. Additionally, Well 2 and Well 3A/B will be replaced to maximize the capacity and operational flexibility of the water system. Manganese treatment may also be needed for Well 3A/B to make full use of these supplies.
- Use cost-effective wholesale supplies from Tacoma to their full extent: The City has obtained 3,556 gpm (5.12 mgd) of peak season and 1,736 gpm (3.5 mgd) of average day wholesale supplies from Tacoma. The City may also secure additional permanent or temporary (market-rate) supplies from Tacoma in the short-term planning period.
- Secure additional water rights: The City has an application into the Ecology for new primary water rights. The new rights will provide supply for the City, Algona, MIT, Covington Water District, and WD#111. The City may also consider securing additional wholesale supplies from Tacoma.
- Consider opportunities for water reuse: Water reuse, as reclaimed water, is a potential source of supply. No reclaimed water is currently available from King County Metro sewer system in the City, who treats the City's sewage. The City will continue to participate in local and regional wastewater reuse planning efforts to identify new opportunities.

- Continue an aggressive Water Use Efficiency Program: To reduce or delay the need for more supplies the City will continue to reduce demand through a WUE, which is discussed in more detail in an subsequent section.

ES.7 WATER QUALITY

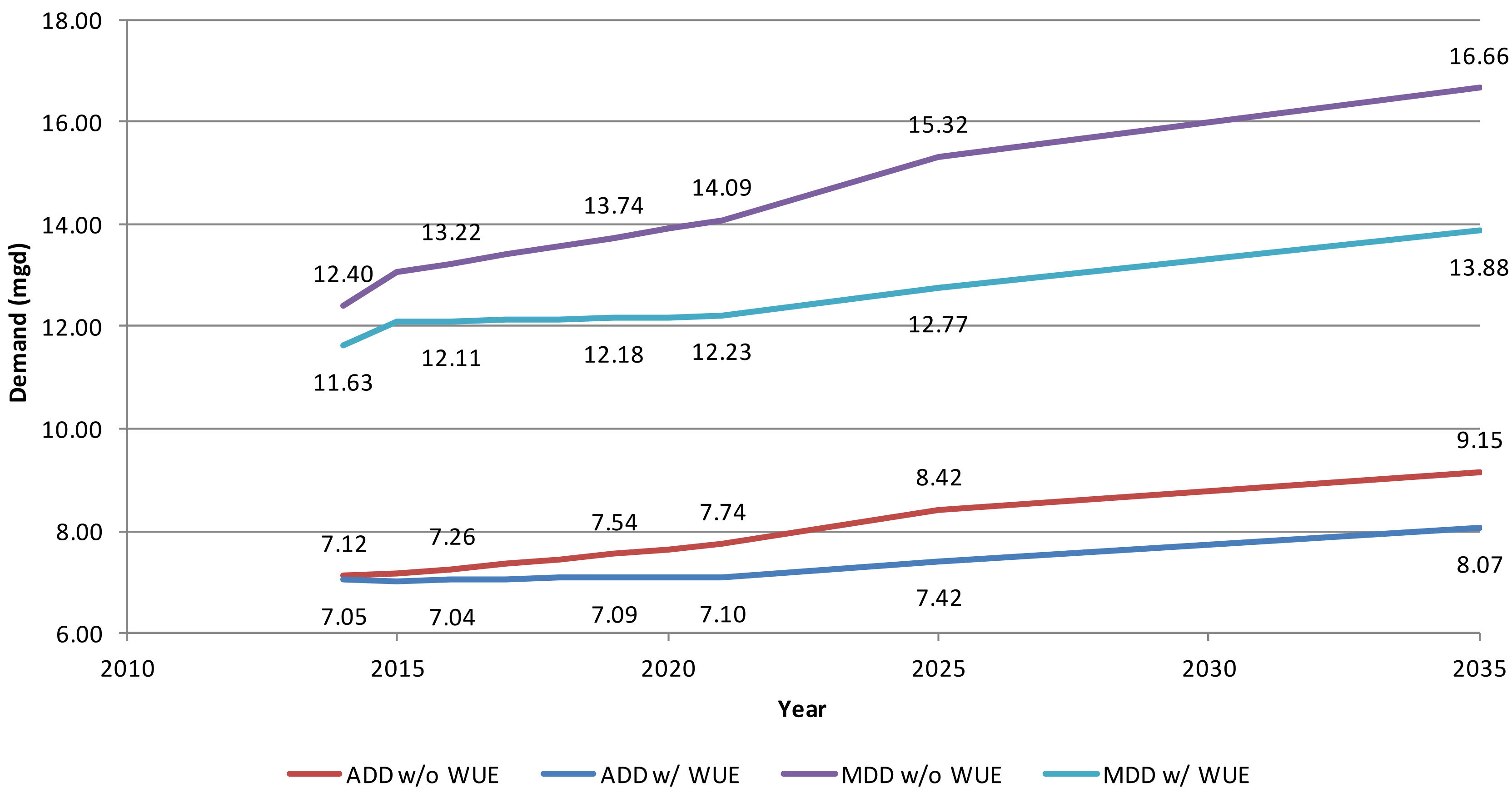
The City is in compliance with all current regulatory requirements, including monitoring requirements. The following actions are recommended to maintain future compliance:

1. It is recommended that the City continue its monitoring program. Continue to routinely evaluate water quality parameters and potential issues throughout the system to maximize the water supply benefit and minimize potential adverse water quality issues.
2. The City should continue to coordinate with Tacoma concerning the water quality of the wholesale supplies. It is recommended that the City add continuous chlorine analyzers at each intertie with supervisory control and data acquisition (SCADA) connections to monitor and record residual at the interties. Additional sampling at the Tacoma interties is recommended to fill in gaps in existing source water quality data.
3. Continue to take actions recommended by the DOH to correct deficiencies identified in the 2012 Sanitary Survey.
4. Contact the DOH regional engineer to determine whether treatment provided at the City's sources is sufficient to provide 4-log virus inactivation or removal, especially West Hill Springs and Well 1 (upon completion of the improvements).
5. Update the City's Water Quality Management Plan, as necessary, to address changes due to forthcoming source improvement projects.

ES.8 WATER USE EFFICIENCY

The development of the WUE program is the foundation for using water wisely. The 2015-2020 WUE program will be a continuation of the existing program with specific enhancements to the program to comply with current regulations. The proposed goal for the 2015-2020 WUE program will target a 1 percent reduction in the ERU value per year from the current planning ERU value of 195 gpd/ERU. Re-evaluate goal when the planning ERU value reaches less than 172 gpd/ERU. WUE measures are projected to reduce retail MDD by 1.72 mgd by 2020 and 3.53 mgd by the year 2035, as shown in the Figure ES.4.

The City is planning to implement water meter and billing system improvements that will provide advanced meter infrastructure (AMI) throughout the system during the 2015-2020 program period. In addition to the operational and financial benefits, AMI will provide a new tool for the WUE Program. For example, the AMI meters may be able to identify substantially more water loss reduction opportunities than previously possible.



DEMAND SAVINGS

FIGURE ES.4

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

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ES.9 SYSTEM ANALYSIS

The City's water system includes pump station, storage, and distribution network. An analysis of the City's water system was conducted to identify deficiencies in the system and recommended improvement projects to resolve the identified deficiencies. Implementation of the improvement projects were assigned into three planning horizons: short-term from 2015-2021, medium-term from 2022-2025, and long-term from 2026-2035.

The pump stations (PS) and booster pump stations (BPS) were analyzed to ensure there was sufficient capacity to maintain the required level of service and identify improvements, where needed. Due to capacity considerations and age, one PS will be replaced and one PS will be decommissioned. Due to fire flow demands and reliability requirements, one BPS will be expanded and one BPS will be replaced. Additionally, backup power will be added to one PS.

Historically, the City has considered storage in each service area independently. New sources and PSs increase the ability of the system to operate as an interconnected whole. This new operational ability allows sharing of storage between the service areas and reduces the overall need for new storage. However, the analysis of storage indicates that the Valley Service Area will require additional storage. To meet the future storage requirements, a combination of new storage, improvements to existing reservoirs, and supply improvements are proposed.

The water distribution network was evaluated using demands and fire flows. To satisfy the City's criteria, the system should be able to maintain pressures of 35 psi at all times except during a fire. The system needs to provide fire flow under MDD conditions, while maintaining a minimum pressure of 20 psi or greater. The velocity in transmission and distribution mains should be less than 8 feet per second. The City's fire flow requirements are 1,500 gpm for residential areas and 2,500 gpm for all other land use areas, except City parks and open spaces. Hydraulic analysis showed a number of pipe improvements are required in the future to meet the City's criteria.

ES.10 CAPITAL IMPROVEMENTS PLAN

The Capital Improvement Plan (CIP) was developed which identifies system improvements needed to meet customer demands through the 20 year planning period. Planning-level cost estimates were developed for each of the recommended projects for budgeting purposes. These costs are planning level estimates only and should be refined during pre-design of the projects. Cost estimates are presented as total project costs in October 2014 dollars.

Cost estimates were developed using a Class 5 budget estimate, as established by the American Association of Cost Estimators (AACE). This level of estimate is used for strategic business planning purposes, including long-range capital planning. Planning costs include engineering, legal, administration, and construction management costs. Construction costs include the cost of material, labor, a 30 percent contingency, markup for contractor overhead and profit, and sales tax on both services and materials.

The capital projects identified are categorized into water supply (S), storage (R), pump stations (PS), distribution (D), and general improvements (G). The projects anticipated for the next six years total $35.5M, which are summarized in Table ES.4. The project costs shown in Table 10.7 are divided into three categories: 1) upgrade; 2) expansion; and 3) repair and replacement. Projects may include elements of multiple categories. The City uses this information to develop rates and System Development Charges. The total costs for upgrade related projects over the next six years is $7.9M, the total cost for expansion related projects over the next six years is $7.9M, and the total cost for repair and replacement related projects over the next six years is $19.8M.

ES.11 FINANCIAL

The objective of the financial plan is to identify the total cost of providing water service and to provide a financial program that allows the water utility to remain financially viable during execution of the 2015-2021 CIP. This viability analysis considers the financial condition of the utility over the past six-year period (2008-2013), the sufficiency of utility revenues to meet current and future financial and policy obligations, and the financial impact of executing the CIP.

For the 2015-2021 planning horizon, the City identified 27 projects valued at $35.51 million in current day dollars ($41.27 million inflated). Sources of funding to support this CIP include revenue bonding of $34.92 million (85 percent) and cash funding of $6.35 million (15 percent). Annual debt service for existing and bond issuances is forecasted to total approximately $2.69 million in 2015, increasing to $4.87 million by 2021.

Operating expenses for the Utility, including annual debt service and rate-funded system reinvestment, is forecasted to increase from approximately $13.67 million in 2015, to $18.05 million by 2021.

To fund these financial obligations, the primary source of revenue for the utility is collections from water service charges. Total revenues are forecasted to provide $13.85 million in 2015 and increase to $18.45 million by 2021. The forecasted revenues were developed using the approved 3.5 percent annual increase in rates from 2015 through 2017 and an additional average 5.7 percent annual increase starting in 2018. As a result, the financial condition is forecasted to end 2015 with a surplus of about $171,873 increasing to approximately $410,176 by 2021.

ES.12 MAINTENANCE AND OPERATIONS

The Maintenance and Operations (M&O) Water Division is led by the Assistant Director of Public Works Operations, the Water Manager, Water Operations Supervisor, and the Water Distribution Supervisor. The Water Manager is designated as the individual responsible for the water system M&O staff. The Water Manager is designated as manager of the Water Distribution Supervisor and Water Operations Supervisor.

The City maintains a robust communication system to contact Water Utility personnel during normal work-hours and after-hours. This system is necessary to respond to customer requests, routine maintenance, or emergency situations. Maintenance staff vehicles and other rolling stock are all equipped with radios and personnel carry cellular phones. The Water Utility also has access to an inventory of portable emergency use radio units should they be required.

Primary operation of the City's Water System is maintained via the SCADA computerized control system. A software program called "Wonderware" works in association with SCADA to provide real time graphical display of system data for staff monitoring and control. The City's SCADA system is located in the Public Works M&O Building, and responsibility for the system falls under the Water Operations Manager and associated staff.

The Water Operations Division maintains an active and ongoing program of water quality monitoring and reporting to ensure a safe, high quality water supply. Two staff members are responsible for water quality monitoring, sampling, control, and record keeping. The Water Operations Division also receives assistance from the Engineering Services - Water Quality Program Coordinator.

The City's Public Works Department has prepared a Public Works Emergency Response Manual as a guide for management of emergency situations. The manual is a valuable tool for responding to emergency situations. The primary objectives of the Manual are the protection of life and property and restoration of essential services.

Table ES.4 Capital Improvements Program Costs and Phasing
Comprehensive Water Plan
City of Auburn

CIP ID	NAME	Year	Upgrade	Expansion	Repair & Replacement	SHORT-TERM FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2015 - 2021 Total
Supply													
S-01	Well 1 On-site Improvements Project	2015	50%	0%	50%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-02	Well 4 Emergency Power Improvements Project	2015	100%	0%	0%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-04	Cascade Water Alliance Water Purchase	2017-2029	0%	100%	0%	$0.00	$0.00	$532,561.00	$532,561.00	$532,561.00	$2,164,491.00	$2,164,491.00	$5,926,665.00
S-07	Well Inspection and Redevelopment Program	2017-2033	20%	0%	80%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-08	Water Resources Protection Program	Annual	20%	0%	80%	$24,597.00	$25,335.00	$26,095.00	$26,878.00	$27,685.00	$28,515.00	$29,371.00	$188,476.00
S-09	Coal Creek Springs Collector Improvements	2018-2019	20%	0%	80%	$0.00	$0.00	$0.00	$800,000.00	$2,600,000.00	$0.00	$0.00	$3,400,000.00
S-13	Algona Well 1 Decommissioning	2015	0%	0%	100%	$39,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$39,000.00
S-17	West Hill Springs Flow Control Improvements	2015	50%	0%	50%	$455,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$455,000.00
S-19	Fulmer Field Improvements Project	2016-2017	100%	0%	0%	$0.00	$350,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$350,000.00
	Subtotal					**$668,597.00**	**$375,335.00**	**$558,656.00**	**$1,359,439.00**	**$3,160,246.00**	**$2,193,006.00**	**$2,193,862.00**	**$10,509,142.00**
Storage													
R-01	Lakeland Hills Reservoir 5 Improvements	2015	50%	0%	50%	$735,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$735,000.00
R-03	Annual Reservoir R&R Program	Annual	50%	0%	50%	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$350,000.00
R-05	Reservoir Painting	2020 & 2022	0%	0%	100%	$0.00	$0.00	$0.00	$0.00	$0.00	$1,250,000.00	$0.00	$1,250,000.00
R-06	Reservoir Seismic Rehabilitation	2018-2019	80%	0%	20%	$0.00	$0.00	$0.00	$357,500.00	$357,500.00	$0.00	$0.00	$715,000.00
	Subtotal					**$785,000.00**	**$50,000.00**	**$50,000.00**	**$407,500.00**	**$407,500.00**	**$1,300,000.00**	**$50,000.00**	**$3,050,000.00**
Pump Stations													
PS-03	Green River PS Back-Up Power	2017-2018	50%	0%	50%	$0.00	$0.00	$90,000.00	$600,000.00	$0.00	$0.00	$0.00	$690,000.00
PS-04	Intertie Booster Pump Station Improvements	2021	25%	25%	50%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,303,000.00	$ 1,303,000.00
PS-07	Academy PS No. 1 Improvements	2017-2018	50%	0%	50%	$0.00	$0.00	$925,000.00	$1,200,000.00	$0.00	$0.00	$0.00	$2,125,000.00
	Subtotal					**$0.00**	**$0.00**	**$1,015,000.00**	**$1,800,000.00**	**$0.00**	**$0.00**	**$1,303,000.00**	**$4,118,000.00**

Table ES.4 Capital Improvements Program Costs and Phasing
Comprehensive Water Plan
City of Auburn

CIP ID	NAME	Year	Upgrade	Expansion	Repair & Replacement	SHORT-TERM FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2015 - 2021 Total
Distribution System													
D-02	Annual Distribution Improvements Program	2017-2031	20%	0%	80%	$0.00	$0.00	$300,000.00	$1,000,000.00	$300,000.00	$1,000,000.00	$300,000.00	$2,900,000.00
D-03	SCADA Upgrades	2015	50%	0%	50%	$10,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$10,000.00
D-06	Street Utility Improvements	Annual	20%	0%	80%	$1,519,895.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$4,519,895.00
D-09	Water Repair and Replacements	2015-2031	20%	0%	80%	$0.00	$0.00	$0.00	$300,000.00	$1,000,000.00	$300,000.00	$1,000,000.00	$2,600,000.00
D-10	Pipe Asset Management Study	2018	50%	0%	50%	$0.00	$0.00	$0.00	$50,000.00	$0.00	$0.00	$0.00	$50,000.00
D-13	Lea Hill PRV Station Improvements	2015-2016	50%	0%	50%	$50,000.00	$400,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$450,000.00
D-14	Valley AC Main Replacement	2015	20%	0%	80%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
	Subtotal					**$1,629,895.00**	**$900,000.00**	**$800,000.00**	**$1,850,000.00**	**$1,800,000.00**	**$1,800,000.00**	**$1,800,000.00**	**$10,579,895.00**
General													
G-04	Comprehensive Water Plan Update - 2014	2015	50%	0%	50%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
G-05	Utilities Field Operations Center	2015	100%	0%	0%	$300,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$300,000.00
G-06	MIT Master Meters	2015	20%	0%	80%	$400,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$400,000.00
G-09	Water Meter & Billing System Improvements	2015-2019	20%	0%	80%	$1,000,000.00	$1,000,000.00	$1,500,000.00	$1,500,000.00	$1,500,000.00	$0.00	$0.00	$6,500,000.00
	Subtotal					**$1,750,000.00**	**$1,000,000.00**	**$1,500,000.00**	**$1,500,000.00**	**$1,500,000.00**	**$0.00**	**$0.00**	**$7,250,000.00**
	TOTAL		**22%**	**22%**	**56%**	**$4,833,492.00**	**$2,010,335.00**	**$3,923,656.00**	**$6,916,940.00**	**$6,867,746.00**	**$5,293,006.00**	**$4,043,862.00**	**$35,507,037.00**

INTRODUCTION

1.1 PURPOSE

The City of Auburn (City) prepared this Comprehensive Water Plan (Plan) to document the water utility system (water system), its programs, and analyze the future needs of the water system. This Plan is an update to the City's 2009 Plan, which was approved in 2012. The purpose of this Plan is to document changes to the City's water system, to identify required system modifications, and to appropriately outline capital improvement projects to meet future water demands. Maintaining a current Plan is required to meet the regulations of the Washington State Department of Health (DOH) and the requirements of the Washington State Growth Management Act. This plan complies with the requirements of DOH as set forth in the Washington Administrative Code (WAC) 246-290-100, Water System Plan.

This Plan contains timeframes that are the intended framework for future funding decisions and, within which, future actions and decisions are intended to occur. However, these timeframes are estimates, and depending on factors involved in the processing of applications and project work, and availability of funding, the timing may change from the included timeframes. The framework does not represent actual commitments by the City which may depend on funding resources available.

1.2 AUTHORIZATION

Recognizing the importance of planning, developing, and financing water system facilities to provide reliable service for the existing customers and to serve anticipated growth, the City initiated the preparation of this Plan. In 2013, the City selected the Carollo Engineer's team to prepare the updated Plan in accordance with applicable rules and regulations governing planning for water utility systems.

1.3 OBJECTIVES

This Plan has been prepared to serve as a guide for planning and designing future water system infrastructure and to assist the City in using its water resources in the most efficient manner possible. Identified in this Plan are system improvements intended to meet the expanding and changing needs of the City. Specific objectives of this Plan are addressed by individual chapters presented herein and include the following:

- Develop a document that can be updated periodically as additional information on the water system is obtained.
- Planning Considerations (Chapter 2): Describe system history, water service area, and interconnections with adjacent water utilities.

- Policies and Criteria (Chapter 3): Establish clear policies and criteria relating to water service and within the City's water system.
- Water Requirements (Chapter 4): Identify historical water use and project future demands based on growth projections.
- Existing System (Chapter 5): Document the existing water system supply, storage, and distribution facilities.
- Water Resources (Chapter 6): Document existing and potential future water resources available to the City for meeting demands.
- Water Quality (Chapter 7): Review existing water quality data for the system and discuss existing and forthcoming regulatory requirements on the City water system.
- Water Use Efficiency (Chapter 8): Identify the role that water use efficiency will have in reducing future water requirements and how the City's water conservation program will be implemented.
- System Analysis (Chapter 9): Analyze storage and booster pump stations capacity. Evaluate the distribution system using the City's calibrated InfoWater hydraulic model.
- Capital Improvements Plan (Chapter 10): Summarize identified water system deficiencies and develop a program of recommended capital improvements, including costs and timing.
- Financial (Chapter 11): Summarize the City's total cost of providing water service, assurances that the utility improvement schedule will be implemented, and established fees for service.
- Operations and Maintenance (Chapter 12): Provide a comprehensive review of operations and maintenance of system facilities.
- Prepare an environmental checklist for City Council action on the proposed water system plan. The checklist is to be reviewed by the various City departments for a threshold determination.
- Prepare a plan to comply with the requirements of the DOH as set forth in the WAC 246-290-100, Water System Plan.

1.4 LOCATION

The City is centrally located between Seattle and Tacoma in both King County and Pierce County, Washington. The City encompasses 29.8 square miles. Adjacent cities include: Pacific, Algona, Bonney Lake, Federal Way, Kent, Sumner, and Covington.

1.5 OWNERSHIP AND MANAGEMENT

The City owns their water system (DOH ID 03350V) and serves the majority of the City of Auburn as delineated by the Retail Water Service Area (RWSA). The RWSA boundaries are further described in Chapter 2. The City additionally provides water to the City of Algona (Algona), King County Water District #111 (WD#111), and the Muckleshoot Indian Tribe. The City provides internal staffing for the management, operations, and maintenance of the water system.

1.6 ENVIRONMENTAL ASSESSMENT

A State Environmental Policy Act (SEPA) Checklist and determination of non-significance (DNS) has been prepared for this Plan. The City anticipates this Plan does not have probable significant adverse impacts on the environment in accordance with the DNS under WAC 197-11-340(2). Many of the projects proposed within the Plan will require subsequent project specific environmental review and SEPA checklists as part of their preliminary and final design process. The SEPA Checklist and DNS are included in Appendix A.

1.7 APPROVAL PROCESS

This Plan is required to meet state, county, and local requirements. It complies with the requirements of the DOH as set forth in the WAC 246-290-100. The City has submitted this plan to DOH, King and Pierce Counties, adjacent utilities, and local governments as part of the Agency Review process. See Appendix B for the Comment Letters. Note, no comments were received from adjacent utilities and local governments. As required by WAC 246-290-108, a local government consistency review checklist is required as part of this plan and is included in Appendix C. The Adopting Resolution is included in Appendix C, documenting the plan approval by the City Council.

1.8 ACKNOWLEDGEMENTS

Carollo and their team member Robinson Noble wish to acknowledge and thank the following individuals for their efforts and assistance in completing this Plan.

- Kevin Snyder, Director of Community Development and Public Works
- Ingrid Gaub, Assistant Director of Engineering Services & City Engineer
- Lisa Tobin, Utilities Engineering Manager
- Susan Fenhaus, Water Utility Engineer
- Jirong Lu, Civil Engineer - Utilities
- Randy Bailey, Assistant Director of Public Works Operations
- Allen Hunter, Water Manager
- Phil Ast, Water Operations Supervisor
- Josh Flanders, Water Distribution Supervisor

PLANNING CONSIDERATIONS

2.1 PLANNING CONSIDERATIONS

This chapter includes a description of the area served by the City of Auburn's (City) water utility. A brief history of the water system provides insight into how the system has developed over time. Information on adjacent water utilities provides an understanding of existing and potential opportunities for collaborative activities that can enhance the system's reliability or reduce costs.

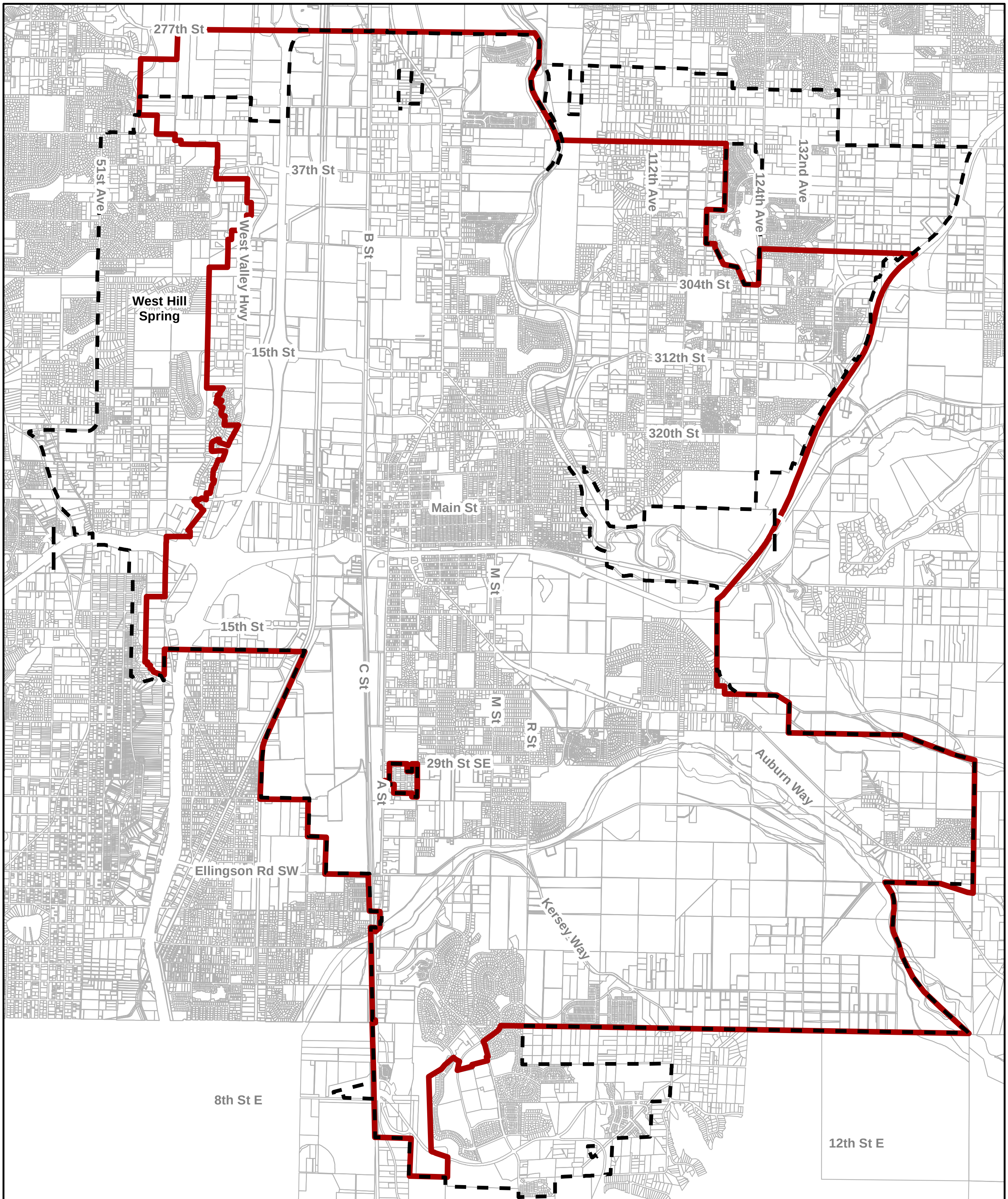
2.2 RETAIL WATER SERVICE AREA

The City's Retail Water Service Area (RWSA) boundaries were initially defined and documented through the South King County Coordinated Water System Plan (CWSP) in 1989. The current boundaries of the RWSA have been adjusted since 1989. An area of Pierce County was incorporated into the RWSA through the Pierce County Coordinated Water System Planning process (1997) and interlocal agreements with the City of Bonney Lake (Bonney Lake) (1998), Lakehaven Utility District (LUD) (2004), the City of Kent (Kent) (2006) and King County Water District #111 (WD#111) (2006). In 2014, the City proposed an updated boundary with Bonney Lake to reflect current parcel boundaries. The resulting RWSA boundary resolves comments made by Pierce County in the 2012 Plan. Additionally, subsequent planning and work with adjacent jurisdictions established several potential annexation areas (PAA) that provide for growth of the City over the planning period. The City limits, RWSAs, and the PAAs are shown on Figure 2.1. Copies of the Service Area Agreements can be found in Appendix D.

For areas outside the City's municipal boundaries, the City maintains water franchises that allow for construction and operation and maintenance of its facilities. Water system design and construction in the franchise areas are consistent with franchise requirements and the standards included in this Comprehensive Water Plan.

2.3 WATER SYSTEM HISTORY

The City's water system has a rich history that is summarized below. The City's current water system is described in detail in Chapter 5, including a map of all current facilities. The earliest record of a potable water system for the City is the Peasley Canyon supply in 1884. Surface water was supplied to the City (then called Slaughter), through a 4-inch wood-stave pipe from a Peasley Canyon Reservoir.



Legend
City Limits
Retail Water Service Area
Parcels

0 0.5 1 Miles

Figure 2.1
Water Service Area
Comprehensive Water Plan
City of Auburn

In 1907 the City purchased West Hill Springs for $2,000. The West Hill Springs, with production of 540,000 gallons of water per day (gpd), remains in service today. In 1915, the City constructed a 210,000-gallon concrete reservoir to store water from the West Hill Springs. The reservoir was removed in 1988 and all of the water produced from the West Hill Springs now flows continuously into the system. By 1922, the City population had grown to a few thousand, and the City decided to supplement the West Hill Springs with groundwater wells. Wells were drilled in the downtown area and pump stations were constructed. One well was located at the present site of City Hall (25 West Main Street). While these early wells and pump stations served the City for many years, they have long been abandoned.

The initial water distribution system consisted of wooden pipes. The first recorded steel water main was installed in 1924. It was a 10-inch pipeline from the West Hill Springs to the valley floor.

By 1925, City growth required additional water supply development and construction of storage facilities. The Coal Creek Springs collection system, consisting of a 24-inch, wood-stave supply pipeline connected to a booster pump station, located at the present Howard Road site, and an uncovered 3.0-million gallon (MG) reservoir (called City Reservoir 1) were constructed. The booster pump station included five hydraulic ram-type pumps to move water from the springs up to the reservoir through a 14-inch pipeline and then through a 16-inch wood-stave pipeline to the distribution system. Three of the ram-type pumps were still in operation until 1962.

By 1946, the City population had increased to 6,500. The City constructed a second pump station, the Coal Creek Pump Station, to pump water from Coal Creek Springs into the distribution system. The station consisted of a pump house and one electric pump. A second pump was later added to increase the pumping capacity to 2,000 gallons per minute (gpm). In 1953, a third pump was installed in the Coal Creek Pump Station to bring the pumping capacity to 3,000 gpm. Like the hydraulic ram-type pumps, the electric pumps boosted water from Coal Creek Springs to Reservoir 1.

In 1959, the 16-inch wood-stave pipeline from Reservoir 1 into the distribution system was replaced with a 16-inch cast iron pipeline. Two years later, initial water system facilities for the Academy Service Area were constructed. These included the Academy Pump Station with 300-gpm and 500-gpm pumps, a 500,000 gallon steel reservoir and approximately 2 miles of 10-inch cast iron water line from the pump station to the reservoir. The Academy distribution system was constructed in 1961. A larger 1.0-MG reservoir (Reservoir 8A) was constructed in 1973. The Academy system was improved again between 1978 and 1980, with a second booster pump station (two 750-gpm pumps and an emergency power generator), a 1.5-MG steel reservoir (Reservoir 8B) and approximately two miles of 14-inch ductile iron transmission pipeline. The 500,000-gallon reservoir constructed in 1961 was removed at that time.

The City began to supplement its two spring water supplies with a well system in 1960. Well 1, in operation until an unexplained drop in water level in 1998, was drilled and equipped with a 2,100-gpm pump. It was the only well in service until Well 2 (3,000-gpm capacity) was constructed in 1969.

The City expanded service to the Lea Hill area between 1964 and 1965. Basic facilities for the Lea Hill Service Area included the Lea Hill Pump Station, with two 600-gpm pumps, a 1.0-MG steel reservoir (Reservoir 4A) and approximately two miles of 12-inch ductile iron pipeline from the Porter (8th Street NE) Bridge to the reservoir. The Lea Hill distribution system was constructed at the same time and consisted of 6-inch and 8-inch ductile iron distribution water lines. A second 1.5-MG reservoir (Reservoir 4B) was constructed next to the 1.0-MG reservoir in 1983.

The Coal Creek supply system was extensively modified in 1964. New collector piping was installed at Coal Creek Springs; the 24-inch wood-stave pipe from the Springs to the Coal Creek Pump Station was replaced with a 24-inch concrete pipe; the Coal Creek Pump Station was equipped with new piping manifolds, and two of the then existing pumps were replaced with a new 1,500-gpm pump and a new 2,500-gpm pump.

In 1975, the City replaced Reservoir 1, an uncovered 3-MG reservoir, with a covered 5-MG concrete reservoir, also named Reservoir 1. A control pressure reducing station serving the Valley Service Area was installed near the Coal Creek Pump Station along with a 30-inch ductile iron water line from the new reservoir. At the same time, an underground 3.6-MG storage (Reservoir 2) was constructed on Lea Hill above the Lea Hill Pump Station. Like Reservoir 1, Reservoir 2 also serves the Valley Service Area.

The City added a supervisory control telemetering system in 1975. The control system controls all reservoirs, wells and pumps from the Maintenance and Operations building. This telemetry control system was upgraded in 1987.

In 1976, a chlorination station was constructed at Coal Creek Springs, replacing the system located at the Coal Creek Pump Station. The chlorination system at West Hill Springs (located near West Valley Highway) was moved in 1992 as a result of road construction.

Many improvements occurred in the early 1980s, including extension of the water system south of the White River with the development of Lakeland Hills Divisions Nos. 1, 2, and 3 in 1982. The Lakeland Hills facilities included a 12-inch diameter well (Well 5), a well house, a 1,000-gpm submersible pump, a 1.0-MG steel reservoir, three pressure-reducing stations and 8- to 12-inch distribution water lines.

Well 3A was constructed in 1983. This 1,500-gpm well was equipped with an automatic standby generator and pumps directly into the Valley Service Area. In 1984, Well 3B (1,500-gpm) was completed adjacent to Well 3A. A chlorination system was included with Well 3B that can chlorinate both Wells 3A and 3B.

Well 4, with a capacity of 3,000-gpm, was completed in 1985. Well 4 pumps directly into Reservoir 1. It is also capable of feeding the south end of the Valley distribution system through a pressure reducing station located on 25th Street SE, if low pressures are caused by fire fighting or other emergencies require this additional water supply.

A booster pump station was added to the Lakeland Hills system in 1989 to accommodate growth and provide pressure for development at higher elevations. The station consists of a three-pump pressure sustaining package system and two large-capacity fire pumps.

In 1991, Braunwood Estates (now called Hidden Valley) was accepted as a satellite water system providing water to thirteen 5-acre lots in the southeast portion of the City. Constructed by the developer, the system was turned over to the City to operate and maintain.

The Hidden Valley system consists of a well, a 33,000-gallon reservoir (for fire storage), and hydro-pneumatic tanks to maintain system pressure. The well produces 20 gpm. Because of its location, this system is not connected to the City distribution network.

Well 5A was constructed in Lakeland Hills in 1993 to provide additional water for continued growth. This well has a capacity of 180 gpm and pumps directly into the Lakeland Hills distribution system.

Following the 1995 Comprehensive Water Plan, the City implemented several significant improvements identified in the plan, as well as others required to serve a growing customer base.

In 1995, the City secured a water rights attorney to assist in developing a Water Rights Strategy for obtaining the additional water rights needed to meet future supply requirements. An integral part of the strategy was to complete technical studies of the local groundwater system, including the deep aquifer the City has traditionally used as a supply source. Two key elements of the program were the installation of monitoring wells and river gauges and the assessment of the existing City wells in the deep aquifer. The groundwater and local river levels were collected with data loggers, recorded in a newly developed database, and documented in annual reports. Pacific Groundwater Group in the 1999 Hydrogeologic Characterization Report summarized the ground-water study. Lastly, the program included the development of a regional ground-water model. The regional ground-water model using the USGS model program, MODFLOW, was completed in 2000 and could be used to analyze the impact of potential ground-water withdrawal scenarios.

In 1996, the City entered into Interlocal Agreement 3 (IA3) with the City of Algona (Algona) for a firm quantified (uninterruptible) wholesale water supply from the City. This agreement was superseded in 2002 by IA3A. As part of the agreement, Algona provided its groundwater right to the City. The agreement also called for Algona to provide direct service to some customers inside the Algona city limits who were being served by the City.

The water supply intertie project between WD#111, Covington Water District (CWD) and the City is commonly referred to as the Interlocal Agreement 2 (IA2) project. IA2 was signed in 1996. The agreement provides WD#111 and CWD up to 2.5 mgd each of wholesale water supply from the City. The supply is on an interruptible basis until the City obtains additional valley groundwater water rights to make the supply firm. IA2 included construction of significant new water system facilities.

The new IA2 facilities were constructed between 1998 and 2000 and included the following: two new 3,500-gpm wells, Well 6 and Well 7, both within the Valley Service Area; the Green River Pump Station, constructed in Isaac Evans Park, along with associated pipelines to deliver water into the Lea Hill Service Area; a new booster pump station, the Intertie Pump Station, near the Lea Hill Reservoirs along 132nd Avenue SE; and associated pipelines to deliver water from the Lea Hill Service Area to the Districts. Associated intertie meter stations were constructed by WD#111 and CWD and are located at 132nd Avenue SE and SE 288th Street.

In 1996, the City negotiated a Bilateral Compliance Agreement (BCA) for copper corrosion control with the Department of Health. The Agreement was amended in 2000. The BCA identified a step plan to meet the provisions of the Lead and Copper Rule of the Federal Safe Drinking Water Act (SDWA). The initial step identified treatment of two of the City's water supplies, Coal Creek Springs and Well 2. If this initial step was unsuccessful, additional sources such as Well 4 would be treated. The treatment process selected was to adjust the water pH using aeration. The treatment facilities include packed-media towers, clear wells, booster pumps, chlorination facilities and back-up power generators. During the development of the Corrosion Control Treatment Facilities 30 Percent Design Report, the City concurred with the recommendation that the facility, designed to treat Well 2, also include treatment for the City's two new wells, Well 6 and Well 7, located nearby. The BCA was revised to include this change and to modify the schedule in 2000.

To implement the change in corrosion control strategy, the City decided to rehabilitate Well 2 and included this work in the Well 6 project scope. The new Well 2 and Well 6 facility includes a new masonry building (housing both wells), new well pumps and associated equipment.

In 1998, the City replaced the protective coatings on the exterior surfaces of both Lea Hill Reservoirs and the interior of the Lea Hill 1.0-MG Reservoir.

The diesel fuel storage tanks for the emergency generators at the Coal Creek Springs Pump Station, the Academy Pump Stations, and the Lea Hill Pump Station were removed and replaced in 1999 with above ground, double-walled fuel tanks. The new tanks can be more easily inspected for fuel leakage.

In 1999, a Corrosion Control Specialist recommended recoating the exterior and interior of the Reservoir 5. In 2002 and 2003 the exterior and interior of both Academy Reservoirs and the interior of the Lea Hill 1.5-MG Reservoir were recoated. In 2012, a new tank, Reservoir 6, was constructed in the Lakeland Hills Service Area. This tank provides storage for both the City and Algona. With the completion of Reservoir 6, Reservoir 5 is able to be taken out of service and Reservoir 5 was recoated 2014.

In 2013, the Lakeland Hills Booster Pump Station was replaced to provide improved service to the boosted Lakeland 697 Pressure Zone. In 2014, Janssen's Addition booster zone was replaced with a new Academy Booster Pump Station. The new Academy Booster Pump Station provides improved fire protection and increased the size of the Academy Service Area's boosted zone.

The City transferred Aaby Drive pump station and service area to LUD in 2004. As recommended in the 1995 Comprehensive Water Plan, the Aaby Drive Intertie, an intertie to LUD, was completed at R Street NW. The Aaby drive pump station was retired upon completion of the intertie, since this provided a gravity service to the Aaby Drive service area for fire protection.

The Water Service Area was expanded to the south to include areas within Pierce County. The area was redefined between Bonney Lake and the City in 1998 to allow adequate service to developments within the Lakeland Hills South Planned Unit Development (PUD) in the Lakeland Hills Service Area. This service agreement was reaffirmed for seven years in 2013. The City and WD#111 modified their service area to allow the City of Kent in 2006 to provide service to the Verdana PUD. The Verdana PUD is an incorporated area of Kent surrounded by Auburn.

Pipeline and other system improvements were implemented since the last plan.

2.3.1 Service Area Topography

The City's RWSA is dominated by a broad valley surrounded by uplifted plateaus. The Green River runs near the eastern limit of the City. Mill Creek, a tributary of the Green River, parallels the western corporate limits. The White River flows through the southern part of the City before turning south to join the Puyallup River. The topography of the service area is a result, in part, of glaciation of the region.

The majority of the City lies on a two to three-mile wide plain bound by Mill Creek on the west and the Green River on the east. Ground elevations in the area range between 50 to 100 feet and slope upward generally to the north. The terrain rises sharply to elevations of 400 to 500 feet on either side of the valley as well as in the southern portion of the City, south of the White River and between the White and Green Rivers.

The topographic features of the RWSA made it necessary to divide the water system into four major service areas serving the valley and the surrounding plateaus. The following are the major service zones and associated elevations: Valley Service Area (service elevation from 39 to 235 feet); Lea Hill Service Area (service elevation from 150 to 515 feet);

Academy Service Area (service elevation from 146 to 444 feet); and Lakeland Hills Service Area (service elevation from 58 to 513 feet). Each service area is further subdivided into smaller hydraulic operating areas depending on topographic elevations, called pressure zones, in order to reduce local pressures. Additional detail on the City's service areas are provided in Chapter 5.

2.3.2 Climate

The RWSA has a West Coast, marine-type climate caused by the influence of air masses coming from the Pacific Ocean. In late fall and winter, orographic lifting and cooling causes moist air masses to create clouds and precipitation throughout the area. Average annual rainfall is about 40 inches, generally occurring between October and March. Average annual snowfall is 8.6 inches. The temperatures range from the mid-70 degrees Fahrenheit in the summer, to 40 degrees Fahrenheit during the winter, with an overall average of 50 degrees Fahrenheit.

Climate has a significant effect on water consumption since customers use more or less water depending on the weather. During hot, dry weather, water consumption increases as a result of lawn watering and other outdoor water uses; during wet weather, consumption decreases.

2.3.3 Geology

The geology of the City is the result of glacial and interglacial processes acting over millions of years. Large continental glaciers in the Puget Sound area created the glacial deposits and erosion of material through these processes. During the periods when glaciers, not rivers nor lakes, did occupy the area, landslides created deposits and erosion through glacial and interglacial deposits. Generally, the uplands surrounding the City are composed of glacial and interglacial deposits and the valleys are filled with more recent deposits overlying glacial and older interglacial deposits.

Five major geologic units lie within the White and Green River Valleys: White River Alluvium (Qaw), Osceola Mudflow (Qom), Undifferentiated Alluvium (Qua), Vashon Recessional Deltaic Deposits (Qd) and Undifferentiated Glacial and Interglacial Deposits (Qu). Bedrock is known to lie approximately 1,280 feet beneath the valley floors.

The City completed an extensive study of the geology and hydrogeology within the City's RWSA. The study, known as the Auburn Water Resources Program Study, is documented in several volumes: 1996 Preliminary Hydrogeologic Characterization, Summary of 1997 Hydrogeologic Investigations, the 1997-1998 Test Well Drilling and Installation Program, and the 1999 Hydrogeologic Characterization Report and Appendices. The studies were completed by the Pacific Groundwater Group.

The general groundwater flow system in the City’s vicinity is characterized by recharge within uplands and discharge to the rivers in the lowland valleys. Precipitation is the major source of recharge. Lake Tapps is also a source of groundwater recharge. Lake water flows from the lake bottom into the groundwater system. Contrary to recharge in other upland areas, recharge from Lake Tapps is not totally dependent upon precipitation because water is routed to the lake from outside the area.

The main discharge zone for the City's area is the Green River Valley. Some groundwater discharges into the river in the City vicinity and further downstream.

2.4 ADJACENT WATER PURVEYORS

Several other water purveyors adjoin the City RWSA. These include the Cities of Algona, Bonney Lake, Kent, Pacific, and Sumner. Also included are the CWD, the LUD, WD#111, Highline Water District and the Muckleshoot Indian Tribe (MIT) Utility. Adjacent purveyors are shown on Figure 2.2 and described in the following paragraphs. Purveyors receiving wholesale water from the City and interties with these adjacent purveyors are discussed later in this chapter.

2.4.1 City of Algona

Algona is located at the southwest corner of the City's RWSA. Until 1996, Algona provided water from a shallow well located at the intersection of 3rd Avenue South and Washington Boulevard. In 1996, the well failed and Algona entered into a water supply agreement with the City (IA3, dated August 1996). Algona and the City superseded this agreement with a new agreement (IA3A October 2002) to reflect current status and update information and exhibits. The agreement calls for five meter stations between the two systems, Reservoir 6 in Lakeland Hills provides water to Algona, and Well 6 and Well 7 also will provide water to Algona. Currently Algona is served through the metered Boeing Welded Duct Intertie (located west of Pacific Avenue off 1st Avenue) and by two intertie meter stations located at Boundary Boulevard and Industry Drive North and at Boundary Boulevard and Milwaukee Avenue. Both new stations include 8-inch meters. Algona serves a population of about 3,120 and maintains a hydraulic grade line (HGL) of 245 feet. Algona's water right for the failed well was transferred to the City as a provision of the interlocal agreement.

2.4.2 City of Bonney Lake

Bonney Lake is located south and east of the City's RWSA in Pierce County. Bonney Lake serves a population of over 32,600 through a combination of two well fields and two spring sources. The Bonney Lake water system operates over a total of eight pressure zones with its 748-foot HGL pressure zone adjacent to the City's RWSA.

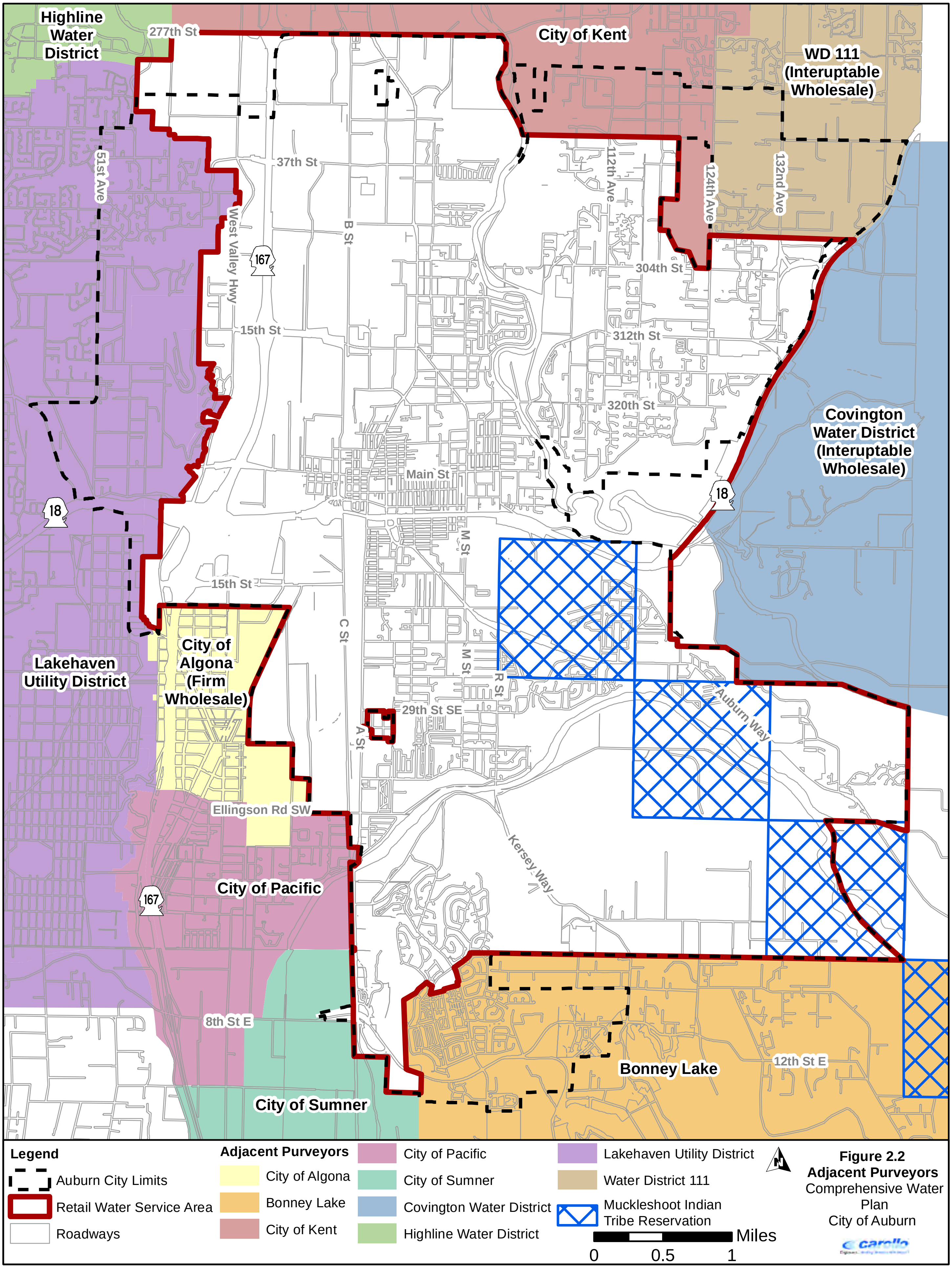


Figure 2.2
Adjacent Purveyors
Comprehensive Water Plan
City of Auburn

In 1998, the City and Bonney Lake entered into an agreement allowing Bonney Lake to provide interim water service to a portion of the City's PAA in Pierce County for a period of at least seven years after annexation by Auburn. At the end of the seven years, the City has the option to serve the customers within the annexation area. The City renewed this agreement in 2005 and again in 2012. Currently, Bonney Lake provides water service to approximately 4,000 City customers.

The City purchases water from Bonney Lake to serve two customers along Kersey Way near the Pierce County Line. This arrangement was implemented because the customers were adjacent to the Bonney Lake system and some distance from the City facilities. Additional development in this area will probably depend on individual wells, satellite systems, or additional purchased water from Bonney Lake.

2.4.3 City of Kent

Kent and the City originally established S 277th Street as the boundary between the two cities. Due to the City's annexation of the Lea Hill area, the new boundary between the cities is SE 280th, SE 282nd, and SE 288th streets. The City does not anticipate extending its system north of these streets. The Kent water supply source is a combination of springs and wells that serve a population of about 65,500. For the future, Kent does have additional supply from the Second Supply Project of Tacoma. The City serves outside its RWSA, as a result of the division of Water District No. 87 until such time as Kent's system expands.

Water District No. 87 once served the area between the City and Kent; however, the district was divided between the two cities and no longer exists. A portion of the old Water District No. 87 system was connected to the City's distribution system along B Street NW near South 285th Street and along Auburn Way North near SE 280th Street. These connections resulted in an intertie between the City's water system and the Kent water system at SE 277th Street and 78th Avenue SE, which can be opened in an emergency. Kent maintains an HGL at the intertie of about 240 feet, which is slightly lower than the City's Valley 242 Pressure Zone. The City maintains a 6-inch meter at the intertie; the City of Kent also has a 6-inch meter that allows flow to Auburn. The City serves outside its RWSA as a result of the division of Water District No. 87 until such time as the Kent system expands.

In 2006, the City, Kent and WD#111 agreed that Kent would serve the Verdana PUD, which is located north of SE 304th Avenue and west of 124th Avenue SE. The service area for the WD#111 has been adjusted to reflect this agreement.

2.4.4 City of Pacific

Pacific is located south of the City's RWSA, just west of Lakeland Hills. Pacific uses groundwater from two shallow wells in the vicinity of Ellingson Road and Pacific Avenue. Pacific currently serves a population of about 6,303.

In October 2003, Pacific and the City mutually adjusted their service boundaries to include the Illako Elementary School and several parcels to the south and east of the school in the City's RWSA.

Pacific's system is operated at a HGL of about 250 feet, which is slightly higher than the City's Valley 242 Pressure Zone. Pacific maintains a one-way intertie on Ellingson Road with the City for emergency water supply. Another emergency water intertie is located on East Valley Highway between the two cities.

2.4.5 City of Sumner

Sumner is located south and west of the City's RWSA. Although Sumner and the City's RWSA are adjacent at a corner of the two service areas, there are no connections, emergency or otherwise, and no plans at this time to establish interties.

2.4.6 Covington Water District (CWD)

The CWD is located east of the City's RWSA which includes urban and rural development. CWD uses groundwater to serve a population of about 44,000, with a HGL of 660 feet in the vicinity of the City.

The CWD and WD#111 entered into an IA2 with the City in September 1996. The agreement required construction of supply and delivery facilities to deliver up to 5.0 mgd of water to the districts. Under IA2, CWD is provided up to 2.5 mgd of wholesale water supply from the City on an interruptible basis. CWD did not renew the purchase agreement in 2010; however, the City may provide supply per the IA2 upon request of CWD as determined by the City.

In 2007, the CWD began receiving supplies from Regional Water Supply System (RWSS), which is also known as the Tacoma Second Supply Pipeline. CWD is a 7/36 partner in the RWSS, which provides the right for 12.5 mgd of supply. The RWSS is a primary supply that is supplemented by the CWD's well. The CWD also maintains three interties with Cedar River Water and Sewer District, which in turn purchases water from the City of Seattle, and one emergency intertie with WD#111.

2.4.7 Highline Water District

Highline Water District serves a population of approximately 70,000 people and 28,000 employees to the northeast of the City's RWSA. Highline Water District receives supply from groundwater and Seattle Public Utilities (SPU). The City (Auburn) does not currently serve customers near along the joint boundary and does not intertie with the District.

2.4.8 Lakehaven Utility District (LUD)

LUD serves an area to the west of the City's RWSA. LUD uses groundwater and an intertie with Tacoma to serve a population of about 112,800. LUD maintains a HGL of 578 feet near the City's RWSA.

LUD has a service area agreement with the City creating a mutual water service planning area that allows the LUD to serve the West Hill area within the city limits along the steep West Valley hillside. Because the City's Valley Service Area serves elevations below 160 feet, it would be impractical to install facilities to serve each residential development along the hillside when adequate service can be provided by the LUD from its 578-pressure zone through the use of pressure reducing stations. Within this 2002 agreement, the City transferred the pump station and distribution system that serves the Aaby Drive neighborhood to LUD. In 2009, LUD decommissioned the Aaby Drive pump station and completed a second feed to the West Hill area via an 8-inch pipeline within Hi-Crest Drive.

LUD has three interties to serve the West Hill area; however, these interties are separated from the Valley Service Area by normally closed valves. In 2002, LUD and the City entered into an agreement that grants the City the right to connect a future intertie to LUD located in the vicinity of 15th Street NW and Terrace Drive.

2.4.9 King County Water District #111 (WD#111)

WD#111 lies north and east of the City. WD#111 serves a population of about 18,092 using a combination of wells and water purchased from the City. The District operates at a HGL of 590 feet, slightly higher than City's adjacent Lea Hill Service Area.

WD#111 and the City have two emergency interties. The intertie facilities are located near the intersection of 124th Avenue SE and SE 300th and the intersection of 127th Place SE and SE 300th, which are used only for the Duberry Hill development.

In 1996, WD#111 and the City entered into a water supply intertie arrangement documented in an interlocal agreement, IA2. Under the agreement, WD#111 and CWD are provided up to 5.0 mgd of wholesale water supply from the City on an interruptible basis.

In 2006, it was agreed upon by the City and WD#111 that the City of Kent will serve the Verdana PUD, which is located north of SE 304th Avenue and west of 124th Avenue SE. WD#111 adjusted its west boundary line to remove this from their service area.

In December 2010, to avoid unpredictable water sales and create a predictable and reliable cost for wholesale water to be sold by the City to WD#111, the District agreed to purchase an average of 0.75 mgd (during the winter) and 1.0 mgd (during the summer) from the City on a take or pay basis. This is a portion of, not in addition to, the 2.5 mgd allocated to the District as addressed in IA2. The agreement expires in 2015, with the option for one year extensions.

2.4.10 Muckleshoot Indian Tribe (MIT)

The MIT currently operates a water system on reservation lands east of the City. The MIT and the City's water systems are not currently connected by intertie, however, the City and the MIT have discussed their future relationship. The City currently serves some customers outside of the city who reside on reservation land.

2.5 OTHER WATER SYSTEMS

There are many smaller water systems, such as Class A, Class B, and private wells operating within the City's limits or PAA. The City encourages other systems within the City RWSA to connect to its system. The following Class A water systems have been identified by the Department of Health:

Braunwood Estates
25 W Main Street
Auburn, WA 98001-4998

Danner Corp
307 Oravetz Place SE
Auburn, WA 98092

Hazelwood Heights
30224 – 108th Avenue SE
Auburn, WA 98092

South Auburn Water Association
208 – 31st Street SE
Auburn, WA 98002

Logandale Water Association
6430 S 287th Street
Kent, WA 98032

2.6 INTERTIES

Under interlocal agreements water utilities use interties to move water between adjacent systems to meet supply needs, to increase reliability, and to respond to emergencies. The City's water system interties are described in the sections that follow. The City has separated its interties into three groups: wholesale interties, emergency interties, and potential future interties. The Cities' interties are shown on Figure 2.3. The City's interlocal agreements are provided in Appendix D.

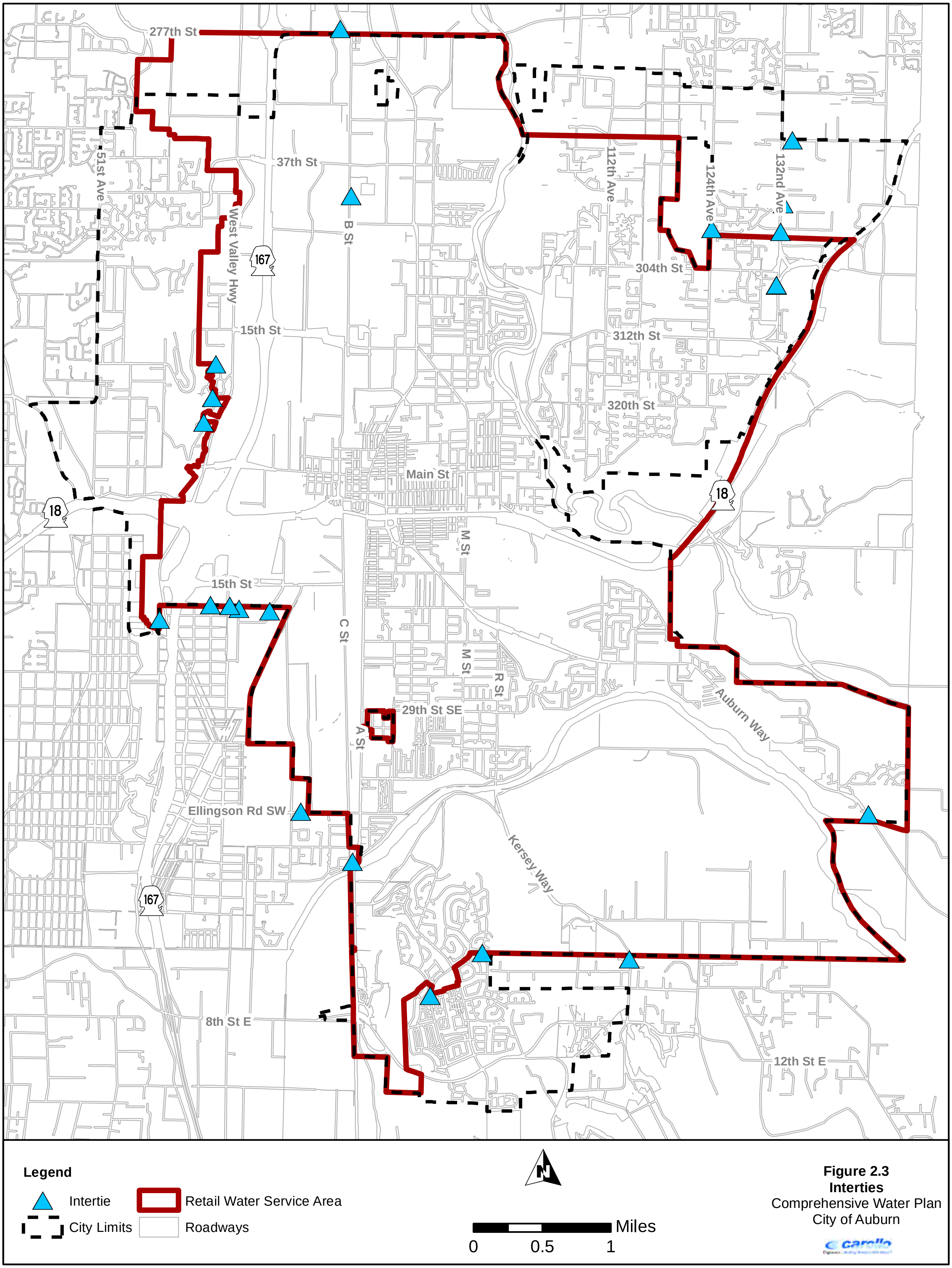


Figure 2.3
Interties
Comprehensive Water Plan
City of Auburn

2.6.1 Wholesale Interties

The City maintains wholesale supply interties with three adjacent water systems: Algona, CWD, and WD#111. The City also has a supply contract with the MIT and the Indian Health Service, dating from 1972, for services along a pipeline at 368th Street SE extending from the City limits into the reservation.

2.6.2 City of Tacoma

In 2012, Tacoma agreed to provide water to the City in the quantity of up to 1.0 mgd average day use, 1.8 mgd peak day use, and 1.62 mgd four-day peak use. Tacoma also agreed to supply at the City's Option to exercise no later than December 31, 2015, and additional 1.0 mgd average day use, 1.8 mgd peak day use and 1.62 mgd four-day peak use. Two interties were constructed to supply the City: one located at 3200 B Street NW, Auburn and one located at 29600 132nd Avenue SE (Kent). This agreement will remain in force as long as the City of Tacoma (or its successors in interest in its water system) remains in the business of providing water, and as long as the City (Auburn) meets the terms and conditions of the agreement. In 2014, the City executed an superseding agreement to provide an total of 3.5 mgd (2,430 gpm) of average use and 5.12 mgd (3,555 gpm) of peak use from the interties. The B Street NW Intertie is limited to a maximum flow-rate of 2,200 gpm and the 132nd Avenue SE Intertie is limited to a maximum flow-rate of 4,500 gpm.

2.6.3 City of Algona

The City has supplied water to Algona on a regular basis since 1996. In 1996, Algona's well failed and Algona negotiated an interlocal agreement with the City, IA3, to purchase specific quantities of water. A superseded agreement, IA3A October 2002, reflects the current status and updates information and exhibits. Currently, Algona is served through the metered Boeing Welded Duct intertie (located west of Pacific Avenue off 1st Avenue) and by two 8-inch intertie meter stations located at Boundary Boulevard and Industry Drive North and at Boundary Boulevard and Milwaukee Avenue. The agreement anticipates 0.491 mgd average and 1.029 mgd peak by 2009 and 0.525 mgd average and 1.114 mgd peak by 2014. In the event that the City experiences any failure or decreased capacity, the supply of water to Algona may be decreased by the same percentage that is experienced by the City.

2.6.4 Covington Water District and King County Water District #111

An intertie between the City, CWD, and WD#111 was constructed in 1996 as part of IA2, to enable the Districts to purchase water from the City. The intertie also allows the City to provide an emergency supply to Kent's East Hill Service Area through WD#111. Effective December 31, 2010, CWD terminated water purchases from the City.

As part of the IA2, the City agrees to provide up to 2.5 mgd of MDD to both CWD and WD#111 (total maximum day demand of 5.0 mgd). The conditions of this agreement include:

"VIII. Conditions of Service.

A. Auburn does not presently have the necessary capacity (i.e., water supply and/or water rights) to guarantee delivery of firm uninterruptible water. It is acknowledged and agreed that in the event Auburn experiences any failure or decreased capacity for any reason or increased demand within its retail service area, the supply to the Districts may be immediately reduced or stopped under such conditions at the sole discretion of Auburn. The Districts agree that Auburn may take such action irrespective of any cost, investment in capacity, or other reliance which may have been placed upon the intertie facilities and interruptible water supply referenced in this Agreement."

A provision of the IA2 agreement calls for either of the Districts to send an emergency supply of water to the City when needed for the Lea Hill Service Area. The IA2 also included several improvements to allow delivery of water:

- The Green River Pump Station and pipelines to deliver additional water into the Lea Hill Service Area.
- The Intertie Pump Station and pipelines to deliver water from the Lea Hill Service Area to the Districts.
- Construction of two additional wells (Well 6 and Well 7).

2.7 EMERGENCY INTERTIES

2.7.1 City of Bonney Lake

The Cities of Auburn and Bonney Lake have an emergency intertie located in the Lakeland Hills Area on Lakeland Hills Way, south of Evergreen Way SE. This intertie, controlled by the City Fire Department, is to provide support for the Bonney Lake system only in the event of a fire at three multi-family development sites in its service area.

In March 2002, the City and Bonney Lake created a two-way emergency supply intertie located in Evergreen Way SE. The agreement will remain in force until terminated by either city. This agreement was replaced in May 2010 with a new Emergency Intertie Agreement allowing the Cities of Auburn and Bonney Lake to take and provide water under emergency conditions *(Resolution 4596).*

2.7.2 City of Kent

The City and Kent have an emergency intertie at South 277th Street. This is a two-way intertie with two valves and two meters that normally are closed. Flow is accomplished by manually opening the connection in an emergency. The City HGL at the intertie location is higher than Kent's (HGL 242 vs. HGL 240) so, the only time water can flow from Kent into the City is during emergency conditions when the pressure in the City's system drops below that of Kent's or if water is pumped from Kent to the City.

2.7.3 City of Pacific

The City supplies water to the City of Pacific on an emergency basis through a 4-inch meter located off Ellingson Road near Pacific Avenue. An emergency water intertie was agreed upon between the City and Pacific in October 2003. This is located on East Valley Highway between the two cities. There is also a normally closed, unmetered intertie located on A Street SE on the north side of the White River Bridge. Each emergency supply can be used only by opening manual valves between the systems. Pacific must notify the City before the valves are opened. Pacific has used water from the City occasionally.

2.7.4 Lakehaven Utility District

The LUD and the City have a 6-inch intertie located at Aaby Drive and Knickerbocker Drive. In October 2010, LUD and the City entered into an agreement that grants the right to install a water meter and control the valve located in the vault at the intersection of Knickerbocker Drive and Aaby Drive for emergency water in order to increase fire protection and emergency water supply reliability. This emergency intertie is limited to a maximum flow-rate of 800 gpm. This agreement will remain in place until terminated by either city upon 60-day written notice.

2.7.5 King County Water District #111

WD#111 and the City have two emergency interties to serve the Duberry Hill development. The intertie facilities are located near the intersection of 124th Avenue SE and SE 300th and the intersection of 127th Place SE and SE 300th between the City and WD#111 boundaries. These interties are for emergency use only and are two-way.

2.7.6 City of Tacoma

In October 2010, the City of Tacoma and the City entered into an agreement that allows the City to take water through the B Street NW and 132nd Ave SE Intertie under emergency conditions. This agreement is superseded by the Wholesale Water Agreement dated July 2012 between the City and Tacoma and detailed in section 2.6.2.

2.8 POTENTIAL INTERTIES

The City has an interest in acquiring additional interties that would enhance the reliability of water service in the City and among adjacent purveyors.

Tacoma Public Utilities constructed the Second Supply Pipeline Project, which runs through the north end of the City's RWSA between 30th and 37th Streets NE. In addition to the B Street NW and 132nd Avenue SE interties, a third turnout was constructed as part of the pipeline project in the Valley Service Area. The City does not currently plan to develop this turnout, but may do so in the future.

2.9 INVENTORY OF RELATED STUDIES

In preparing this Comprehensive Water Plan, related studies were reviewed to ensure coordination between this Plan and previous studies. Brief synopsis of related studies are presented below:

City of Auburn Water Resources Program, Pacific Groundwater Group, Inc., 1995-1999: Pacific Groundwater Group conducted this comprehensive groundwater study in response to recommendations of the 1995 Comprehensive Water Plan. The work of the study was documented in a series of reports including: 1996 Existing Data Hydrogeologic Characterization; 1996 Preliminary Hydrogeologic Characterization; Summary of 1997 Hydrogeologic Investigations; 1997-1998 Test Well Drilling and Installation Program; 1999 Hydrogeologic Characterization Report and Appendices; and Regional Groundwater Model Report.

The Auburn Water Resources Program assessed the long-term potential for the City's continued use of ground water for its water supply. The study confirmed substantial quantities of ground water underlying the valley area and concluded that the continued potential for water supply is excellent. However, the Program focused on hydrogeological issues as opposed to legal issues associated with obtaining additional water rights.

This study provided the basis for the water supply conclusions for this Plan, however, further work is anticipated to address legal issues as well as ESA issues.

City of Auburn Comprehensive Plan, 1995 and Amendments: This plan, originally adopted in 1995 in response to the WGMA, is the City's long-range comprehensive land use plan and policy document. It consists of goals, land use policies, and the Comprehensive Plan map. The plan is amended annually.

City of Auburn 2012 Comprehensive Water Plan, City of Auburn Public Works, 2012: The previous Comprehensive Water Plan provided evaluation of needs and recommended improvements to the City system for 2012-2015. The plan adopted in 2012 constitutes the basis for this Plan.

Capital Facilities Plan (2014-2019), City of Auburn Finance Department, 2013: The Capital Facilities Plan was adopted in 2013 and includes goals, policies, capital improvements and implementation programs as required by the State GMA, coordinated with the City capital improvements program.

Water Cost of Service Rate Update Study, City of Auburn, 2014: The most recent water-rate cost of service study for the City.

System Development Charge Study (2014): The City completed a study of its system development charges in 2014.

King County 2012 Comprehensive Plan, King County Department of Permitting and Environmental Review, 2012: The King County Comprehensive Plan establishes land use zoning for areas outside the City limits, but within the RWSA. Additionally, King County provides critical area ordinances and critical aquifer recharge areas that support the City's wellhead protection efforts.

Pierce County Comprehensive Plan, 1996 and Amendments: This is a comprehensive plan and policy document for Pierce County. The plan was developed in accordance with the State Growth Management Act (GMA) and is amended every two years.

Pierce County Coordinated Water System Plan, 2003: In 1983, all of Pierce County was declared a Critical Water Supply Service Area. In response to this declaration, Pierce County established the first Coordinated Water System Plan in an effort to coordinate planning and establish water service areas. The current Coordinated Water System Plan was adopted in 2003 through Ordinance 2003-69.

Pierce County White River Basin Plan, 2013: The White River Basin Plan provides a comprehensive guide to storm drainage and surface water management in the portions of the White River Basin that are under Pierce County's jurisdiction.

Soos Creek Community Plan, King County Planning Department, 1991: This plan is a growth management plan, guiding growth and development in the Soos Creek community.

South King County Coordinated Water System Plan (CWSP), Economic and Engineering Services, Inc., 1989: This plan, adopted in 1989, defined the initial service area boundaries for the water systems within the Critical Water Supply Area of South King County. The City of Auburn Comprehensive Water Plan, upon adoption, becomes an element of the CWSP.

Draft Ground Water Management Plan (GWMP), South King County Groundwater Advisory Committee, 2003: The GWMP was initiated by Ecology with the intent to develop methods to protect the quality and quantity of ground water, meet future resource needs while recognizing existing water rights and provide effective and coordinated management of ground-water resources.

Tribal Land Use Plan, Muckleshoot Indian Tribe, 1978: The Tribal Council adopted the MIT's Zoning Ordinance on August 31, 1979.

USGS South King County Ground Water Study, Occurrence and Quality of Ground Water in Southwestern King County, Washington. Water-Resources Investigations Report 92-4098: Prepared in cooperation with: State of Washington Department of Ecology

(Ecology), Regional Water Association of South King County, and Seattle - King County Department of Public Health, Tacoma. 1995.

In addition to the studies listed above, the Water Comprehensive Plans from the following neighboring water systems were considered during the preparation of this Plan.

- City of Algona, July 2013, Gray & Osborne, Inc (Draft).
- City of Bonney Lake, 2009, RH2 Engineering, Inc.
- City of Kent, 2011, PACE.
- City of Pacific, 2000, Gray & Osborne, Inc. / 2002 Parametrix (Amendment).
- Covington Water District, 2014, Carollo Engineers, Inc (Draft).
- Lakehaven Utility District, 2013, Carollo Engineers, Inc.
- King County Water District #111, 2008, Roth Hill Engineering Partners.
- Highline Water District, 2008, BHC Engineers.

Chapter 3

POLICIES AND CRITERIA

3.1 INTRODUCTION

The City of Auburn (City) manages the water utility in accordance with established water-system policies that govern various facets of utility operations. City policies are established by the City in order to provide a vision or mission of the Water utility and to provide a framework for the design, operation, and ongoing well being of the City's Water utility. Generally, the water utility policies will provide necessary guidance for staff to develop appropriate criteria and programs to implement the defined policies. The policies seek to provide uniform treatment to all Utility customers and to provide documentation to current water-system customers as well as those considering service from the City. It should be noted that what is included in these policies is limited to those things related to the water system and its design and operation. The City has a wide variety of other policies (and criteria) related to land use, development, and finance that would condition what may be done, in addition to the requirements related specifically to the needs of the water system included in this plan.

The policies included in this plan are developed specifically for the City's multi-source municipal water system (System Number 03350V). In addition to policies documented in this section, criteria and standards relating to the planning, design, construction, operation, and maintenance of the water system have been developed to establish consistency and to ensure that adequate levels of service are provided throughout the system.

The City's Water Comprehensive Plan is based upon the following mission statement for the water utility:

"The City will provide for the efficient, environmentally sound and safe management of the existing and future water system within Auburn's service area" (City 2014-2015 Budget).

The City's policies are grouped by major categories. These categories are:

- Business Practices
- Service Area
- Operations and Maintenance
- Financial
- Planning
- Environmental Stewardship
- Design and Construction

3.2 BUSINESS PRACTICES

The City desires to employ recognized best business practices, which result in the efficient and cost effective operation of the utility. The City has identified the following key business functions within the utility and has developed supporting best business practices for each of the following:

- Asset management,
- Water quality complaints,
- Cross connection control, and
- Billing practices.

The utility will conduct a performance audit every six years in conjunction with its capital projects planning cycle to evaluate how well best business practices are being implemented and how effective they are.

The City understands that defining and implementing best business practices is a long-term effort and will require a stepwise approach. Given that the utility is largely made up of physical assets, which have the greatest value and represent the greatest cost to operate and maintain, the City shall address the business practice of asset management first.

Business Practices Policies are presented in Table 3.1. The policies are intended to support the City's Business Practices framework for asset management. The policies define programmatic objectives and requirements for City assets.

3.3 SERVICE AREA

Service area policies define the Retail Water Service Area, the City's duty to serve and conditions of service. The policies also define government consistency, agency coordination, satellite systems, and the level of service provided by others within the Auburn's City limits. Service area policies are summarized in Table 3.2.

3.4 OPERATIONS AND MAINTENANCE

The operational and maintenance policies summarize the City's multiple programs, commitment to training, and certification opportunities for its employees. Table 3.3 identifies operational and maintenance programs that reflect the City's current operations and maintenance best management practices. For each program, the City's goal or actual level of achievement has been identified.

Operations and Maintenance policies are summarized in Table 3.4.

3.5 FINANCIAL

The financial policies summarize the City's general financial policies and criteria, including water rate structure, development charges, capital improvements financing, and reserves. Financial policies are summarized in Table 3.5.

3.6 PLANNING

Planning policies define a wide range of planning activities that the City's conducts. The policies define conditions for service extensions, fire system responsibility, oversizing, and service Pressures and flow. The policies also define planning activities, including water supply planning and capital facility planning. Planning policies are summarized in Table 3.6.

3.7 ENVIRONMENTAL STEWARDSHIP

The environmental stewardship policies outline the City's dedication to develop and implement facilities and programs that will protect the environment. It also defines the City's conservation program, as well as its demand management and water shortage response. Environmental Stewardship policies are summarized in Table 3.7.

3.8 DESIGN AND CONSTRUCTION

Water system design and construction policies define the criteria, methods, and procedures for the City to provide guidance for how water facilities are designed and constructed. Included in these policies are criteria for supplies, pump stations, storage reservoirs, system pressures and fire flow requirements. Design and Construction policies are summarized in Table 3.8.

Table 3.1 Business Practices Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.2.1	Asset Management Business Practices	Asset management is the manner in which to maintain assets in good working order to minimize future costs of maintaining and replacing them, especially to avoid costly deferred maintenance. The best practices for asset management involve systematically basing choices on an understanding of asset performance, risks and costs in the long-term. Asset management best practices include: • Having knowledge about assets and costs (i.e., detailed inventories). • Maintaining desired levels of service. • Taking a lifecycle approach to asset management planning. • Implementing the planned solutions to provide reliable, cost-effective service. • The City will develop and implement system improvements, infrastructure renewal (repair, rehabilitation, or replacement), and operations and maintenance programs for the water system according to asset management principles that address levels of service, address the triple bottom line (economic, social, and environmental benefits and costs), minimize asset life cycle costs, and incorporate risk management into decision-making. This will be accomplished in part by implementing sub items 3.2.2 thru 3.2.8. The utility shall begin implementing the above best practices during the next planning period and report progress annually.
3.2.2	Connections to Water System	It is unlawful for any person to make connections with any water facility belonging to the water utility without first obtaining an approved utility permit for service. (Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinan**ce 4878 § 3, 1996) [13.06.090 Connection]** Connections to the public water system shall be made in accordance with City of Auburn polices and design and construction standards. **(Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.100** Connection**]**
3.2.3	Asset Criticality Database	The City will maintain an asset criticality database to be used in prioritizing asset maintenance and repair and replacement. The existing criticality database will be refined to include more asset age and material information, and will be validated using the results of inspections. The database will transition from an external process to an integral process within the City's computerized maintenance management system (CMMS).

Table 3.1	Business Practices Policy Summary Comprehensive Water Plan City of Auburn	
Section	**Policy Name**	**Policy Statements**
3.2.4	Condition Assessments of Critical Assets	The City will perform condition assessments of critical assets. The City will develop and implement a condition assessment schedule for all critical assets.
3.2.5	Design Life of Water Assets	The City will assign industry standard design life's for water assets. The actual physical assessment will be compared to the theoretical design life to determine the optimal economic life. The City will attempt to repair or replace system assets before they exceed their economic life. The number of high-criticality assets beyond economic life will be minimized.
3.2.6	Maintenance Activities for Asset Management	The City will conduct maintenance activities at a level that is consistent with optimizing system reliability, asset economic life, and system performance. The City will develop schedules for maintenance of all water system assets
3.2.7	Addressing Water Quality Complaints	The City will monitor the frequency, location, and details of all water quality complaints. At a minimum, the City will respond, research the cause of, and propose control methods once an issue is documented.
3.2.8	Security of Assets	Adequate measures shall be taken to ensure system security. At a minimum, the City shall maintain security at water facilities by using the SCADA system (motion detection, cameras) to alert City personnel when unauthorized access is occurring.
3.2.9	Public Health Protection	The City shall conduct periodic inspections of its water system in coordination with the Washington State Department of Health. The City shall from time to time promulgate, publish and enforce such rules and regulations deemed necessary to protect the municipally owned water supply from contamination. (Ord. 5851 § 1, 2004; Ord. 2789 § 1, 1974; 1957 code § 10.12.033.) [13.12.080]

Table 3.1	Business Practices Policy Summary Comprehensive Water Plan City of Auburn	
Section	**Policy Name**	**Policy Statements**
3.2.10	Cross-Connection Prohibited	The installation or maintenance of a cross connection which will endanger the water quality of the city's municipal water system is prohibited. Any such cross connection now existing or hereafter installed is a nuisance and shall be abated immediately. The control or elimination of cross connections shall be in accordance with WAC 246-290-490 or subsequent revisions, together with any future manuals of standard practice pertaining to the city's cross connection control program approved by the city and the Washington State Department of Health. The water supply will be discontinued to any premises for failure to comply with the provisions of this section. [Ordinance 5851 § 1, 2004; Ordinance 2789 § 1, 1974; 1957 code § 10.12.031(A),] (13.12.040)
3.2.11	Cross-Connection Control	The City reserves the right to require any customer to install, as a condition of water service, a pressure reducing valve, reduced pressure backflow prevention assembly, pressure relief valve or similar assemblies at any location where the City determines a need to protect the municipal water system. Protective assemblies shall comply with requirements of DOH, the City's cross-connection control program and the City's design and construction standards. (Ordinance 5851 § 1, 2004; Ordinance 2789 § 1, 1974; 1957 code § 10.12.032) [13.12.070]
3.2.12	All Meters	All meters shall remain the property of the City and shall not be removed except by the City. In all cases where meters are lost, damaged or broken by carelessness, negligence, or willful actions of owners/operators of premises, they shall be replaced or repaired by or under the direction of the City. The actual cost of repairs or replacement of meters will be charged against the owners/operators. In case of nonpayment of fees, fines, charges, or penalties, the water shall be shut off and will not be turned on until all charges are paid. (Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.330]
3.2.13	Fire Hydrant Unlawful Use	It is unlawful for any person to obstruct the access to any fire hydrant by placing around or thereon any stone, brick, lumber, dirt, landscaping or other material, or to open or operate any fire hydrant, or draw or attempt to draw water there-from without a permit or to willfully or carelessly damage or deface the same. (Ord. 5851 § 1, 2004.) [13.12.035]
3.2.14	Hydrant Meter Permit Regulations	Any person, other than authorized City employees, requiring the use of water from any City hydrant shall obtain authorization in the form of a hydrant meter use permit. (Ord. 5849 § 1, 2004; Ord. 5216 § 1, 1999; Ord. 4878 § 3, 1996.) [13.06.415]

Table 3.1 Business Practices Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.2.15	Leak Adjustment	The City will allow adjustments of the water bill for water that leaked from the service line between the City water meter and the point where the line enters the building. Proof of repair must be provided. One leak adjustment is allowed per 12 month period per account. Index no. 100-52 (Leak Adjustment Policy)
3.2.16	Termination of water service for delinquent accounts	The City has established procedures for terminating water service to delinquent accounts for non-payment. Index no. 100-53 (Termination of Water Service Policy)

Table 3.2 Service Area Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.3.1	Retail Water Service Area	The City's water service area boundaries were initially defined through the South King County Coordinated Water Supply Plan dated 1989 and are in agreement with the Pierce County Coordinated Water System Plan from 2003. These plans define the City's water service area now referred to as the Retail Water Service Area (RWSA). The City will plan for and provide water service to all retail customers and wholesale customers with firm contracts. As supply permits, the City may provide water to wholesale customers without firm contracts unilaterally or as part of a capital improvement partnership agreement. Provision of water service should be consistent with the goals, objectives, and policies of the City of Auburn Water Comprehensive Plan.
3.3.2	Government Consistency	The City's Water Comprehensive Plan will be consistent with local, county, and state land use authorities.
3.3.3	Duty to Serve	The City will plan to provide water service to all customers within the City's RWSA. Revisions to the City's RWSA shall be made only by written agreement and in accordance with local, county and state regulations.

Table 3.2 Service Area Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.3.4	Conditions of Service	For areas outside the current City limits, but within the RWSA, the City shall condition service on agreement that development is in compliance with City water system standards. This conditioning of service ensures that the water systems do not require significant upgrade upon annexation, and that development is consistent with the City's Water Comprehensive Plan. New customers within the City's Potential Annexation Areas are asked to sign an Annexation Agreement before a Water Availability Certificate is issued. Prior to receiving water service, provision of water service both inside and outside the current City limits shall be conditioned on the developer/development providing infrastructure improvements identified by the City, in accordance with City's Policy and Criteria and Comprehensive Plan. In addition, the City requires that all residents of the City within the retail water service area will receive water services from the City, to the extent practical. The City will work with existing water purveyors within the City limits and within the City's Potential Annexation Areas in order to provide fair and equitable water service.
3.3.5	Water Service by Others	In order to provide the same level of service to all City citizens, the City shall require that water service provided by others within Auburn's City limits be provided to the same level of service and to the same policy and criteria as defined in the City's Water Comprehensive Plan. The City shall work with the designated water provider to assure that water-system facilities are designed and installed according to the policies and criteria.

Table 3.2 Service Area Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.3.6	Satellite Systems	The City may consider, on a case by case basis, assisting water providers with water service.
		The City shall not assume ownership of any satellite water system unless it meets current City standards. The responsibility and all costs to bring a satellite system up to City standards shall be the system owner(s).
		The City shall strongly discourage the development of new satellite systems within the City's RWSA. All satellite systems within the City's RWSA shall comply with all the City's applicable regulations. The decision to allow satellite systems to provide service within the City RWSA shall remain solely with the City.
3.3.7	Agency Coordination	The City should coordinate closely with adjacent jurisdictions to determine applicable regulatory requirements, growth projections, and opportunities for joint projects. Agreements should be prepared between the pertinent parties on all joint projects.
		The City shall protect the municipal water supply from adverse impacts resulting from the activities of adjacent purveyors.
3.3.8	Water Supply Management and Planning	The City should work with other water providers to promote effective water supply management and planning consistent with the "South King County Coordinated Water System Plan," as well as regional water supply and conservation goals. [CF-21, (Page 5-6)]

Table 3.2 Service Area Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.3.9	Concurrency of Improvements for Service	Provision of water service in the City's RWSA and extension of the water system shall be conditioned on water supplied – concurrently with development, redevelopment, and/or change in occupancy or use – as required in accordance with the criteria of this Water Comprehensive Plan. While the City should plan for the provision of water service to all customers within the RWSA, water service meeting the criteria discussed herein may lag growth. Water service, including supply, shall be deemed concurrent if all those facilities necessary for meeting the criteria discussed herein, including water right certificate(s) or permit(s) issued by Ecology, are available and adequate to serve the development at the time the development is available for occupancy and use without decreasing service levels below the standards and criteria established herein. If the necessary water-system facilities do not exist or are not under construction, contract, and/or binding development agreement, or if such facilities will not be completed before occupancy and use of the development, then the property developer shall provide the aforementioned required water-system facilities, including water right permit(s), certificate(s), and/or supply facilities prior to the provision of water service by the City. The City will encourage development where new public facilities can be provided in an efficient manner. [CFP Policy 1.3, (Page 11)]

Table 3.3 Existing Business Practices in Operation and Maintenance Programs
Comprehensive Water Plan
City of Auburn

Program	Activity
Valve inspection program	Inspect 25% of all valves each year (goal).
Hydrant inspection program	Inspect 50% of all hydrants each year (goal).
Large meter testing program	Test all meters 3-inch and greater every year to ensure accurate measurement and billing (actual).
PRV inspection and repair program	Inspect and repair all PRVs every year (actual).
PRV and control valve re-build program	Rebuild PRV and pump control valves every 2-3 years (actual).
Reservoir inspection and cleaning program	Inspect and clean reservoirs every 1-5 years depending on quality of water sources (actual).
Leak detection program	Perform leak detection analysis on 25% of the system each year (actual).
Dead-end main flushing program	Flush all dead-end mains each year (goal).
System-wide unidirectional flushing program	Flush 20% of the distribution system each year (goal).

Table 3.3 Operations and Maintenance Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.4.1	System Operation	The primary operations of the water system are carried out through the use of computerized control system in the Water Control Center located at the Maintenance and Operations Building. Status reports on each supply and pump station and the levels of each reservoir are continuously received via telemetry. Reservoir levels are used to determine which water supplies need to be placed in service and which booster pumps need to be operated. Regular system operating activities include preparation and submittal of the Monthly Operating Report required by DOH, that includes data on system operation and water quality.
3.4.2	Regular Inspection of Facilities	Water facilities such as wells, springs, and booster pump stations are regularly inspected. Facility status is verified, and routine maintenance is performed.
3.4.3	Meter Reading	Water service meters of single-family residential and school customers are read every two months. All other meters are read on a regular basis.

Table 3.3 Operations and Maintenance Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.4.4	Customer Service	The City is committed to resolving customer complaints. All complaints are recorded and forwarded to the appropriate staff member for resolution.
3.4.5	Pressure Reducing Valve Program	The City will continue its regular program to adjust all pressure reducing valves to the proper settings to maximize system operating efficiency.
3.4.6	Employee Certification	The City will pay annual certification, provide time and tuition for certification training courses, and provide time-off for certification exams. In addition, the City will provide its staff opportunities for obtaining the continuing education required to maintain certification. Professional growth requirements for certification are met through continuing education units (CEUs) as monitored and maintained by the Washington Environmental Training Resources Center (WETRC) at Green River Community College.
3.4.7	Continuing Education	The City supports continuing educational opportunities that may include seminars, conferences, and college coursework.

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.1	Source Meters	All sources will be metered to measure the amount of water produced. Meters will be calibrated every year in order to ensure an accurate accounting of water produced.
3.5.2	Water Use from Fire Hydrants	All hydrant water sales shall be metered and require a hydrant meter use permit that authorizes the use of hydrants.

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.3	Fiscal Stewardship	The City should manage the water utility funds and resources in a professional manner in compliance with applicable laws, regulations, and City financial policies. Responsible fiscal stewardship requires ongoing monitoring of revenues and expenses in order to make prudent business decisions and report to City officials, as needed, regarding the status of utility operations. There is created, in the treasury of the City, a fund to be known and designated as the “water fund.” All moneys due the City for water service of any kind or as penalties for violation of the provisions of this chapter or of any other ordinance of the City relating to the municipally owned water system of the City shall be paid to the finance director, who shall ensure receipt and deposit into the water fund. The water fund shall not be commingled with any other fund or funds of the City and shall be disbursed only upon checks drawn by the order of the City Council against the fund. (Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.030 Water fund] The City Council shall establish rates and charges to be paid by a customer receiving water service from the water utility of the City. The total cost of fees and charges shall be charged to and paid by the owner of the premises receiving the water service. The City reserves the right to temporarily discontinue the service at any time without notice to the customer. As a condition of service, the owner/operator is subject to all provisions of this chapter and of any ordinance of the City relating to the subject, hereafter passed. The City shall not be held responsible for any damage by water or other cause resulting from defective plumbing or appliances on the premises supplied with water, installed by the owner/operator of the premises. The fact that the agents of the City inspected the plumbing and appliances shall not be pleaded as a basis of recovery in case of damage to premises from defective plumbing or appliances installed by the owner/operator of such premises. In case the supply of water is interrupted or fails by reason of accident or any other cause whatsoever, the City shall not be liable for damages for such interruption or failure, nor shall such failures or interruptions for any reasonable period of time be held to constitute a breach of this chapter on the part of the City or in any way relieve the customer from performing the obligations of this chapter. A copy of this chapter may be obtained by all owners of property and customers of the water utility, and shall be considered a part of the conditions of service. (Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.065 Water service – Generally]

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.4	Self-Sufficient Funding	The City maintains the water utility fund as a self-supporting enterprise fund. Water utility revenues come primarily from customer charges and are dependent upon established rates. The Revised Code of Washington requires that utility funds be used only for stated utility purposes. Although General Fund revenues can be used to fund water utility programs, the City has a general policy of not doing so. The City budgeting process should include a balanced and controlled annual water utility budget. This requires careful preparation of expense and revenue projections that may be reviewed by City management, the general public, and the City Council before approval of any rate increases.
3.5.5	Capital Improvement Program Level	Funding for the Capital Improvement Program (CIP) identified in the budget should be maintained at a level sufficient to assure system integrity. To the extent that the annual level of the CIP investment can be managed by scheduling and scoping of projects, the funding should be provided at a fairly uniform level in order to avoid significant fluctuations and to reduce the impact on the operating budget and related rate increases. The City should maintain reasonable level of reserves in the CIP fund in order to manage cash flow variation caused by the nature of the cost and timing of projects. Utility sold revenue bonds, Utility Local Improvement Districts (ULID), State Public Works Trust Fund loans, any available grants, system developer charges and developer contributions should be considered for funding the future CIP projects.

**Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn**

Section	Policy Name	Policy Statements
3.5.6	Development Charges	Both existing and future development will pay for the costs of needed capital improvements. Ensure that existing development pays for capital improvements that reduce or eliminate existing deficiencies, and pays for some or all of the cost to replace obsolete or worn out facilities. Existing development may also pay a portion of the cost of capital improvements needed by future development. Payments may take the form of user fees, charges for services, special assessments and taxes. Ensure that future development pays a proportionate share of the cost of new facilities that it requires. Future development may also pay a portion of the cost to replace obsolete or worn-out facilities. Payments may take the form of voluntary contributions for the benefit of any public facility, impact fees, mitigation payments, capacity fees, dedications of land, provision of public facilities, and future payments of user fees, charges for services, special assessments and taxes. [CFP Policy 2.5, (Page 12)] A water utility systems development charge is imposed upon all lands inside the boundary of the City and all lands outside the boundary of the City, which utilize water facilities. The utility systems development charge as set forth in the City fee schedule will be computed to consider the future and/or current value of the utility system's fixed assets, excluding contributions by developers, and outstanding bonded indebtedness, and will also consider an appropriate service unit. The utility systems development charge shall be reviewed annually by the City council and the charges may be revised to reflect changes in utility asset value, depreciation of the utility system fixed assets, bonded indebtedness, the number of ERU, RCE or ESU customers served. (Ordinance 5819 § 4, 2004; Ordinance 5801 § 1, 2003; Ordinance 5709 § 1, 2002; Ordinance 5619 § 2, 2001; Ordinance 5125 § 2, 1998; Ordinance 4830 § 1, 1996; Ordinance 4479 § 2, 1990; Ordinance 3510 § 1, 1980; Ordinance 6341§ 1; Ordinance 6391§ 1) [13.41.030 Utility systems development charge imposed – Rates – Review]

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.7	Capital Facilities Plan	The City shall continue to fund utility costs through utility enterprise funds, based on user fees and grants. Public facilities that are utilities are sewer, solid waste, storm drainage, and water. Where feasible pursue joint venture facility construction, construction timing, and other facility coordination measures for City provided facilities, as well as with school districts and other potential partners in developing public facilities. The City shall continue to assist through direct participation, SDC credits, LIDs and payback agreements, where appropriate and financially feasible. Where funding is available, the City may participate in developer initiated facility extensions or improvements, but only to the extent that the improvements benefit the broader public interest, and are consistent with the policies of the Capital Facilities Plan. [CFP Policy 2.3, (Page 11)] Ensure that the ongoing operating and maintenance costs of a capital facility are financially feasible prior to constructing the facility. [CFP Policy 2.7, (Page 13)]
3.5.8	Capital Budget	Enterprise fund working capital in excess of that needed for operations may be used for capital needs in order to conserve the debt capacity of those funds for major facility expansions to meet future needs. [BBP Policies – 6, (Page 41)]

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.9	Development Charge Cost Recovery	The City shall continue to recognize the overall system impacts of new development upon the City water system through the collection and appropriate use of system development charges or similar fees. [CF-18, (Page 5-6)] The City should establish fees and charges to recover City costs related to development. In general, water utility costs related to development should be recovered through a system of fees and charges. Fees shall be established by City Ordinance for routine services such as meter installation. In situations where new development or extension of services is complicated or lengthy, permit applicants should be charged for direct administrative costs and associated staff time. These rates should be reviewed periodically to ensure that the cost methodology is appropriate. System development charges shall be charged to all new development properties to reimburse the water utility for historical asset investments that provided overall benefits to the service area. These fees should be reviewed regularly and adjusted as needed. All new connections to the water system shall be charged a service installation fee to recover the costs of connecting to the water line and setting a service meter. In addition, when another developer or the City has at its own expense constructed new water mains, new customers connecting to that portion of the water main shall pay a latecomer fee or charge in lieu of assessment. The City may enter into a payback agreement with the party constructing the improvement to recover appropriate costs from the new customers when they connect to the system. After the City and a developer execute a latecomer agreement, the City shall collect the amount due and forward the appropriate payment to the party constructing the improvement. Latecomer agreements may have a term of up to 20 years. The water utility also may collect an overhead amount on this charge to pay for processing the agreement and payments, which should be reviewed regularly and adjusted as needed. (Water Plan)
3.5.10	Payback Agreement	The City engineer is authorized and directed to execute payback agreements at the request of the developer upon City Council approval. All payback agreements shall be executed pursuant to ACC 13.40.060. (Ordinance 5850 § 1, 2004; Ordinance 5212 § 1 (Exhibit H), 1999; Ordinance 4760 § 1, 1995; 1957 code § 10.10.070) [13.08.070]

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.11	Water Rate Levels	Water rates should be set at a level sufficient to cover expenses and maintain reserves. Water rates should be set as low as possible and still provide for the on-going operations, maintenance, repair, replacement, capital improvements, and general business of the water utility. The City's budget process should be used as an opportunity to increase or reduce current service levels. The final budget should include the total authorized expenses and establish the amount of revenue required for balancing the expenses.
3.5.12	Water Rate Structure	The water-rate structure should be set by customer class based on costs to serve each customer class. The water-rate structure shall support water conservation and wise use of water resources objectives as required by State law.
3.5.13	Water Rate Equity	The water-rate structure should fairly allocate costs between the different customer classes. Rates should be established on a "Cost of Service" basis so that each customer class pays its prorated share of the total costs needed to operate and maintain the water utility. All projected future costs should be allocated to each customer class by using established criteria that reflect the benefit that each customer class receives from the service. For example, the cost of producing water should be allocated to customer classes as determined by the volumes used. Fixed costs, such as for meter reading and billing, should be allocated to each meter based on the customer class. A Cost of Service and Rate Study should be performed periodically to ensure ongoing equity between customer classes.
3.5.14	Water Rate Uniformity	Water rates should be uniform for all water utility customers of the same class throughout the City.
3.5.15	Frequency of Water Rate Adjustments	Water rates should be evaluated regularly as part of the water utility budgeting process to ensure that budgeted expenses, including the impact of increasing water-supply regulations, are reflected in current rates.
3.5.16	Financial Reserve Levels	The City shall maintain water utility cash balances to serve as a contingency reserve fund. The fund should maintain a balance of $1,000,000 to cover working capital needs and emergency contingencies and cash flow fluctuations. Base the financing plan for public facilities shall be based on realistic estimates of current local revenues and external revenues that are reasonably anticipated to be received by the City. [Policy 2.2, (Page 11)]

Table 3.4 Financial Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.5.17	Charges for Services Outside the City Limits	The City may include a rate adjustment for water service outside the City limits.
3.5.18	Low-Income Assistance Program	The Utility Rate Exemption Program currently provides water rate assistance for specific low-income senior citizens or for specific low-income totally or permanently disabled citizens. The City should administer the rate discount program on the monthly water base charges for senior citizens over 62 years old and with incomes below certain levels as defined in Ordinances No. 4256 and 4879.

Table 3.5 Planning Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.6.1	Connections for Existing Wells	Owners of lands with existing wells will conform to the following: • The owner of lands located in the City who makes application for a short plat or preliminary plat that requires water service from the City shall extend, at the owner's cost, the municipal water system to serve the development, provided the City permits such extension. • The owner of lands located in the City and within 200 feet of a municipal water line, undertaking new nonresidential construction, shall connect to the municipal water system when the City permits such construction, and shall extend, at the owner's cost, the municipal water system to serve the development. • The owner of lands located in the City on which a private well or wells are located, and who applies to connect to a municipal water system, shall work with the City to seek authorization from the Washington State Department of Ecology (Ecology) to transfer any water rights associated with the well or wells from the owner to the water service provider, or to the City if the provider does not accept the water rights. The owner of permitted water rights may seek compensation from the transferee under mutually agreed upon terms. Any such compensation paid by the City shall be based upon the value of the water, as determined by the City, made available to the City under such a transfer. Regardless of whether Ecology allows such a transfer of water rights, the well or wells shall be decommissioned in accordance with Ecology’s requirements prior to connection to a municipal water system. • The owner of lands located within Auburn's water service area that apply to connect to the Auburn water system shall sign a service agreement prohibiting the installation of an irrigation well or wells on their lands for which service is provided. The applicability of this policy to lands designated as proposed special planning areas shall be reviewed by the City engineer on a case-by-case basis. (Ordinance 5974 § 1, 2006) [13.06.150]

Table 3.5 Planning Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.6.2	Service Extension	Water system service extension will be considered, provided the area to be served is within the City's existing retail water service area and the extension of service is consistent with adopted annexation policies. Service extension by the City may be considered under such conditions only if the City's costs are recovered, and sufficient financial and staffing resources are available. The property owners shall be responsible for an equitable share of extension costs at the time of connection to the system. The City will cooperate with DOH, King County and Pierce County regarding feasibility studies of extending service to existing small systems as they might occur within the City's retail water service area. Water system extensions shall be designed and constructed according to current City codes and standards. Service extensions to existing systems not meeting City water system standards shall be upgraded, at property owner expense, to meet City standards before service is provided. The City may consider the use of master meters for small systems with functioning distribution systems which wish to remain privately owned and operated. The City shall continue it's policy of requiring that water system extensions needed to serve new development shall be built prior to or simultaneously with such development, according to the size and configuration identified by the Comprehensive Water Plan as necessary to serve future planned development. The location and design of these facilities shall give full consideration to the ease of operation and maintenance of these facilities by the City. The City may continue to participate to the extent permitted by law, through SDC credits, Local Improvement District (LIDs) and payback agreements to assist in the financing of such improvements. Wherever any form of City finance is involved in a water line extension, lines that promote a compact development pattern will be favored over lines traversing large undeveloped areas where future development plans are uncertain. [CF-16, (Page 5-6)] All persons or LIDs desiring to extend City water mains in the City must extend the same under the supervision of the City engineer. All extensions shall extend to and across the full width of the property served with water. No property shall be served with City water unless the water main is extended to the extreme boundary limit of the property line extending the full length of the front footage of the property. (Ordinance 5850 § 1, 2004; Ordinance 5212 § 1 (Exhibit. H), 1999; 1957 code § 10.10.020) [13.08.020] All properties shall be metered. Master meters will be evaluated and determined on a case-by-case basis.

Table 3.5 Planning Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.6.3	Facility Extension Agreement	The City engineer is delegated and authorized to develop, implement, execute, and administer facility extension agreements with developers for water within the applicable service areas. The City engineer shall provide an application form for the facility extension agreement to be filled out by each applicant. (Ordinance 5995 § 1, 2006; Ordinance 5791 § 4, 2003; Ordinance 3375 § 3(A), 1979) [13.40.020]
3.6.4	System-Wide Reliability	The City shall invest the resources necessary to construct, maintain, and renew water-system infrastructure and equipment to ensure that customers are provided consistent, reliable service in accordance with WAC 246-290-420 Reliability and Emergency Response. Wherever possible, the City should anticipate system interruptions and design and operate the system to minimize the impact of such interruptions to customers. The City shall establish reliability criteria for water-system components as an element of its water-system criteria.
3.6.5	Emergency Preparedness	The City shall update, as needed, a citywide Emergency Response Plan that will include the water system operations. The water system portion of the plan should ensure that adequate provisions are in place to provide for an organized response to the most likely kinds of emergencies that might endanger the health and safety of the general public or the operation of the municipal water system. The Emergency Response Plan shall comply with applicable RCW and WAC requirements.
3.6.6	Fire System Responsibility	The City should provide and maintain water-system infrastructure to deliver adequate water for fire protection to retail customers served by the multi-source municipal water system. The multi-source water system, including water mains, storage facilities, hydrants, booster-pump stations, and related facilities, shall be designed to meet all applicable codes at the time of construction. The City should maintain, repair, or replace mains, lines, hydrants, and valves as necessary to keep the facilities in good working order.
3.6.7	Emergency Interties	The City should support emergency interties with adjacent water systems where there is a benefit to both water systems. Interties increase reliability of the City-wide water system during emergencies and other unusual operating circumstances.
3.6.8	Water Supply Interties	The City should consider water-supply interties on a case-by-case basis. Water supply interties should provide benefits to both water service providers and should not compromise the City's ability to serve its existing customers or its future water supply needs.

Table 3.5 Planning Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.6.9	Water Supply Planning	The City's objective is to assure a continuous, safe water supply to meet firm customer demands. The City will plan for and provide water service to all firm customers. Firm customers are those retail customers within the RWSA and wholesale customers to whom the City is obligated to provide an uninterruptible supply of water. As supply permits, the City may provide water to non-firm customers unilaterally or as part of a capital improvement partnership agreement. Provision of water service must be consistent with the goals, objectives, and policies of the City of Auburn Comprehensive Water Plan. Effects of past water conservation will be considered when projecting future water needs. Future water demands will be estimated using existing water usage patterns and projected future populations developed by the City Community Development and Public Works Department and consistent with the Puget Sound Regional Council data. The City will plan for and provide water service to all firm customers.
3.6.10	Oversizing	The size of the water main to serve developing property shall be determined by the City engineer taking into consideration the Comprehensive Plan, the length of line, potential land use and fire flow requirements. When it is deemed necessary by the City to install major transmission lines larger than are required to serve adjacent properties, the City may enter into an agreement to compensate the developer for the difference in cost of the oversizing. (Ordinance 5850 § 1, 2004; Ordinance 5212 § 1 (Exhibit H), 1999; 1957 code § 10.10.040) [13.08.040]
3.6.11	Service Pressure and Flow	The City should provide potable water to customers in sufficient quantity to meet maximum day demands at a pressure that meets or exceeds all minimum applicable regulations, except during emergency conditions. Property owners may install private booster pumps to achieve higher pressures under supervision of the City and in accordance with WAC 246-290-230 Distribution Systems.
3.6.12	Water for Irrigation	Irrigation water, for use by non-single-family residential customers, shall be provided through an irrigation meter installed in accordance with the City of Auburn design and construction standards. Irrigation water shall be billed at the irrigation only rate identified in City code. Deduct meters, as defined in City code, shall not be used to supply water for irrigation. (Ordinance 5849 § 1, 2004) [13.06.230]

Table 3.5 Planning Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.6.13	Water Meters	A water meter shall be placed on every service to measure the quantity of water used by a customer. (Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.320]
3.6.14	Capital Facilities Plan	The City is required by the Washington State Growth Management Act to adopt a Capital Facilities Plan. The plan should include capital projects for the water utility for a six-year period of time. Projects should be financially constrained and broken-down into capacity and non-capacity projects. (Water Plan) The City will develop a multi-year plan for capital improvements as required by the Growth Management Act of Washington State. The Capital Facilities Plan will be updated annually and be financially constrained for the appropriated budget period. [Biennial Budget, Budget policies] The City will establish level of service standards that are achievable with the financing plan of the Capital Facilities Plan. [CFP Policy 2.1, (Page 11)] The City will match revenue sources to capital projects based on sound fiscal policies.

Table 3.6 Environmental Stewardship Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.7.1	Conservation Promotion	The City shall promote water conservation and the wise use of water resources. [CF-20, (Page 5-6)]
3.7.2	Demand Management and Water Shortage Response	In the event of a water-supply shortage caused by a drought or supply interruption, the City shall take reasonable actions to ensure that the essential needs of its customers are met and that available supplies are equitably distributed to all affected retail customers. The water utility criterion for demand management requires that the water system is capable of delivering two days of MDD, after which the Demand Management Notification Program will reduce water demands to Average Daily Demand (ADD) levels. Water service to wholesale customers shall be maintained in accordance with the terms and conditions of the applicable wholesale contractual agreement. The following procedures shall apply during the various stages of water emergencies as set forth in this section: • Stage I – Anticipated Water Shortage – Internal Preparations. The public works department shall conduct public education efforts regarding the benefits and necessity of conservation by the public. The public works department initiates coordination with other utilities for delivery of emergency water supply through emergency interties. • Stage II – Serious Water Shortage – Voluntary Conservation. The public works department shall conduct an intensified public information campaign and shall coordinate the campaign to encourage voluntary water conservation through news releases and other methods of providing information about conservation methods. The public works department evaluates the need to accept delivery of emergency water supply through emergency interties.

Table 3.6 Environmental Stewardship Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
		• Stage III – Critical Water Shortage – Limited Outdoor Restrictions. The mayor may declare a Stage III water emergency when a water shortage exists such that water supplies are critically impacted and water demand must be reduced. The mayor is authorized to establish certain specified days or hours for irrigating, sprinkling or watering lawns and gardens, and may prohibit or regulate other nonessential uses of water within the water system during such times as there is an actual or impending water shortage, extreme pressure loss in the distribution system, or for any other reasonable cause. • Stage IV – Emergency Water Shortage – Mandatory Outdoor Restrictions and Indoor Conservation. The mayor may declare a Stage IV water emergency when a water shortage exists such that maximum flow reduction is immediately required, water available to the City is insufficient to permit any irrigation, watering, or sprinkling, and all available water is needed solely for human consumption, sanitation, and fire protection. • Stage V – Regional Disaster – Water Rationing. Water shortage exists such that water rationing must be implemented and emergency water distribution may be necessary for customers without water. [13.14.030] It is in the public interest to promote the conservation of the city's water supply in order to protect the health, welfare, and safety of water users. To accomplish this declared purpose, the City reserves the right to exercise its powers through emergency measures. Penalties for violations of this power are addressed in the City Code. [13.14.060]
3.7.3	Natural Resources	Promote conservation of energy, water, and other natural resources in the location and design of public facilities. [CFP Policy 3.1, (Page 13)]

Table 3.6 Environmental Stewardship Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.7.4	Water Quality Responsibility	The City shall provide water to all water-system customers that meet all state and federal water quality standards. The City shall take the actions necessary to ensure that all water quality standards are met to the point of delivery (meter). The customer is responsible for maintaining water quality from the meter to the actual point of use. The City shall seek to ensure adequate and healthful supplies of domestic water by protecting groundwater from degradation, by providing for surface water infiltration, by minimizing or prohibiting unnecessary withdrawals of groundwater and by preventing unintended groundwater discharges caused by disturbance of water-bearing geological formations. [EN-1, (Page 9-2)] The City's surface water, groundwater, sanitary, and storm drainage systems shall be protected from contamination by hazardous materials or other contaminants. [EN-84, (Page 9-16)]
3.7.5	Water Resource Protection	The City shall maintain a Water Resource Protection Program to protect the City's groundwater supplies from degradation. The City should develop programs and implement procedures to protect water quality, habitat, and other environmental values in areas where the City must construct, operate, maintain, or replace water-system infrastructure. Special consideration shall be given to threatened or endangered species identified under the provisions of the National Endangered Species Act. The programs and procedures developed should include consideration of best management practices and adaptive management concepts.
3.7.6	Sustainable Development	The City strives to be a sustainable community: meeting the needs of the present while preserving the ability of future generations to meet their own needs.

Table 3.6 Environmental Stewardship Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.7.7	Coal Creek Springs Protection	The City shall protect Coal Creek Springs by: • Limiting densities to no more than one residential unit per four acres within the area tributary to the Coal Creek Springs Watershed. • Designating a Special Planning Area for the Mt. Rainier vista site. [Comprehensive Plan LU-9, (Page 3-11)] Protection of the City’s Coal Creek Springs and West Hill Spring watersheds, wells, and other sources shall be a high priority in the designation of appropriate land uses in the vicinity of these areas and facilities. [CF-15, (Page 5-5)]
3.7.8	Aquifer Recharge Area	The City shall consider the impacts of new development within aquifer recharge areas of potable water sources as part of its environmental review process and require any appropriate mitigation measures. Such mitigation may require hydrogeologic studies, testing, and/or monitoring (including monitoring wells), spill response planning, spill containment devices, sanitary sewers, and use of best management practices. [CF-19, (Page 5-6)]
3.7.9	Mining Impacts	The City shall consider impacts of mining on groundwater and surface water quality as well as possible changes in hydrology as a result of the mining during the environmental review process and require appropriate mitigating measures to prevent water quality degradation. [EN-50, (Page 9-11)]
3.7.10	Water Use Efficiency Goals	The City will continue implementation of its existing Water Use Efficiency Program. The City will target a 1 percent reduction in equivalent residential unit value for each year until reaching a planning ERU value of 172 gpd/ERU. The City shall consider financial incentives as a tool which may be used to achieve demand reduction. A goal of the City is to reduce peaking factors that occur during the high usage periods to maximize existing water supply sources. The City will reevaluate the program with each Comprehensive Water Plan update. The City’s goal shall be in compliance and consistent with all applicable local, state, and federal laws and regulations within the RWSA.
3.7.11	Non-Revenue Water	The City will strive to maintain levels of water leakage for its distribution system at less than 10 percent.

Table 3.6 Environmental Stewardship Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.7.12	Leak Detection	The City is committed to a tight, non-leaking water distribution system. Each year the City will check approximately one-quarter of the water distribution system for leakage.
3.7.13	Reclaimed Water	The City is committed to wastewater reuse and rainwater reclamation. These can serve as cost-effective and environmentally beneficial sources of water thereby increasing the security and reliability of the drinking water supply. The City will explore opportunities and evaluate options on a case-by-case basis.
3.7.14	Aquifer Storage and Recovery	The City shall consider the use of aquifer storage and recovery (ASR) as a conservation and demand management tool to make best use of City water resources.

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.1	Service Ownership / Responsibility	The City shall own and maintain the service line between the main and the meter, the meter and setter, and the meter box. The property owner shall own and maintain the service line and other facilities such as pressure-reducing valves, pumps, or cross-connection assemblies beyond the meter. For unmetered connections (fire sprinklers), City ownership ceases at the fitting on the water line. Where on-site fire hydrants are required, the City shall own the mains and hydrants. Easements shall be provided for the mains and hydrants. The City shall be responsible for the maintenance and operation of the public water system within public rights-of-way and easements up to and including water service meters. The responsibility for the maintenance and operation of the non-public water supply system within private property shall be with the property owner. (Ordinance 5849 § 1, 2004) [13.06.027 Water system responsibility]

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.2	Source of Supply	Source of Supply reliability is critical to providing an uninterrupted level of service to City utility customers. Malfunction of any of several supply components could cause a temporary limitation of the supply capacity. The following is a list of possible malfunctions and the time necessary to correct them: • Well pump failure - 1 week • Submersible well pump failure - 3 weeks • Loss of power - 4 hours • Source failure - 6 months • SCADA or communication failure - 8 hours The City should provide sufficient water to meet maximum day demands. Since any of the City's supply facilities (a single well or spring supply) might fail as a result of a rare or catastrophic emergency event, it is the City's goal to have sufficient system-wide supply facilities (including both permanent and emergency interties) to meet the MDD with the largest active water supply source out of service. Since power continuity is a concern, auxiliary power, such as an installed or portable generator of sufficient capacity to power the well or spring pumps should be provided.

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.3	Pump Stations	For important pumps and other mechanical equipment that might be occasionally out-of- service for repair or maintenance, the City's goal is to have sufficient capacity to allow full service with any single component out-of-service. For pump stations, this usually means installing pumping capacity larger than required to meet demand. In other cases, it means having spare units that can be readily installed if a component fails. The following is a list of possible malfunctions for pump stations and the time necessary to correct them: • Pump or motor failure - 1 week • Electrical equipment failure - 1 week • Control Valve failure - 2 days • Loss of power - 4 hours • SCADA or communication failure - 8 hours A minimum of two pumps or a complete spare pump will be provided for each distribution system pump station to provide flexibility and system redundancy. Where multiple pumps are provided, the pumps will be sized so that the station can meet MDD flow conditions with the largest pump out-of-service. If the area is not served by gravity by a reservoir, booster pumps (along with any supply available) will be sized to provide peak hour demand and fire demand for the service area should the largest pump be out-of- service. Since power continuity is a concern, auxiliary power, such as an installed or portable generator of sufficient capacity to power the station with the any single pump out of service should be provided.

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.4	Storage Reservoirs	Reservoir redundancy is not a criterion of the City. The reliability of City storage reservoirs is affected by a limited number of components. Possible malfunctions and the time necessary to correct them and return the storage reservoir to service include: • Reservoir inlet or outlet out-of-service - 2 days • Reservoir contamination - 1 week However, where an area is served by a single reservoir, supply capacity (source and pumping) shall be sufficient to meet peak hour demand and fire demand during the duration that the reservoir is out-of-service.
3.8.5	Distribution System	It is important to have a distribution network that allows water to be re-routed to affected customers if there is a pipeline failure. Therefore, providing system looping and redundant pipeline connections are important distribution system features. Providing multiple connections between service zones at various locations is particularly important. Possible malfunctions and the time necessary to correct such malfunctions include: • Pipeline break - 1 day • Control or Pressure Reducing Valve failure - 2 days • Valve failure - 2 days
3.8.6	Fire Protection Services	Services for fire protection are required to be installed with the proper backflow assemblies. It shall be mandatory for the installation to be made with an approved water flow alarm, as approved by the City and the chief of the Fire Authority, or their delegate, on each such service installation. **[13.06.270]**

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.7	Fire Flow Requirements	The City has established two distinct and independent parts to the municipal water-system fire flow requirements within the City Retail Water Service Area. The first is a fire flow requirement established by the Fire Authority as a building-specific fire flow based on building use and materials of construction. The second is a multi-source municipal water system level of service criterion. The City shall require that both parts of the fire flow requirements be met as a condition of development and as a condition of any extension of the City water system. New development, redevelopment, or change in use or occupancy (as defined by Auburn City Code) shall meet the full fire flow requirements as established by this policy. Change of occupancy is not intended to include change of tenants or proprietors. The developer shall be responsible for installing all necessary facilities needed to serve his property and for complying with the City's development, design, and construction standards in order to meet these requirements. Fire flow requirements for existing structures and uses or occupancies are those that were required at the time of construction, as determined by the Fire Authority and the City's water utility (since 1995). Such existing structures shall not be required to upgrade the municipal water-system infrastructure to meet current fire flow and development standards. Similarly, the City shall not be obligated to upgrade the existing water-system infrastructure to meet current fire-flow criteria and standards. The City should consider the benefit of improved fire flows when analyzing the need, design, and merits of municipal water-system improvements.
3.8.8	Fire-Flow Improvements	As resources become available, the City shall make municipal water-system improvements to meet the current fire flow criteria. Such system improvements may include replacing undersized water mains and pumping stations or correcting fire hydrant deficiencies of spacing and standardization where current standards are not met. When prioritizing and scheduling system improvements, the City capital facilities planning procedures should consider the severity of deficiencies. The City should seek opportunities to make improvements in conjunction with other City projects to achieve economic efficiency. There are some areas within the City RWSA that have fire hydrants on private water lines. This is no longer allowed. The City should work to eliminate these systems with other improvement projects.

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.9	Fire-Flow Quantity	The quantity of water available for firefighting establishes an important level of service for a water system. The City has established a fire flow criterion of: • 1,500 gpm for all single-family residential area of the City. • 2,500 gpm for all multifamily residential and all other non-residential land use areas, except parks and open spaces within the City. These criteria apply to all improvement projects within the water system, including those necessary to provide service to new customers or to serve modified property uses or occupancies by existing customers both inside and outside the City limits. The fire flow criteria described above are minimum requirements. Fire flows in excess of the above criteria may be required by the Fire Authority to provide fire protection for specific types of building construction and use. Where the Fire Authority determines higher fire flows are required, the higher flow will be the criterion used to determine the required system improvements. Fire flows are to be provided during MDD at the pressure requirements discussed in the paragraphs on Distribution System.
3.8.10	Fire-Flow Duration	The time or duration, for which a fire flow is to be provided, is based on the quantity of fire flow required: Required Fire Flow; Duration • 2,000 gpm or less: 2 hours • 2,001 to 3,000 gpm: 3 hours • 3,001 to 4,000 gpm: 4 hours • 4,001 to 5,000 gpm: 5 hours • 5,001 to 6,000 gpm: 6 hours • 6,001 to 7,000 gpm: 7 hours • 7,001 to 8,000 gpm: 8 hours

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.11	Source of Supply Requirements	The City will have sufficient water supply facilities and/or interties available to meet the MDD. The City will meet MDD with the largest active supply source out of service. MDD is calculated based on the peaking factor (historical ratio of MDD to ADD) multiplied by the ADD. The peaking factor is based historical data from the most recent planning period, accounting for data anomalies. Peak hour demand will be determined using the Washington State Department of Health design criteria.
3.8.12	Individual Service Area Water Supply Requirements	The City will provide sufficient water supply capacity to meet MDD for each of the four service areas (Valley service area, Academy service area, Lea Hill service area and the Lakeland Hills service area) and any sub systems within these service areas utilizing a combination of reliable sources, reliable pump stations and reservoirs in accordance with system reliability criteria.
3.8.13	Construction Standards	All projects shall comply with the “Standard Plans (M21-01), Specifications, and Standard Details for Road, Bridge, and Municipal Construction" prepared by the Washington State Department of Transportation, to define construction contract documents. Additionally, the City will comply with the most recent version of the King County and Pierce County Road Standards when performing work within the County road right-of-way. These technical or standard specifications shall be modified as necessary within the contract documents to meet the City’s requirements. The City will maintain services from City mains in streets and will have such access on private property as shall be necessary to maintain such services during the work, and shall, as soon as practicable, upon the completion of such work, reconnect the pipes in the street to the owner maintained service pipes. (Ordinance 5849 § 1, 2004; Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.120 Service pipes – Specifications – Maintenance]

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.14	Hydrants	Dead-end mains over 50 feet in length that supply hydrants shall be at least 8 inches in size.
		All hydrants newly installed in commercial, industrial, multifamily residential areas, and other similar areas shall be supplied by not less than 8-inch mains.
		All hydrants shall have at least a five-inch minimum valve opening, “O” ring stem seal, two 2-1/2-inch national standard thread hose nozzles, one steamer port per City Fire Authority specifications and a 6-inch mechanical joint shoe connection. In addition, all hydrants shall meet AWWA standards for public hydrants and shall be installed according to the specifications of the City Fire Authority and the City’s Design and Construction Standards.
		The maximum distance between fire hydrants in single-family use district zones shall be 600 feet, measured as the fire vehicle lays its hose.
		The maximum distance between fire hydrants in commercial, industrial, and apartment (including duplex) use district zones shall be 300 feet, measured as the fire vehicle lays its hose. [13.16.060]
		Lateral spacing of fire hydrants shall be approved by the Fire Authority and predicated on hydrants being located at street intersections. [13.16.060]
		The lead from the service main to the hydrant shall be no less than 6 inches in diameter. Any hydrant leads over 50 feet in length from water main to hydrant shall be no less than 8 inches in diameter. [13.16.060]
3.8.15	Dead-End Mains	Provisions shall be made wherever appropriate in any project for looping all dead-end or temporarily dead-end mains. Construction plans must be approved by the appropriate water authority prior to the commencement of construction. Where it is not feasible at the time of approval and installation to loop a water system, the loop requirement may be relaxed if the intent of the code is met and a stub is provided on the main for future expansion. (Ordinance 3064 § 1, 1976) [13.16.090]

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.16	System Pressure	The City of Auburn has established a criterion for minimum pressure within the water distribution system of 35 psi for all new facilities during MDD, including peak hour demand. This criterion exceeds the minimum pressure of 30 psi established in WAC 246-290-230 Distribution Systems. There is no upper pressure regulation in the WAC. The distribution system shall be capable of providing required fire flow under MDD conditions. During these conditions, a minimum pressure of 20 psi is allowed at any point within the distribution system when fire fighting storage and equalizing storage are depleted (WAC 246-290-230 Distribution Systems). The City requires individual pressure regulating valves (PRVs) on service lines where pressures exceed 80 psi; therefore, 80 psi is used as the target maximum pressure for water system design.
3.8.17	Elements of Required Storage	The City storage reservoir volume requirements are comprised of three separate categories: Equalizing Storage, Fire Fighting Storage, and Emergency Storage. In addition, reservoirs may include a "dead storage" volume that is not useful because of the water system configuration. Auburn will provide sufficient storage volume so that each storage component is provided separately, recognizing that a fire could occur during an emergency (supply or pump station out-of-service). As a result, nesting of storage (using the same storage for both emergency and fire fighting) is not acceptable and the City requires these volumes to be stacked. Evaluation of the required reservoir volume must be done by analyzing each reservoir independently to ensure that adequate storage is provided to meet the needs of customers within the reservoir service area. Storage within a zone of higher elevation can be used to meet the storage requirements of lower zones served by the reservoir.

Table 3.7 Design and Construction Policy Summary
Comprehensive Water Plan
City of Auburn

Section	Policy Name	Policy Statements
3.8.18	Reservoir Sizing	The following criteria will be used to size, evaluate, and plan Auburn storage requirements: • Equalizing Storage - Equalizing storage will be computed to be 25 percent of MDD within the service area. • Fire Fighting Storage - Fire fighting storage will be computed based on the size and duration of the largest known fire demand within each storage service area (The duration of fire demand is dependent on the size of the required fire flow, as described hereinafter). Emergency Storage - Emergency storage facilities will be computed for each service area. The City should provide either sufficient water to meet two days of the maximum day demands with the largest supply facility in each service area out of service or sufficient water to meet two days of maximum day demands using only reliable sources in each service area. The emergency storage volume will be calculated as the more conservative of the two criteria. Although a reservoir may be out-of-service, the frequency of such an event is rare. Consequently, the City does not have a redundancy requirement for storage if the peak-hour demand and fire demand for the reservoir service zone can be provided by supply or pumping.
3.8.19	Distribution System Materials and Configuration	Pipe velocities shall not exceed 8 feet per second in watermains. Distribution system piping shall be 8-inch minimum cement-mortar-lined ductile-iron pipe, Class 52. It is the intent to have the water distribution system looped to provide redundancy and reliability and to provide fire flow in two directions; however, in rare instances, looping may be impracticable. This criterion will often require off-site improvements to developing areas in order to achieve distribution looping. Water mains larger than 8-inch may be required for major distribution lines or where fire flows are larger than required for single-family residential zoning. Where the distribution system is divided into separate pressure zones, each zone should have multiple supplies (booster pumps or pressure-reducing stations), to reduce the likelihood that a single component failure interrupts service. Distribution valves are to be placed every 400 feet (maximum) and at the intersection of all lateral lines. Whenever a street is to be substantially reconstructed or a new street built, the City shall determine whether water facilities in that street right-of-way shall be constructed or brought up to the size and configuration indicated by the Water Comprehensive Plan. [CF-17, page 5-6]

CITY OF AUBURN

COMPREHENSIVE WATER PLAN

WATER REQUIREMENTS

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WATER REQUIREMENTS

Projecting realistic future water requirements, or demand, is necessary for planning infrastructure projects and securing adequate water supply to meet future growth. Future water demands are a key component of the water system analyses presented in this Plan and in the City's Capital Improvement Program (CIP). Accurate demand projections require a thorough review of historical water use, predicting where and how much growth will occur, and estimating the future water use for existing and new customers.

Historical data provides the City's unique water use over a long period of time, which captures the range of water use due to weather, economic conditions, conservation practices, and other factors. This Chapter presents an analysis of historical water use from 2008 to 2013 based on customer billing and production records. These data provide information on the City's different types of customers, as well as water use parameters on an average annual basis, seasonally, and for the maximum day. Historical water use patterns and parameters were established from these data to predict future water use for existing and new customers.

Demographic projections were used to predict where and how much will occur in the water system. The demographic projections are developed based on the City's comprehensive planning and regional policies adopted by the Puget Sound Regional Council (PSRC) Vision 2040 plan. These demographic projections were consistent with the PSRC projections and the Growth Management Act (GMA). Future customer accounts were developed based on existing customer accounts and the demographic growth rates of each Service Area. The resulting future accounts were converted to projected demands using the historical water use patterns and parameters.

Demand projections were generated for the planning period of 2015 to 2035 for the City's established Retail Water Service Area (RWSA). The projections were divided into three planning scenarios:

- Short-term (2016 - 2021).
- Medium-term (2022 - 2025).
- Long-term (2026 - 2035).

Dividing the planning period into three scenarios aids in the development and phasing of improvement projects and the CIP, as well as being consistent with DOH requirements.

Demand projections were expressed as Equivalent Residential Unit (ERU), average day demand (ADD), and maximum day demand (MDD). One ERU is defined as the average quantity of water beneficially used by one average, full-time, single-family residence per day. The quantity of water used by other customer classes, and by the whole system, can be expressed in terms of equivalent ERUs. The ADD is typically used in operational evaluations. It is calculated by dividing the total water produced by the number of days per year (2004, 2008, and 2012 were leap years and include 366 days per year). The MDD represents the single largest day water demand during the year and is a key parameter for infrastructure sizing.

Changes in water use, conservation activities, system growth, and other factors may result in higher or lower than projected water use. Planning for the potential changes allows the City to better manage potential risks from these changes. For example, lower than projected water use may be a concern for the City's financial planning, while higher than projected water use may be a concern for water supply planning. Therefore, three growth scenarios were developed: Low, Medium, and High demand scenarios. The low growth scenario represents future demand with conservation; the medium scenario was analogous with City's historical projections; the high scenario includes greater water use by new customers. Details on the historical water use, demographic projections, and demand calculations used to develop these projections are presented in this Chapter.

4.1 HISTORICAL WATER USE

Historical water use, or consumption, data were obtained from City records to characterize the demands of the City's customers. Annual water use data for the years 2008 to 2013 were used to develop historical demand patterns and parameters, which represent current and likely future water use. Two key demand parameters were generated from the data: typical water use per customer class, and typical water use per ERU. These parameters were used as the basis of future demand projections.

4.1.1 Historical Accounts

The City customers were divided into nine customer classifications, plus unmetered (non-revenue) water. The customer classes are:

- Single-family Residential/Duplex (SFR).
- Multifamily Residential (MFR).
- Commercial.
- Manufacturing / Industrial.
- Schools.
- City Accounts.
- Irrigation.
- Large Users.

- Wholesale.

The Large Users customer class was added in this Plan Update, which represent the City's largest industrial, commercial, and institutional customers, as well as large master metered residential areas. Large Users include the following customers: Boeing Company Fabrication Division, Muckleshoot Casino, Emerald Downs, Wal-mart – Supermall Way, Adventist Academy, Safeway Auburn Distribution Center, Auburn Dairy Products, Inc., MultiCare Auburn Medical Center, Auburn Manor (Mobile Home Park), Rio Verde Mobile Estates, White River Estates (Mobile Home Park), Forest Villa Manor (Mobile Home Park), Tall Cedars Mobile Home Community, and Leisure Manor (Mobile Home Park). These customers were the largest water users in their Service Areas, which warranted careful consideration. Therefore, individual demand projections were developed for each large user to provide additional accuracy in the demand projections, as well as the system analyses. Large users have multiple meters and accounts, potentially of different classes, and do not represent a City billing class; therefore, Large Users' historical accounts and water use have been subtracted from the appropriate customer class in all summarized tables, figures, and statistics.

In the past, the City does not differentiate between SFR customers and duplex customers. Where a duplex is served by a single meter due to historic policies, it is counted as one account. Where a duplex is served by two meters, it is counted as two accounts. The number of duplexes is small compared to the total number of single family customers and only a portion of those duplexes are served by a single meter. Therefore, the combination of SFR and duplex customers was considered reasonable for planning level analyses.

The number of accounts for each customer class is summarized in Table 4.1. As seen in the table, SFR makes up approximately 80 percent of accounts. The total number of accounts has increased by approximately 6 percent from 2008 to 2013. SFR, MFR, and Irrigation accounts increased during this period, while the number of other customer classes remained constant or declined slightly over the period.

4.1.2 Historical Consumption

4.1.2.1 <u>Historical Retail Consumption</u>

The City's historical annual water consumption was provided for each customer class based on City billing data, as presented in Table 4.2. The City uses the 75th percentile of historical water use parameters in the demand projection; therefore, this statistic was included along with the annual average in applicable tables in this Section. While accounts have increased over the period, consumption has actually decreased. Despite the increasing number of accounts (as seen in Table 4.1), the City's total water consumption declined during the period from 7.85 mgd in 2008 to 6.66 mgd in 2013. Declines have been seen in almost all of the customer classes, where the largest decreases have been in Wholesale, Commercial, and Schools.

Table 4.1 Historical Number of Connections by Customer Class
Comprehensive Water Plan
City of Auburn

Year	Single-family/ Duplex	Multi Family	Com-mercial	Mfg/ Industry	Schools	City Accounts	Irrigation	Large Users	Wholesale(1)	Total
2008	10,493	952	1,098	39	39	30	383	56	7	13,097
2009	10,535	976	1,083	38	37	27	363	56	8	13,123
2010	10,564	982	1,100	38	37	29	401	56	8	13,215
2011	10,704	982	1,095	38	37	28	434	56	7	13,381
2012	11,055	976	1,098	37	36	26	453	56	7	13,744
2013	11,224	980	1,098	37	36	26	446	56	7	13,910

Notes:

(1) Wholesale accounts are maintained with City of Algona, CWD, and KC WD #111.

Table 4.2 Historical Annual Water Consumption by Customer Classification
Comprehensive Water Plan
City of Auburn

Year	Single-family/ Duplex (mgd)	Multi Family (mgd)	Com-mercial (mgd)	Mfg/ Industry (mgd)	Schools (mgd)	City Accounts (mgd)	Irrigation (mgd)	Large Users (mgd)	Wholesale(1) (mgd)	Total (mgd)
2008	2.09	1.28	0.94	0.11	0.21	0.02	0.36	1.05	1.78	7.85
2009	2.12	1.26	0.96	0.14	0.14	0.02	0.39	1.01	1.85	7.98
2010	1.92	1.21	1.13	0.10	0.13	0.01	0.30	1.10	1.62	7.51
2011	1.92	1.25	0.71	0.20	0.04	0.01	0.29	0.92	1.16	6.52
2012	1.90	1.25	0.77	0.06	0.07	0.01	0.35	1.09	1.17	6.67
2013	1.95	1.20	0.76	0.04	0.07	0.01	0.34	1.13	1.15	6.66
Average	**1.98**	**1.24**	**0.88**	**0.11**	**0.11**	**0.02**	**0.34**	**1.05**	**1.45**	**7.20**
75th Percentile	**2.05**	**1.26**	**0.96**	**0.13**	**0.13**	**0.02**	**0.36**	**1.10**	**1.74**	**7.77**

Notes:

(1) Wholesale accounts are maintained with City of Algona, CWD, and KC KCWD #111.

The decline was likely caused by multiple factors, including the economic downturn from 2008 to 2010, continued conservation activities, and higher water use efficiency in new homes and offices. Total water consumption has remained relatively constant since 2011 and remains well below historic highs.

In addition to billing data, the City tracks some authorized unmetered water use, such as street sweeping and hydrant testing. Unmetered water use represents a small portion of the overall water use; an average of 0.03 mgd.

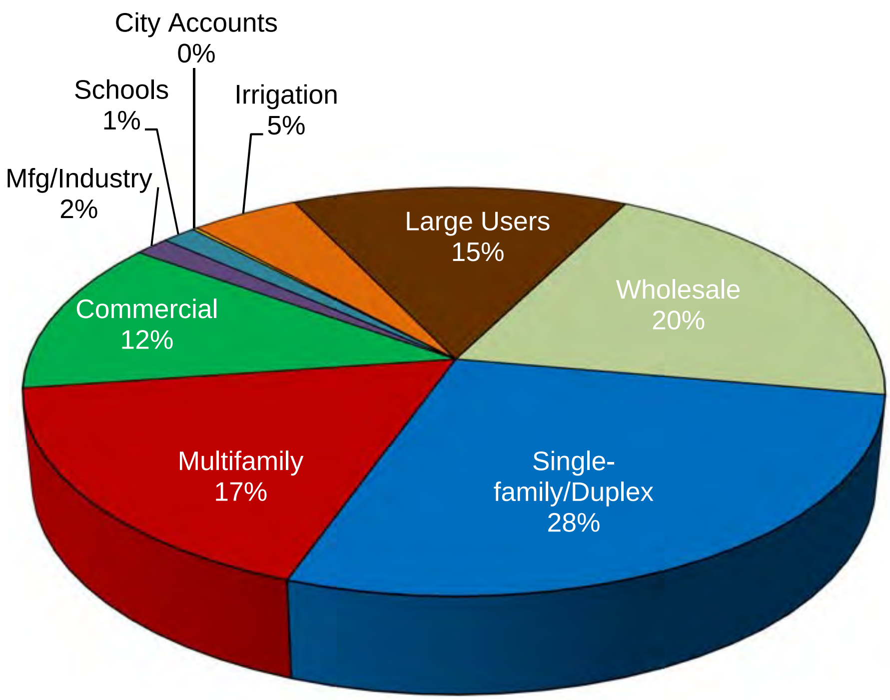
The average percentage of accounts and annual water consumption by customer class is presented in Figure 4.1. The top pie chart shows the average number of accounts for each customer class from 2008 to 2013. The bottom pie chart shows the average annual water consumption for each customer class over the same period. Comparing accounts and water consumption illustrates the differences in water use between the customer classes. This difference in proportional water use is quantified by comparing the historical water use per account for each customer class (in Table 4.3), as described in the section 4.1.3. As seen in the figure, SFR customers represent 80 percent of the accounts, yet only use 29 percent of the demand. Large Users represent less than one percent of accounts, but use 14 percent of the demand. More information on the amount of water use per account is presented in the following section.

4.1.2.2 Historical Wholesale Consumption

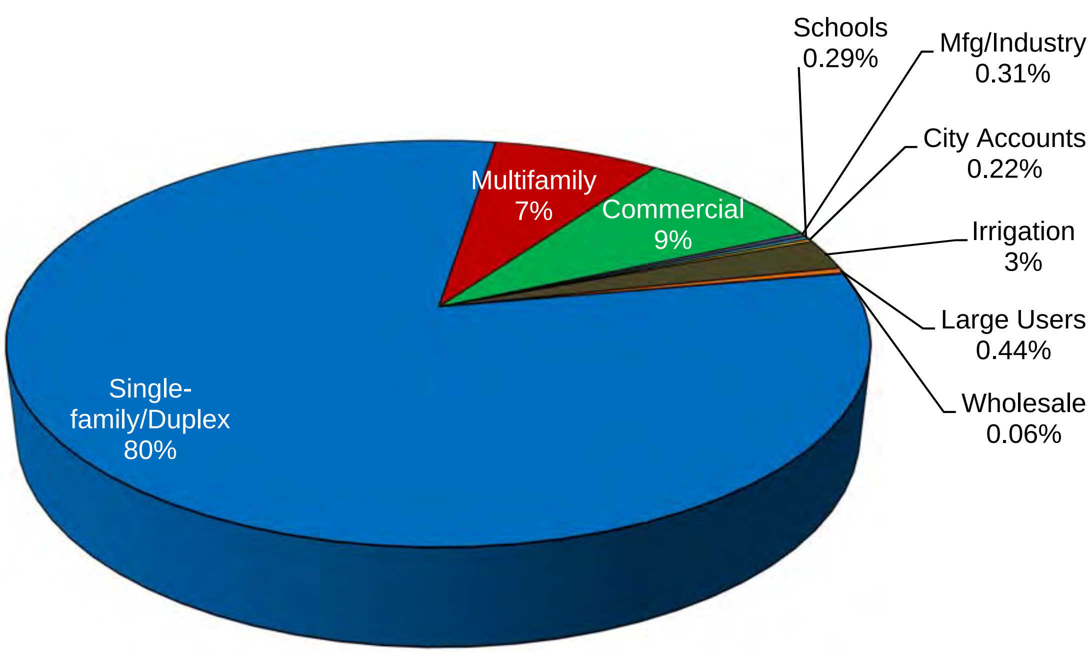
Wholesale accounts represent 20 percent of the City's average water consumption. As discussed in Chapter 2, the City of Algona relies on the City for its water supplies. The contract requires the City to deliver up to 0.525 million gallons per day (mgd) of ADD and up to 1.114 mgd of MDD through 2014. Historically water use from Algona averaged 0.33 mgd, which is approximately five percent of the City's average water consumption. Algona's demand varied through the planning period; however, no major trend in demands was observed.

The remaining wholesale demand was purchased by King County Water District 111 (WD #111). Covington Water District (CWD) did not purchase wholesale water during the planning period. The City's agreement with CWD and WD #111 is on an interruptible basis and allows sales up to 2.5 mgd to CWD and 2.5 mgd to WD #111. This agreement was executed in October of 1996 and will remain in full force unless terminated by mutual agreement of the participants. Purchases by WD #111 decreased substantially from 2008 to 2013, declining by approximately 40 percent or 0.6 mgd. Similar to the City, these declines are likely due to multiple factors and may be reversed in the future.

Copies of the wholesale water agreements are included in Appendix D.



Percent Consumed by Customer Class (2008 - 2013)



Average Percent of Accounts by Customer Class (2008 - 2013)

WATER CONSUMPTION PERCENTAGE BY CUSTOMER CLASS (2002 TO 2013)

FIGURE 4.1

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

carollo

4.1.3 Water Use Per Account and Equivalent Residential Units

The demand of each customer class can be expressed in terms of ERUs for forecasting and planning purposes. As discussed previously, one ERU is defined as the average quantity of water beneficially used by one average, full-time, single-family residence per day. The ERU calculation does not include non-revenue water or distribution leakage.

Table 4.3 shows the historical annual average water consumption by customer classification used to determine the ERU planning value and the distribution system leakage. Based on the data from 2008 through 2013, the average quantity of water used by one typical, full-time single-family residence ERU is equal to 185 gallons per day (gpd).

Because water use varies, an ERU planning value higher than the average was used by the City for demand forecasting. The 75th percentile of all the six-year values was used to select the planning ERU value of 195 gpd. The other customer class planning values were also selected by determining the 75th percentile from all the six-year values. The ERU value of 195 gpd is 15 percent lower than the 2012 Plan's ERU planning value of 230 gpd/ERU, which is consistent with the observed decreased water use.

As previously discussed, the conversion of total water use to ERUs provides a means to express water use by non-residential customers as an equivalent number of SFR accounts. The ERUs per account is obtained by dividing the water use per account by the water use per ERU. Table 4.3 presents the ERUs per account for each customer class based on 75th percentile of historical water use and the planning value of 195 gallons per ERU. The number of equivalent ERUs per account range from 3.1 for City accounts to 100.7 for Large Users. The historical Equivalent ERUs for 2008 through 2013 are presented in Table 4.4.

4.2 HISTORICAL PRODUCTION

The historical average and maximum water demands are important parameters when performing system and supply analyses. The term "water demand" refers to all the water requirements of a system including metered customers, unmetered water use, and unaccounted-for water such as leakage. For this reason, the City's production data, which accounts for all water demand, was used to calculate the ADD and MDD for each year. Additionally, historical production or supply allows the City to track system-wide demands on a daily basis, rather than monthly or bi-monthly billing records.

4.2.1 Average and Maximum Demands

The City produces water for its customers through its multiple springs, wells and wholesale water purchases. Table 4.5 presents the historical total production, the ADD, and MDD (based on production) for the period of 2000 through 2013. The MDD is a key benchmark

**Table 4.3 Historical Annual Water Use Per Account (gpd/account)
Comprehensive Water Plan
City of Auburn**

Year	Single-family/ Duplex	Multi Family	Com-mercial	Mfg/ Industry	Schools	City Accounts	Irrigation	Large Users	Wholesale	Total
2008	199	1,349	852	2,846	5,359	767	940	18,798	254,286	463
2009	201	1,292	890	3,553	3,703	630	1,077	17,950	231,000	459
2010	182	1,233	1,023	2,684	3,378	448	736	19,696	202,000	446
2011	180	1,275	646	5,263	946	500	668	16,446	166,286	399
2012	172	1,280	700	1,676	1,833	462	775	19,386	166,857	400
2013	174	1,219	688	1,189	1,861	423	771	20,171	164,286	395
Average	**185**	**1,275**	**800**	**2,869**	**2,847**	**538**	**828**	**18,741**	**197,452**	**427**
75th Percentile	**195**	**1,289**	**880**	**3,376**	**3,622**	**597**	**913**	**19,618**	**223,750**	**456**
ERUs per Account(1)	**1.0**	**6.6**	**4.5**	**17.3**	**18.6**	**3.1**	**4.6**	**100.7(2)**	**1,148.1**	**2.34**

Notes:

(1) ERUs per Account based on 75th percentile of annual water consumption.

(2) An individual demand projection was made for each Large User. Data for comparison purposes only.

Table 4.4 Historical Equivalent Residential Units (ERU)
Comprehensive Water Plan
City of Auburn

Year	Single-family/ Duplex	Multi Family	Com-mercial	Mfg/ Industry	Schools	City Accounts	Irrigation	Large Users	Wholesale	Total
2008	10,724	6,588	4,797	570	1,072	118	1,847	5,401	9,133	51
2009	10,862	6,470	4,946	693	703	87	2,006	5,158	9,482	513
2010	9,867	6,214	5,772	523	641	67	1,514	5,659	8,292	0
2011	9,872	6,424	3,628	1,026	180	72	1,488	4,726	5,972	51
2012	9,759	6,409	3,946	318	339	62	1,801	5,570	5,993	51
2013	10,000	6,132	3,874	226	344	56	1,765	5,796	5,901	103
Average	**10,731**	**6,830**	**5,348**	**2,036**	**797**	**89**	**1,922**	**5,385**	**8,296**	**112**
75th Percentile	**10,543**	**6,459**	**4,909**	**662**	**688**	**83**	**1,836**	**5,637**	**8,923**	**90**

Notes:

(1) Based on an 195 gpd per ERU

for supply capability, pump station discharge rates, reservoir capacity, and pump sizes. The last column of Table 4.5 presents the historical MDD to ADD peaking factor, which normalizes the historical data to compare between years. The peaking factor is also a key parameter in developing the future MDD projections, as discussed later in this chapter. The long period of record (2000 to 2013) captures the variability in this City's historical record.

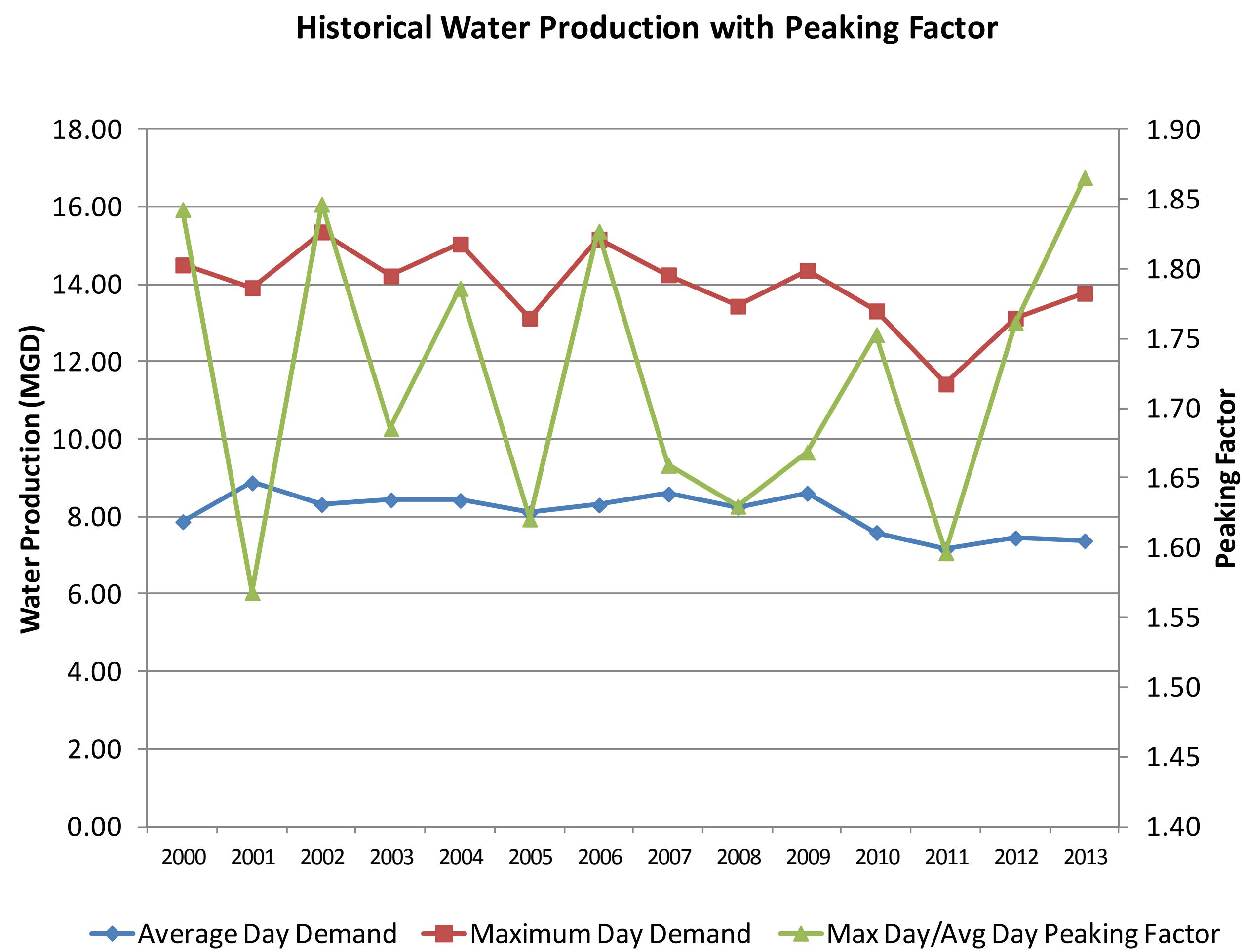
The average annual water produced from 2000 through 2013 is 2,958 million gallons per year (MG/year). As shown in this table, the minimum ADD was 7.16 mgd in 2011, and the maximum ADD was 8.88 mgd in 2001. The average ADD over the period was 8.10 mgd.

Table 4.5 Historical Annual ADD, MDD, Peak Day, and Peaking Factor
Comprehensive Water Plan
City of Auburn

Year	Annual Production (MG/year)	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Date of Maximum Day Demand	Max Day/Avg Day Peaking Factor
2000	2,881	7.87	14.50	8/20/2000	1.84
2001	3,239	8.88	13.92	6/24/2001	1.57
2002	3,035	8.32	15.35	7/12/2002	1.85
2003	3,079	8.44	14.22	8/4/2003	1.69
2004	3,082	8.42	15.04	7/30/2004	1.79
2005	2,957	8.10	13.13	8/5/2005	1.62
2006	3,030	8.30	15.17	8/4/2006	1.83
2007	3,134	8.59	14.25	7/11/2007	1.66
2008	3,018	8.25	13.44	8/6/2008	1.63
2009	3,142	8.61	14.36	7/30/2009	1.67
2010	2,773	7.60	13.31	8/5/2010	1.75
2011	2,613	7.16	11.43	8/18/2011	1.60
2012	2,728	7.45	13.13	8/16/2012	1.76
2013	2,694	7.38	13.77	8/21/2013	1.87
Average	**2,958**	**8.10**	**13.93**		**1.72**
75th Percentile	**3,082**	**8.43**	**14.47**		**1.82**

Historical values of MDD are equivalent to the highest production and purchase in one day in a given year, and are usually during the summer when irrigation is occurring. The minimum MDD was 11.43 mgd in 2011, and the maximum MDD was 15.35 mgd in 2002. The average MDD from 2000 to 2013 was 13.93 mgd.

The ADD, MDD, and MDD to ADD peaking factor over the period is shown graphically in Figure 4.2. The figure illustrates the variability in the peaking factor over the period.



HISTORICAL PEAKING FACTOR BY YEAR

FIGURE 4.2

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

The maximum peaking factor of 1.87 occurred in 2013 and the minimum peaking factor of 1.57 occurred in 2001. Due to variability of the peaking factor, average annual peaking factor of 1.72 is substantially lower than many of the highest years. Therefore, the City has chosen to use the 75th percentile of the historical peaking factors in demand projections, which is 1.82. This factor provides a better representation of the peaking factors observed historically for water supply predictions.

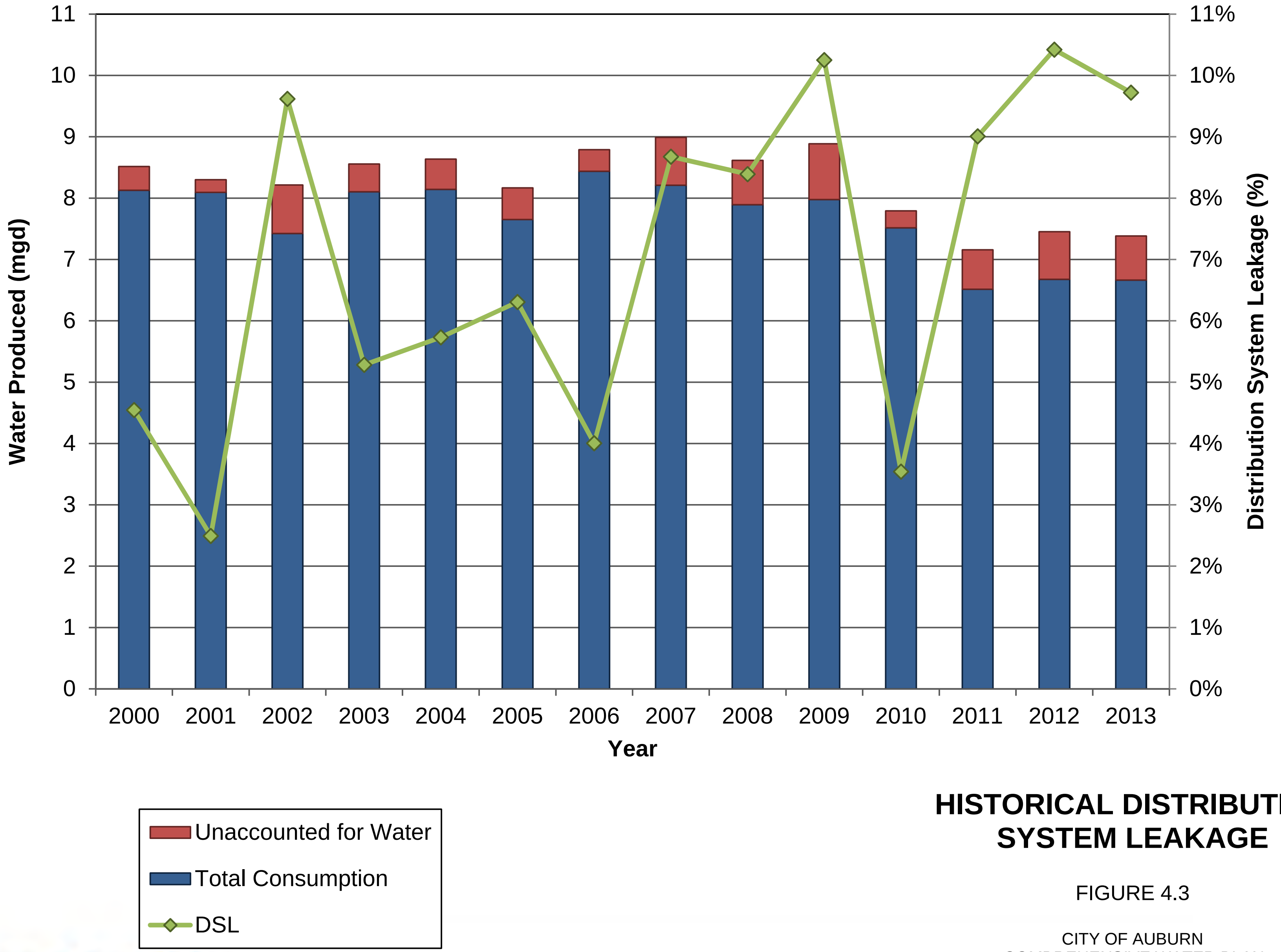
4.2.2 Distribution System Leakage

Distribution System Leakage (DSL) represents the difference between production and documented water use (retail, wholesale, and authorized unmetered). It may include inaccurate master and service connection meters, unaccounted-for non-revenue water use, pipeline leakage, and unauthorized use. DSL does not include authorized water usage such as water used for fire protection, flushing, construction, and other maintenance and operations practices. However, to be credited, this must be accounted for by metering or estimating using credible means.

DSL is calculated as the difference between the total amount of water produced and the sum of water sold and authorized unmetered water usage. DOH requires the 3-year average DSL to be under 10 percent to minimize water waste.

The City's estimated DSL for 2000 through 2013 is presented graphically in Figure 4.3 and Table 4.6. For the City's water system, the total 3-year rolling average DSL was between 5.6 percent and 9.7 percent of the total production. The City's annual average DSL over the period was 7.0 percent.

The City's DSL has approached and exceeded 10 percent for a single year, but has not exceeded a 3-year rolling average of 10 percent. The City is committed to maintaining DSL below 10 percent and is actively working to identify and eliminate DSL. The City has ongoing leak detection, meter calibration, and repair and replacement programs for water system infrastructure, as detailed in Chapter 12 – Operations and Maintenance. Additionally, the City has recently increased its efforts to reduce non-payment of bills and water theft.



HISTORICAL DISTRIBUTION SYSTEM LEAKAGE

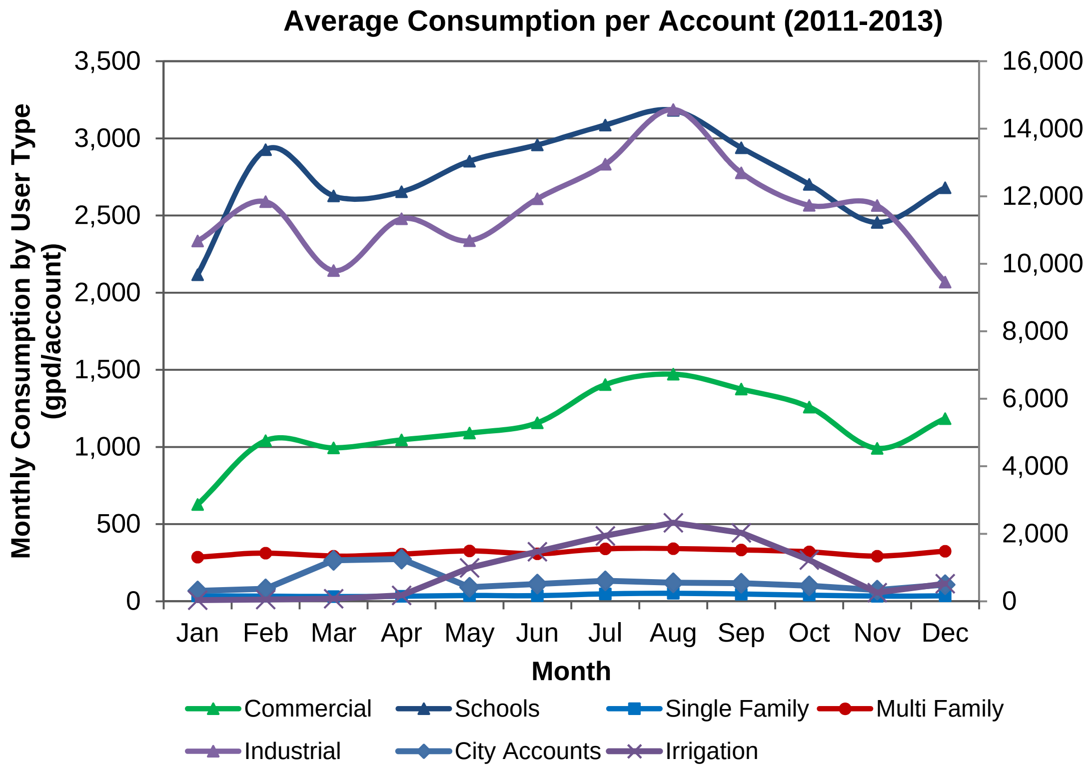
FIGURE 4.3

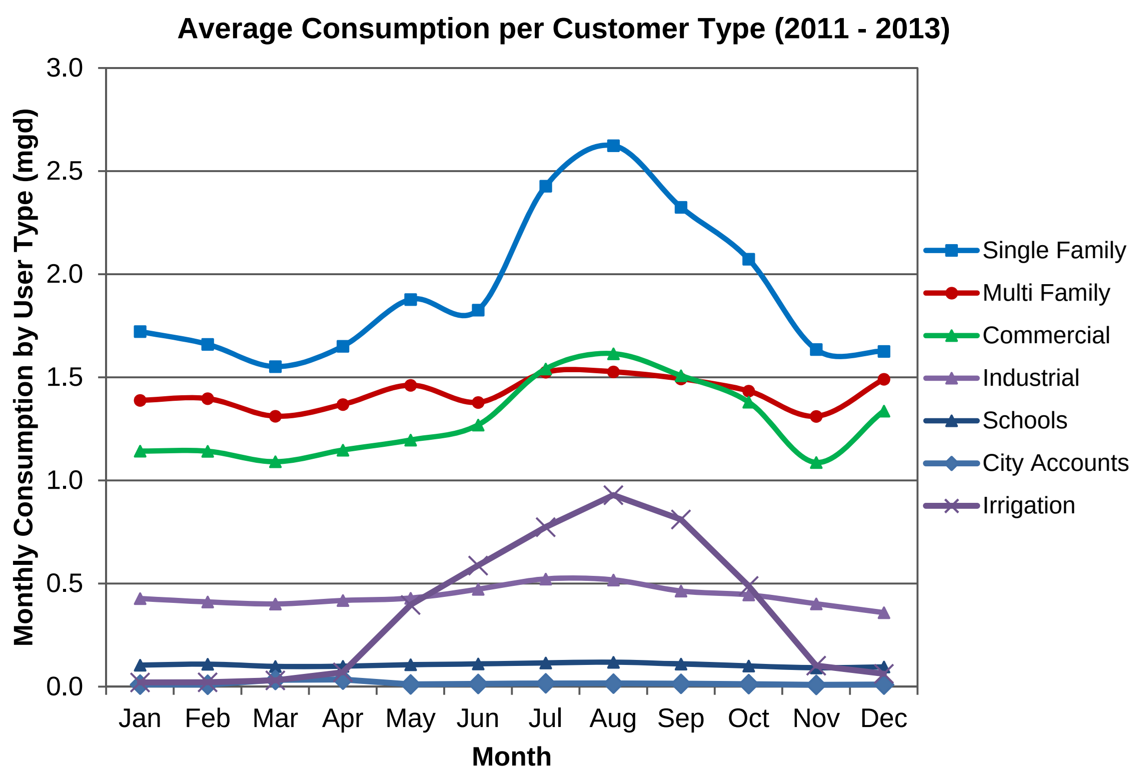
CITY OF AUBURN
COMPREHENSIVE WATER PLAN

Table 4.6	Historical Distribution System Leakage Comprehensive Water Plan City of Auburn				
Year	**Annual Consumption (mgd)**	**Annual Production (mgd)**	**Unaccounted for Water (mgd)**	**Unaccounted for Water (%)**	**Unaccounted for Water – 3 year average (%)**
2000	8.13	8.52	0.39	4.5%	
2001	8.09	8.30	0.21	2.5%	
2002	7.42	8.21	0.79	9.6%	5.6%
2003	8.10	8.56	0.45	5.3%	5.8%
2004	8.14	8.64	0.50	5.7%	6.9%
2005	7.65	8.17	0.52	6.3%	5.8%
2006	8.44	8.79	0.35	4.0%	6.0%
2007	8.21	8.99	0.78	8.7%	7.5%
2008	7.89	8.62	0.72	8.4%	8.5%
2009	7.98	8.89	0.91	10.3%	9.1%
2010	7.52	7.79	0.28	3.5%	7.4%
2011	6.51	7.16	0.64	9.0%	7.6%
2012	6.68	7.45	0.78	10.4%	7.7%
2013	6.66	7.38	0.72	9.7%	9.7%
Average	**7.67**	**8.25**	**0.57**	**7.0%**	

4.3 SEASONAL DEMANDS

The pattern of water consumption differs between the customer classes. Water use increases significantly during the summer when daylight hours are longer and lawn and landscape watering is prominent. Other outdoor uses, including car washing and recreation, are also at their highest during summer months. Figure 4.4 presents average monthly consumption by customer class from 2011 through 2013. The top chart shows the average total monthly consumption and the bottom chart shows the average monthly consumption per account. Note, with the exception of some of the city's largest users, the City conducts bi-monthly meter reading, therefore the water consumption was averaged between months to better reflect the actual water consumed in the month.





AVERAGE CONSUMPTION BY MONTH FOR 2011 TO 2013

FIGURE 4.4

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

As seen in the top figure, SFR customers show a significant peak in total consumption during the summer months. Other smaller customer classes also show a similar peak when normalized by account. Uncharacteristically, MFR water use does not show an irrigation peak. The City's policy of using separate irrigation accounts for all non-SFR accounts may account for the lack of peak for the MFR accounts. These monthly variations can be used to target water use efficiency efforts and/or to project future water-use patterns for planning purposes.

4.4 CLIMATIC REVIEW

Climate is an important factor driving water use, because temperature, precipitation, and other climate-driven weather patterns affect irrigation, commercial and industrial cooling, etc. As shown in the above section, irrigation is common in the summer and early fall and largely drives the MDD. Water consumption during peak irrigation season (July through October) accounts for approximately 50 percent of the City's water use in less than 4 months. However, many additional factors influence demands, including the economy and conservation activities. Auburn's maritime climate is characterized by wet cool winters and dry warm summers. The City's temperate climate is largely protected from continental weather by the Cascade Mountains to the east. During the period of historical data, annual precipitation and temperature varied substantially from year to year, providing a good indication of the variability in demand from climatic conditions.

While there are many examples that illustrate how climate affects demand, the statistical correlations between the two factors are difficult to establish. From the available data provided by the City, the MDD/ADD peaking factor provides a good indication of climate-driven water use (i.e. irrigation and cooling) from year to year. By comparing these data to historical temperature and precipitation, it was possible to investigate the statistical correlations between climate and historical demand. Table 4.7 presents the MDD/ADD peaking factors, month the MDD occurred, monthly precipitation, and maximum monthly temperature from the regions long-term climate station at the Seattle-Tacoma International Airport (SEATAC). Anecdotally, comparisons did show examples of hot and dry conditions and high demand. For example, 2012 MDD/ADD peaking factor is relatively high (1.76), which had high average maximum daily temperatures and no appreciable rainfall. In 2008 there was a low peaking factor (1.63) that occurred during relatively low maximum temperatures and high rainfall. However, the highest peaking factor (1.87) occurred in 2013, which had above average rainfall and near average maximum daily temperatures. These variations show the difficulty in correlating climate and demand over a fourteen-year period.

Table 4.7	Climate and MDD/ADD Peaking Factor Comparison Comprehensive Water Plan City of Auburn			
Year	**MDD/ADD Peaking Factor**	**MDD Month**	**Precipitation in MDD Month (in)**	**Average Max Daily Temperature (F)**
2000	1.84	August	0.33	72.9
2001	1.57	June	3.06	65.3
2002	1.85	July	0.64	74.2
2003	1.69	August	0.32	76.7
2004	1.79	July	0.16	78.3
2005	1.62	August	0.29	77.3
2006	1.83	August	0.02	77.1
2007	1.66	August	0.74	74.8
2008	1.63	July	0.48	74.9
2009	1.67	July	0.06	81.0
2010	1.75	August	0.64	75.2
2011	1.60	August	0.13	75.9
2012	1.76	August	0.00	78.5
2013	1.87	August	1.35	79.0
Average	**1.72**		**0.59**	**75.8**
Correlation (R^2) to MDD/ADD Peaking Factor			**0.07**	**0.11**

Climate experts predict that future weather patterns in the Pacific Northwest may change in the next century. If the Pacific Ocean temperatures rise as is expected, the likely result will be warmer temperatures year-round, wetter winters, with more intense storm events, and drier summers[1]. However, the timing and magnitude of such changes is uncertain. No changes to demand projections were made for the 20-year planning period to account for potential climate change due to the uncertain magnitude and timing of local effects. However, it is recognized that demands have the potential to increase in the future given these changes.

4.5 DEMOGRAPHIC FORECAST

Demographic forecasts provide an estimate of future population and employment. The City is a member of the PSRC, which develops demographic analyses for the central Puget Sound region (King County, Kitsap County, Pierce County, and Snohomish County). The demographic projections are developed based on local planned development capacities and regional policies adopted by the PSRC Vision 2040. Vision 2040 established the region’s strategy for accommodating population and employment growth to maintain the high quality of living, economic prosperity and a healthy environment through the year 2040. Through this planning process, the City is required to plan for a specific number of additional housing units and jobs.

[1] Dalton, M.M., P.W. Mote, and A.K. Snover [Eds.]. 2013. *Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities*. Washington, DESIGN CONSULTANT: Island Press.

Consistent with the GMA, the City uses the Vision 2040 growth values as the basis of the demographic projections.

The City's policy is to serve all customers within its RWSA, thus, demographic projections were provided by City planners for all Service Areas. The demographic projections were based on the PSRC's 2013 UrbanSim land use forecast model, which utilizes jurisdictions' allocated employment and housing targets to project growth. Additional information on the City's existing land use and future zoning are provided in this Section. The resulting demographic projections and corresponding rates of growth are also detailed.

4.5.1 Land Use

Land use designations and regulations provide important information in determining future water requirements. Land use determines the area available for various types of development including both SFR and MFR development, as well as commercial and other types of land use that provide the economic base necessary to support residential development. The population and employment projections developed by the PSRC are based on the City's employment and housing targets allocated for the 20-year planning horizon.

4.5.1.1 Existing Zoning

Existing zoning designations for the City of Auburn Water Service Area are shown on the Comprehensive Zoning Map, Figure 4.5. Zoning designations implement the land use identified in Auburn's Comprehensive Plan; therefore, the current land use reflects the City's historical zoning.

The City includes a wide range of residential, commercial, institutional, and industrial land uses. Public and quasi-public land uses include parks, open space, and public recreation as well as institutional uses such as schools. Commercial and industrial uses occur primarily in the valley; however, large areas of residential land use and the Downtown Urban Center also exist in the valley area.

The Academy and Lakeland Hills Service Areas are primarily residential, although some commercial development is located along Auburn Way South (SR 164) in the Academy Service Area. The Lea Hill Service Area is also primarily residential although other uses include small amounts of commercial and open space, and the Green River Community College.

Areas within the RWSA, but outside the City limits, are governed by King County zoning. Land use was assumed to be consistent with zoning in these areas. The area in the northwest corner of the RWSA, west of SR167 and north of S 287th ST is zoned for Agriculture. A second area is located near Auburn Narrows State Park, which is north and west of SR18. This area is includes Rural Residential, as well as Park and Greenbelt zoning. The City does not currently provide service in this area; however, it is willing to provide service to customers meeting the Service Area Policies. There are two additional unincorporated "pockets" of urban residential zoning within the RWSA that the City currently serves, where the southern area also contains a single parcel of Industrial zoning. The King County zoning was used in the demographic analyses.

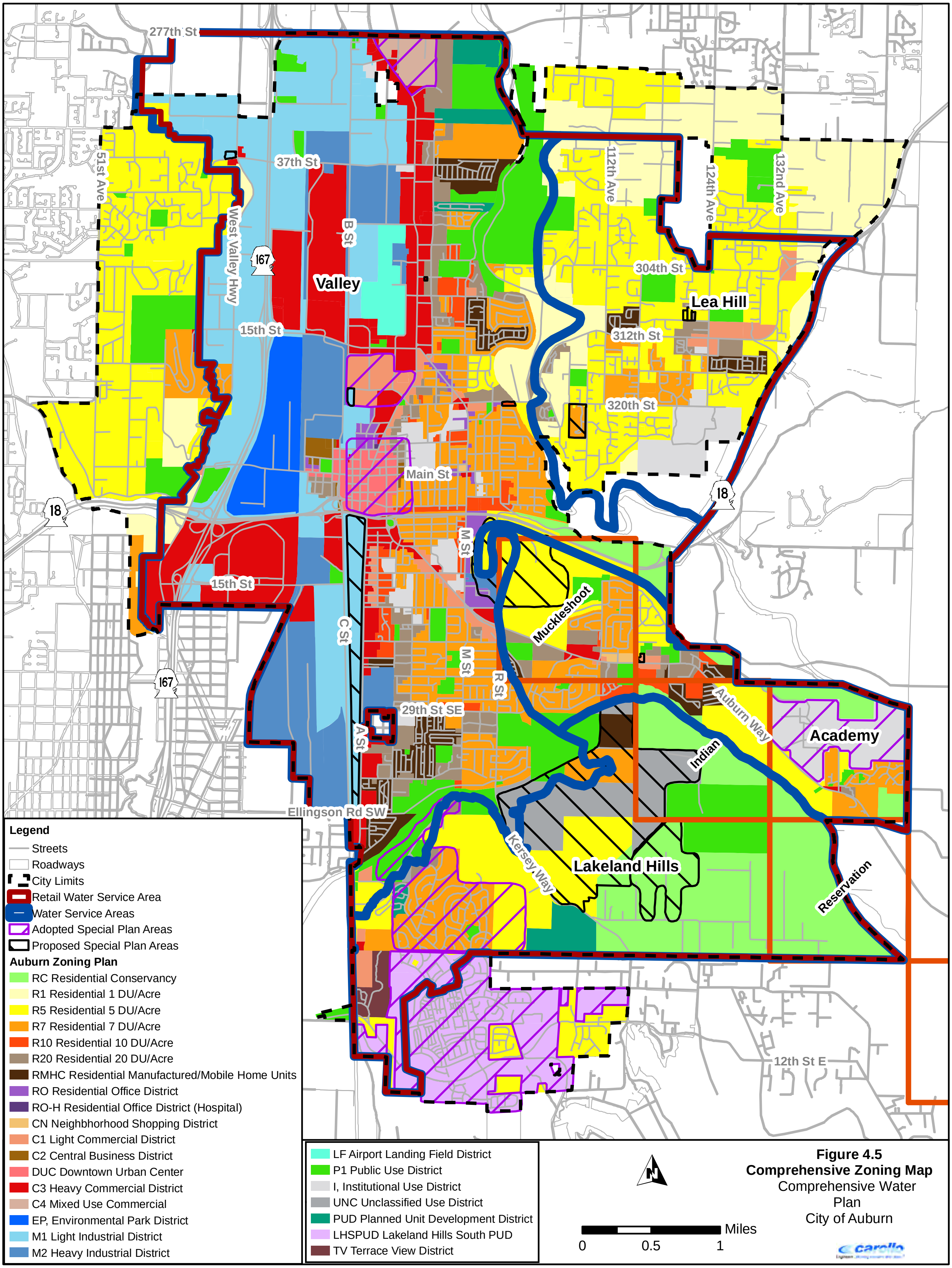


Figure 4.5
Comprehensive Zoning Map
Comprehensive Water Plan
City of Auburn

4.5.1.2 Future Land Use

The Auburn Comprehensive Plan was developed based on the projected needs of the City for 20 years. This consistency of approach is encouraged by the Washington State Growth Management Act and should result in predictable and stable land uses over longer planning periods. Additionally, the Comprehensive Plan is being updated in parallel with this Plan.

While it is likely the City will annex its potential annexation areas (a portion of the currently unserved Lakeland Hills area in Pierce County and the two small pockets within the city) over the next 10 years, annexation should have little impact on current land-use patterns. The Auburn Comprehensive Plan recognizes the need for a variety of land uses and anticipates that areas to be annexed to the City will be residential until redevelopment happens consistent with the industrial and commercial zoning. Future land use for the planning period should conform to the Comprehensive land use map, Figure 4.6. Areas within the RWSA, but outside the City limits, are governed by King County zoning as described in the above section.

4.6 PROJECTED DEMOGRAPHIC GROWTH

Many factors influence population growth. The state of the economy, interest rates, annexation of adjacent areas, and up-zoning all influence new development and population growth. Growth management policies, along with coordination between local governments, should make development more predictable and growth projections more accurate than they have been historically. The City's Comprehensive Plan, as well this Plan, are key documents to aid the City in preparing for the predicted growth. However, it is not uncommon for actual growth rates within the City to vary from those predicted. In addition, growth rates will vary between different parts of the City based on the availability of services and the costs to develop the land for the zoned use.

Population and Employment numbers were used to calculate rates of growth. PSRC's Vision 2040 requires the City to plan for a given number of additional housing units and jobs. The City developed demographic projections allocating these housing units and jobs to the water Service Areas. Housing units are presented in terms of population in the demographic projections. The population was allocated between SFR and MFR and the employment was allocated between commercial and manufacturing/industrial by City planners. From these demographic projections, the number of future accounts was projected for each water customer class.

4.6.1 Demographic Projections

Existing and future demographic projections consistent with the City's GMA goals were provided by the City for 2013, 2015, 2021, 2025, and 2035. The projections by Service Area provided total population, commercial employment, and manufacturing and industrial employment.

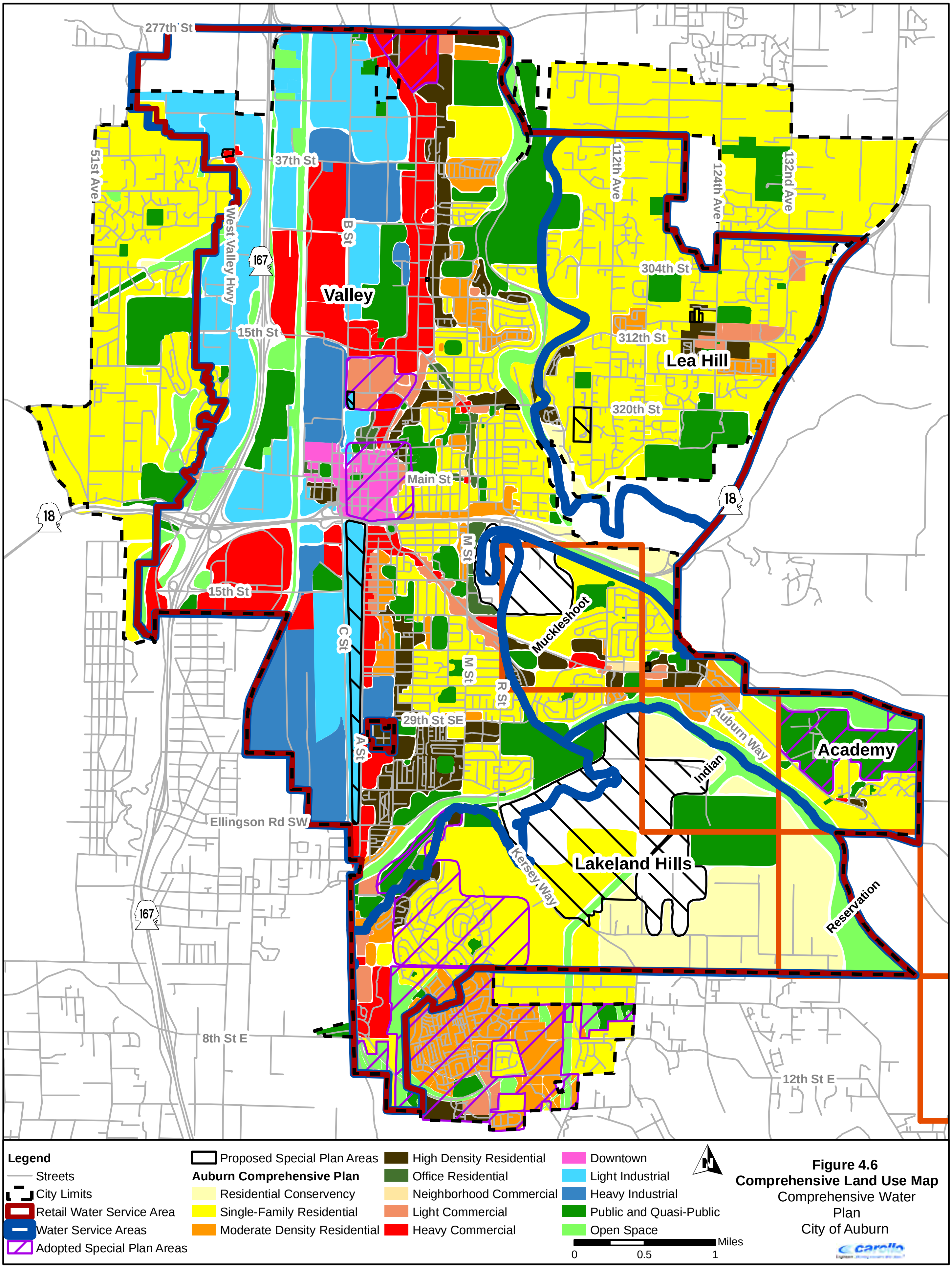


Figure 4.6
Comprehensive Land Use Map
Comprehensive Water Plan
City of Auburn

Due to the difference in water use between the City's SFR and MFR accounts, it was preferable to allocate total population between SFR and MFR. The City's housing unit data provided an ideal means to estimate the population in SFR and MFR. City planning indicated that on average there was a similar number of people in a given dwelling, regardless of being SFR or MFR. Therefore, the 2013 population was allocated to SFR and MFR proportionally to the respective percentage of housing units in a given Service Area. For example, 43 percent of the housing units in the Valley Service Area are SFR that equates to 12,685 people of the Valley Service Area's total population of 29,788 people.

The growth of SFR and MFR housing was expected to vary between the Service Areas due to zoning, availability of vacant or re-developable land, existing and proposed infrastructure, etc. City planning provided projections of development patterns in each Service Area based on current levels of development, zoning, and City programs. These patterns were used to allocate future population between SFR and MFR as detailed below.

- **Valley Service Area:** SFR is not expected to increase substantially in the Valley Service Area. All population growth was allocated to MFR. The majority of MFR development is expected to occur in the Valley floor, especially in the urban center/Downtown Auburn. The City expects limited SFR infill on the Valley, however, the magnitude and timing of the infill is unknown and therefore not considered in the demand projections.

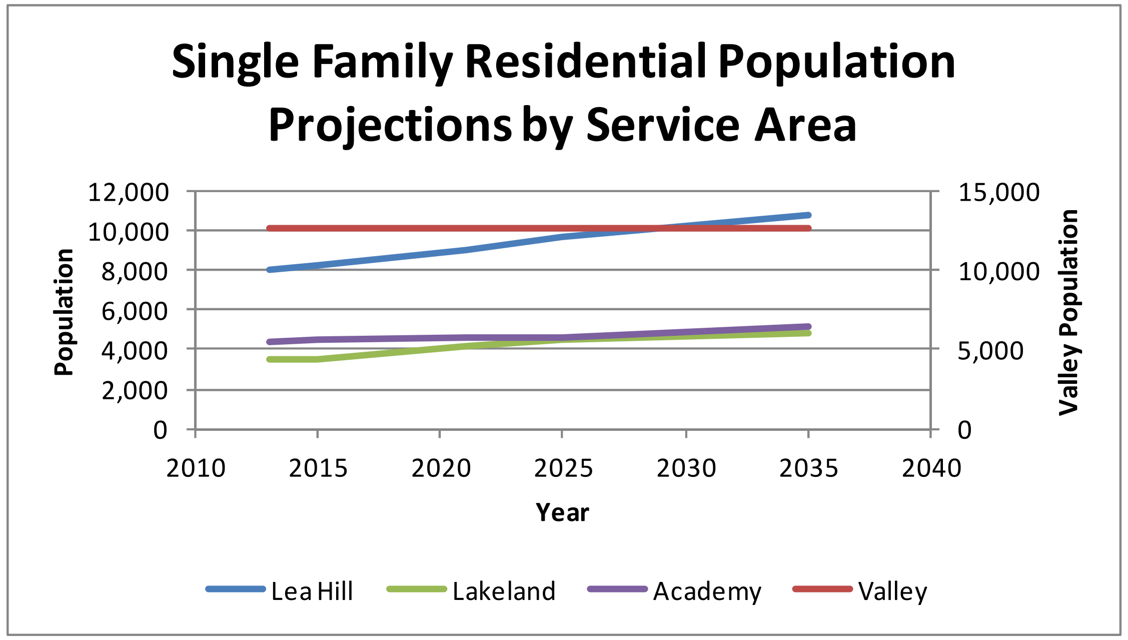
- **Lea Hill:** The current mix of SFR and MFR is expected to remain similar to what it is today (64 percent SFR).

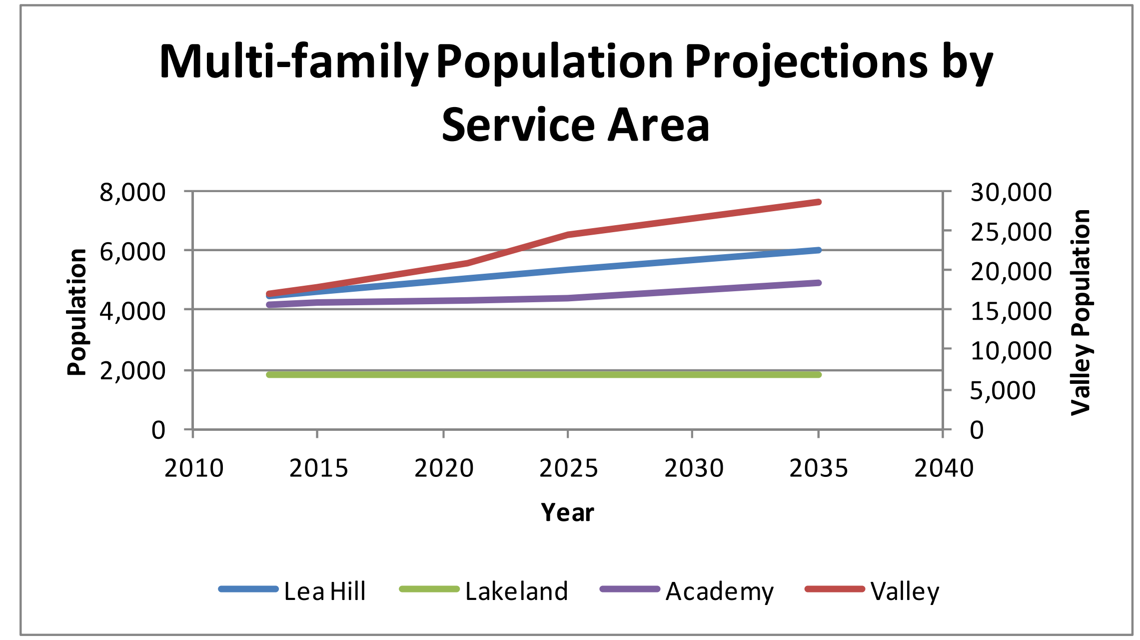
- **Lakeland Hills:** Future population in Lakeland Hills is expected to develop as SFR and MFR zoned areas are built out.

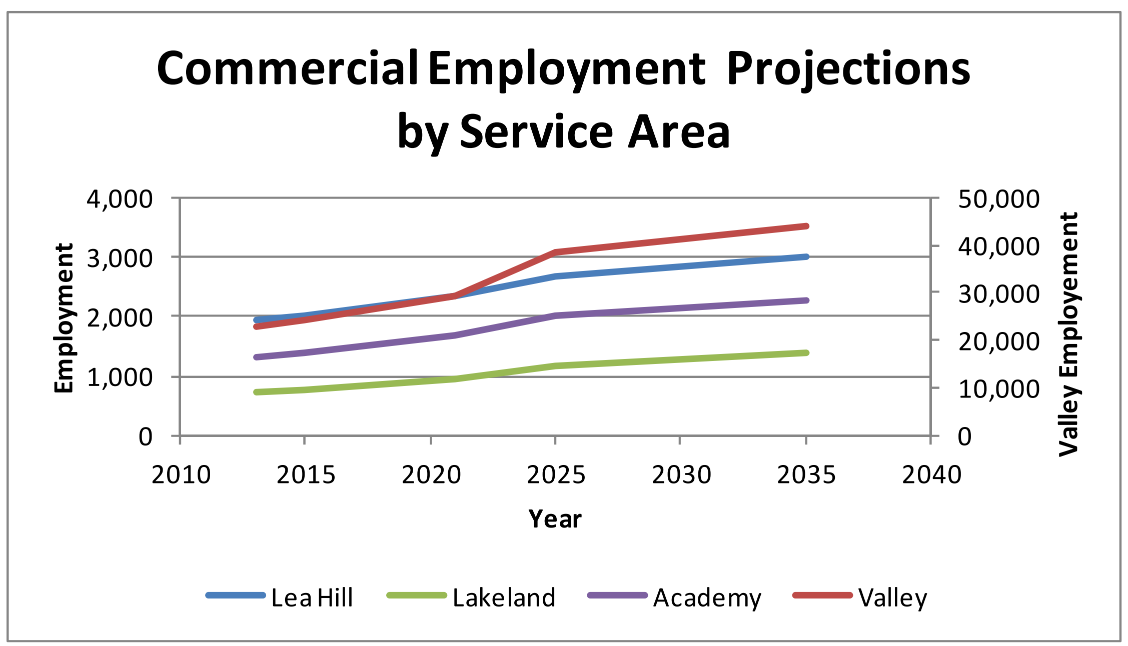
- **Academy:** The current mix of SFR and MFR is expected to remain similar to what it is today (51 percent SFR).

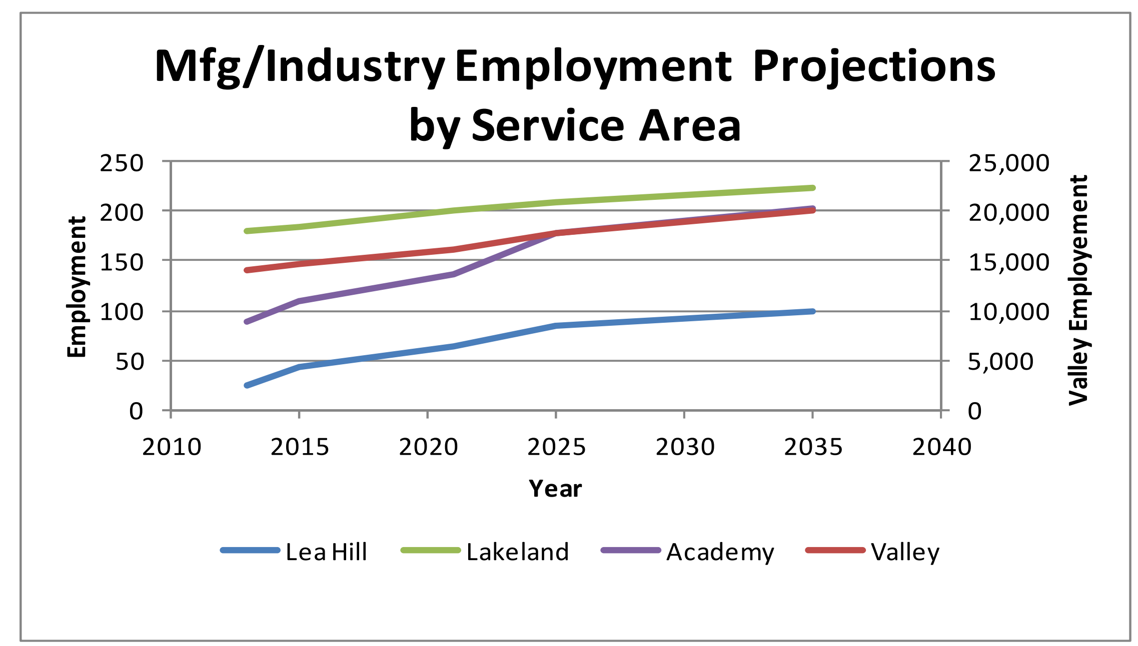
The resulting demographic projections are presented in Table 4.8, which presents the population or employment projections by Service Area for each demographic category. Overall, the City is planning for an additional 18,565 people and 29,854 employees by 2035 for the water service area. The demographic growth for each Service Area are illustrated in Figure 4.7, where each demographic category is presented in a different chart. The figure shows the variability in demographic growth rates within the planning period and between the Service areas. For example, the top right chart shows that Commercial employment growth is greater in the Valley Service Area than in Lea Hill between 2021 and 2025. Note, the Valley Service Area has a much greater magnitude of population and employment than other Service Areas, where the values are shown on a secondary axis in Figure 4.7. For example, the Valley Service Area represents 87 percent of the system's commercial employment in 2035.

Table 4.8	Classification/Customer Projections by Individual Water Service Areas Comprehensive Water Plan City of Auburn				
	2013	**2015**	**2021**	**2025**	**2035**
Single-Family Population					
Lea Hill	8,003	8,228	9,067	9,667	10,809
Valley	12,685	12,685	12,685	12,685	12,685
Lakeland	3,487	3,487	4,110	4,500	4,783
Academy	4,393	4,442	4,550	4,619	5,144
Subtotal	**28,569**	**28,842**	**30,411**	**31,471**	**33,421**
Multifamily Population					
Lea Hill	4,456	4,580	5,047	5,382	6,017
Valley	17,103	17,720	20,950	24,339	28,541
Lakeland	1,847	1,847	1,847	1,847	1,847
Academy	4,177	4,224	4,325	4,391	4,890
Subtotal	**27,582**	**28,371**	**32,170**	**35,959**	**41,295**
Commercial Employment					
Lea Hill	1,930	2,029	2,347	2,691	3,000
Valley	22,789	24,330	29,255	38,438	43,812
Lakeland	727	779	956	1,155	1,395
Academy	1,297	1,390	1,679	2,016	2,264
Subtotal	**26,743**	**28,528**	**34,237**	**44,300**	**50,471**
Manufacturing / Industry Employment					
Lea Hill	25	44	63	85	99
Valley	14,084	14,701	16,230	17,845	19,979
Lakeland	180	185	200	209	223
Academy	88	109	136	178	202
Subtotal	**14,377**	**15,039**	**16,629**	**18,317**	**20,503**
Total Population					
Lea Hill	12,459	12,808	14,114	15,049	16,826
Valley	29,788	30,405	33,635	37,024	41,226
Lakeland	5,334	5,334	5,957	6,347	6,630
Academy	8,570	8,666	8,875	9,010	10,034
Total	**56,151**	**57,213**	**62,581**	**67,430**	**74,716**









DEMOGRAPHIC PROJECTIONS

FIGURE 4.7

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

Demographic growth rates, rather than total number of people or employees, were used in the demand projection. The demographic growth rates as a simple percent growth are presented in Table 4.9. Total population is projected to annually increase by 1.4 percent from 2015 to 2035 and total employment is projected to increase by 3.2 percent over the same period.

Table 4.9 Growth Rates by Customer Class and Service Area
Comprehensive Water Plan
City of Auburn

	2015	2021	2025	2035	Annual Average
Single-Family Population					
Lea Hill	0.9%	1.5%	1.5%	1.3%	1.5%
Valley	0.0%	0.0%	0.0%	0.0%	0.0%
Lakeland	0.0%	2.6%	2.2%	0.7%	1.6%
Academy	0.4%	0.3%	0.3%	1.1%	0.7%
Subtotal	**0.3%**	**0.8%**	**0.7%**	**0.6%**	**0.7%**
Multifamily Population					
Lea Hill	0.9%	1.5%	1.5%	1.3%	1.5%
Valley	1.2%	2.7%	4.0%	2.2%	2.9%
Lakeland	0.0%	0.0%	0.0%	0.0%	0.0%
Academy	0.4%	0.3%	0.3%	1.1%	0.7%
Subtotal	**1.0%**	**2.0%**	**2.7%**	**1.8%**	**2.2%**
Commercial Employment					
Lea Hill	1.7%	2.4%	3.6%	1.5%	2.4%
Valley	2.3%	3.1%	8.1%	2.1%	4.0%
Lakeland	2.4%	3.5%	5.5%	3.0%	4.0%
Academy	2.4%	3.2%	5.2%	1.7%	3.2%
Subtotal	**2.2%**	**3.0%**	**7.5%**	**2.1%**	**3.9%**
Manufacturing / Industry Employment					
Lea Hill	25.3%	10.9%	17.6%	5.1%	12.9%
Valley	1.5%	1.6%	2.3%	1.4%	1.8%
Lakeland	0.9%	1.2%	1.0%	0.7%	1.0%
Academy	8.0%	4.4%	9.5%	2.5%	5.6%
Subtotal	**1.5%**	**1.6%**	**2.3%**	**1.4%**	**1.9%**
Total Population					
Lea Hill	0.9%	1.5%	1.5%	1.3%	1.5%
Valley	0.7%	1.5%	2.3%	1.3%	1.7%
Lakeland	0.0%	1.7%	1.5%	0.5%	1.1%
Academy	0.4%	0.3%	0.3%	1.1%	0.7%
Total	**0.6%**	**1.4%**	**1.7%**	**1.2%**	**1.4%**

4.7 PROJECTED NUMBER OF CONNECTIONS

The number of water connections was used in determining the ERU, ADD, and MDD projections. The number of water connections in the future was projected using the demographic growth rates and the number of existing water accounts presented in Table 4.1. The future connections were projected by both Service Area and customer class and are presented in Table 4.10. SFR and MFR account numbers were grown by the population growth rates presented in Table 4.9 for each Service Area. Commercial and Manufacturing / Industrial were grown by their respective employment growth rates presented in Table 4.9 for each Service Area. Growth rates for schools, city accounts, and irrigation customers weren't provided, therefore a comparable customer classification that represented a similar growth was used. The growth rates of the "total population" for each individual water Service Area were applied to the accounts for schools and city accounts. Total population rates were used as they best represented the growth of schools and city accounts. Total employment growth rates were applied to the irrigation account projections.

4.7.1 Lea Hill Service Area

The Lea Hill Service Area is located east of the Auburn-Kent Valley. The area is largely residential with some supportive neighborhood business. Green River Community College is located in the Lea Hill Service Area and has a concentration of multifamily residential uses in the vicinity of the college.

Much of the area is moving from a rural level of development to a more urban development density. As a result, it is presently an active development area with potential for additional growth. The Lea Hill service area is projected to have the second to highest growth rate in population with a 1.5 percent per year average increase from 2015 to 2035. The Service Area is projected have a moderate growth in employment with a 2.4 percent per year average increase in employment from 2015 to 2035.

Table 4.10 Account Projections by Customer Class and Service Area
Comprehensive Water Plan
City of Auburn

	2015	2021	2025	2035	Ultimate
Lea Hill					
Single-family/Duplex	3,946	4,294	4,526	5,029	5,029
Multifamily	207	226	238	264	455
Commercial	18	20	23	25	27
Mfg/Industry	2	3	3	4	4
Schools	6	6	6	7	7
City Accounts	2	2	2	2	2
Irrigation	62	71	79	88	94

Table 4.10 Account Projections by Customer Class and Service Area
Comprehensive Water Plan
City of Auburn

	2015	2021	2025	2035	Ultimate
Valley					
Single-family/Duplex	5,261	5,261	5,261	5,261	9,181
Multifamily	662	767	869	1,013	1,013
Commercial	1,086	1,279	1,614	1,836	2,100
Mfg/Industry	39	42	45	51	55
Schools	24	26	28	31	33
City Accounts	24	26	28	31	33
Irrigation	342	392	469	530	596
Lakeland Hills					
Single-family/Duplex	1,167	1,346	1,451	1,537	2,335
Multifamily	42	42	42	42	234
Commercial	13	16	18	22	32
Mfg/Industry	2	2	2	2	2
Schools	4	5	5	5	6
City Accounts	1	2	2	2	2
Irrigation	31	36	41	49	70
Academy					
Single-family/Duplex	1,184	1,209	1,224	1,351	2,954
Multifamily	96	98	99	110	295
Commercial	28	33	38	43	65
Mfg/Industry	2	2	2	3	4
Schools	6	6	6	6	7
City Accounts	3	3	3	3	3
Irrigation	26	31	36	40	61
Total					
Single-family/Duplex	11,558	12,110	12,462	13,178	19,499
Multifamily	1,007	1,133	1,248	1,429	1,997
Commercial	1,145	1,348	1,693	1,926	2,224
Mfg/Industry	45	49	52	60	65
Schools	40	43	45	49	53
City Accounts	30	33	35	38	40
Irrigation	461	530	625	707	821

4.7.2 Valley Service Area

The Valley Service Area contains a significant amount of developable land designated as multifamily and commercial, including the Downtown Urban Center. The multifamily connections in this area are projected to grow 2.9 percent per year on average from 2015 to 2035 and commercial connections are projected to grow 4 percent per year on average. There is not expected to be growth in SFR and moderate Manufacturing and Industrial growth rate of 1.8 percent during this period. These growth projections are largely based on the City's anticipation of growth trends and the redevelopment of Auburn's Downtown Urban Center and surrounding areas.

4.7.3 Lakeland Hills Service Area

The Lakeland Hills Service Area includes the entire City south of the White River. Portions of this Service Area are designated residential conservancy, which are not anticipated to develop in the near future. The area includes the master planned area (Lakeland Hills North) and the Kersey III developments. These areas have been largely built-out, which was reflected in the relatively low population growth rate of 1.1 percent per year. Commercial connections in the Service Area is projected to grow by 4.0 percent per year on average from 2015 to 2035. The Lakeland Hills account projections do not include the Lakeland Hills South master planned area, which is currently served by the City of Bonney Lake.

4.7.4 Academy Service Area

The Academy Service Area is a relatively well-developed portion of the City. It is expected to have the lowest population growth in the system, with a 0.7 percent per year average increase from 2015 to 2035. Similar to Lakeland Hills, the commercial connections in the Service Area are expected to increase by 3.2 percent per year on average from 2015 to 2035.

4.7.5 Ultimate Accounts

The ultimate accounts represent the largest number of accounts expected based on the current zoning in the RWSA. The estimates of ultimate SFR and MFR accounts were based on the zoning, dwelling densities, and the holding capacity associated with each Service Area. The ultimate residential growth in accounts was used to project the ultimate non-residential water uses. The ultimate holding capacity was calculated by total land area minus a 40 percent reduction factor for critical areas, rights-of-way, public uses, and market factors. The reduction factor was deduced by analysis of the 2007 King County Buildable Lands Report and the City of Auburn Comprehensive Plan (revision 2011). A 25 percent reduction factor was used for the Valley Service Area due to the more urban nature of its area.

The ultimate number of single-family and multifamily housing units within the Water Service Area were calculated based on the area of each zoning type in a Service Area and the zoning density. For example, 100 acres of Residential 5 DU/Acre (R5) zoning would equal a 500 ultimate SFR accounts. No specific existing areas were targeted for redevelopment nor was a timeframe for redevelopment set in the analysis; rather the analysis assumes that on average of all the R5 zoned area in the Service Area will reach the zoned density over a long period of time. This voluntary redevelopment was required to achieve the projected ultimate number of accounts. To use the best available information, the demographic employment projections were used to predict the growth of non-residential water uses through 2035. From 2035 to the ultimate condition, non-residential growth was projected to mirror the residential growth.

It is important to note that the technique used to make this ultimate demand projection is the best available at this time and uses current planning policies. As a result, as planning policies change, the ultimate water demands should be used to gain additional perspective on what growth may occur in the future and the magnitude of water supply required to serve a fully-developed condition.

4.8 PROJECTED WATER DEMAND

Projecting future water demand is one of the key elements of the water system planning process. Identification of system improvements such as supply, pumping, storage, and piping requirements are all related to demand projections. This section summarizes the ERU, ADD, and MDD projections, as well as the potential range in future demands associated with various factors, such as water use per ERU, DSL, and demographic growth rate.

4.8.1 Potential Range in Future Water Demand

Numerous factors and assumptions affect the accuracy of projected future water demands. Recognizing that certain assumptions built into the demand projections will vary in the future, the projections were developed for low, medium, and high demand scenarios to provide a range in demands that may be experienced in the future. The medium projection will be used for the system analysis in Chapter 9, while the high projection will be used for the water right evaluation in Chapter 6. The system analysis determines future pumping, storage, and distribution system deficiencies and identifies potential improvements to achieve the City's established capacity criteria. The water right evaluation looks at both water rights and overall supply capacity.

The variables considered in developing the range of demand projections are summarized in Table 4.11 and are discussed below.

- **Future Water Accounts:** The future water accounts are presented in Table 4.10 and were used for all demand scenarios (low, medium, and high).
- **Water Use Per ERU:** Water use per ERU for the medium and high demand projections was based on 75th percentile of the historical data presented in Table 4.3, which equals 195 gpd/ERU. The low demand projections reflects the City's conservation goals, where the water use per ERU declines by one percent annual from the current of 195 gpd/ERU until a minimum water use of 172 gpd/ERU is reached.

- **ERUs per Account:** The historical ERU per account by customer class presented in Table 4.3 was used to project the future demands. These ERU per Account values were based on the 75th percentile of the historical data and a water use per ERU value of 195 gpd/ERU.
- **New Customer Demand Adjustments:** New customer demand will likely be below the historical level of water use. For example, all new development should be constructed to meet the updated uniform plumbing code, which requires water efficient fixtures. For the low and medium projections, new customers are expected to use five percent less water per account or 95 percent of the existing water customers. No new customer demand adjustment was made in the high demand scenario or use 100 percent of the existing water customers. These adjustments were made in addition to water use efficiency savings.
- **Distribution System Leakage:** DSL varied between 3.5 and 10.4 percent of the City's total City production between 2000 and 2013. The 75th percentile of historical annual DSL values of 9.5 percent was applied to all demand projections.
- **Maximum Day/Average Day Peaking Factor:** The MDD/ADD peaking factor varied by 18 percent between 2000 and 2013. The 75th percentile of historical annual peaking factors of 1.82 was applied to the medium and high demand projections. The average historical peaking factor of 1.72 was used for the low growth scenario.

Large users and wholesale customers were based on individual demand projections that are presented in the following sections.

Table 4.11 Proposed Planning Values for Demand Projections
Comprehensive Water Plan
City of Auburn

Assumptions	Demand Scenario		
	Low	Average	High
Water Demand (gpd) per ERU	195 to 172[1]	195	195
DSL (%)	9.5%	9.5%	9.5%
Max Day/Avg Day Peaking Factor	1.72	1.82	1.82
New Customer Demand Adjustments			
Single-family/Duplex	95%	95%	100%
Multifamily	95%	95%	100%
Commercial	95%	95%	100%
Mfg/Industry	95%	95%	100%
Schools	95%	95%	100%
City Accounts	95%	95%	100%
Irrigation	95%	95%	100%

Notes:

(1) Water use per ERU declines by one percent annual from the current of 195 gpd/ERU until a minimum water use of 172 gpd/ERU is reached.

4.8.2 Large User Demand Forecast

Large users class was created from the largest water users in the system as presented in Section 4.1.1. The City identified fourteen customers consuming a large annual volume of water. The large users represented commercial, manufacturing and industrial, master metered residential communities, and an academic institution. An individual demand forecast was created for each large user to aid in accurate forecasting and in the system analyses. The forecasts were based on historical water use data from 2008 through 2013.

The large user demands projections are presented in Table 4.12. The table provides for each large user the customer classes, service area, historical water use statistic used in the projection, and the projected 2035 demands. The projected demands were based on a representative water use from the historical period of record. The table provides the number of ERUs for all demand scenarios. The presented ADD and MDD represent the medium and high demand scenarios. Large Users are expected to engage in WUE activities; therefore the projected demand for the low demand scenario will be less than presented in Table 4.12.

Table 4.12 Large User Demand Projections
Comprehensive Water Plan
City of Auburn

Large User	Customer Class	Service Area	Representative Historical Water Use Statistic(1)	Representative Water Use (gpd)(2)	Projected ERUs in 2035
Boeing Company: Fabrication Division	Mfg/Industry, Commercial	Valley	Maximum	568,172	2,914
Muckleshoot Casino	Commercial	Academy	Maximum	117,155	690
Emerald Downs	Commercial	Valley	75th Percentile	109,185	560
Walmart/ Supermall Way	Commercial	Valley	75th Percentile	51,880	266
Adventist Academy	Schools, Multifamily	Academy	75th Percentile	42,756	219
Safeway Auburn Distribution Center	Commercial	Valley	75th Percentile	28,034	144
Auburn Dairy Products, Inc.	Mfg/Industry	Valley	75th Percentile	20,087	103
MultiCare Auburn Medical Center	Commercial	Valley	75th Percentile	49,252	253
Auburn Manor	Multifamily	Valley	75th Percentile	43,202	222
Rio Verde Mobile Estates	Multifamily	Valley	75th Percentile	40,653	209

Table 4.12	Large User Demand Projections Comprehensive Water Plan City of Auburn				
White River Estates	Multifamily	Valley	75th Percentile	40,893	210
Forest Villa Manor (PIC)	Multifamily	Academy	75th Percentile	28,969	149
Tall Cedars Mobile Home Community	Multifamily	Valley	75th Percentile	20,517	105
Leisure Manor	Multifamily	Valley	75th Percentile	15,605	80
Total				**1,176,359**	**6,122**

Notes:

(1) Historical water use data from 2008 through 2013.

(2) Based on representative historical water use statistic.

(3) Muckleshoot Casino demands increased from the historical maximum by 17,401 gpd or 43 ERUs in 2025, which represent an additional commercial area of the casino (i.e. restaurants, bars, shops, hotel, etc.).

The majority of large users were projected to continue using existing levels of water use. Consistent with the overall demand projections this was represented by the 75th percentile of the historical data. Boeing and Muckleshoot Casino are projected to use the maximum water use during the 2008 to 2013 period into the future, which provides a conservative projection for the two largest system demands. The higher demand provides a conservative estimate of these important users. Additionally, the Muckleshoot Casino demands were projected to increase during the long-term scenario (2025 – 2035) representing increased water use from an additional commercial complex for of the casino (i.e. restaurants, bars, shops, hotel, etc.). While the City is not aware of any active projects, this commercial complex has been discussed in the past and therefore included in the long-term projections. The new complex increases the Muckleshoot Casino's ERUs from 589 to 676 in 2025, which represents an approximately 17,400 gpd increase. These demands were projected using the DOH Water System Design Handbook (2009).

4.8.3 Projected Retail ERUs

Future water system demands are based on projected ERUs, which in turn are based on the projected water consumption by customer classification and the projected number of accounts discussed earlier in this chapter. Table 4.13 shows the projected ERUs for the City's individual service areas over the planning period and for the anticipated ultimate demand. The projected number of ERUs for each Service Area was calculated by multiplying the projected number of accounts, provided in Table 4.10, by the number of ERUs per account, as summarized in Table 4.3, for each customer class. It does not include distribution leakage, unmetered water use, or wholesale customer demand.

Table 4.13 ERU Projections by Customer Class and Service Area – Medium Water Use Scenario
Comprehensive Water Plan
City of Auburn

	2015 ERU	2021 ERU	2025 ERU	2035 ERU	Ultimate ERU
Lea Hill					
Single-family/Duplex	3,942	4,273	4,493	4,971	4,971
Multifamily	1,369	1,489	1,564	1,727	2,929
Commercial	81	90	103	111	120
Mfg/Industry	34	50	50	67	67
Schools	111	111	111	128	128
City Accounts	6	6	6	6	6
Irrigation	286	325	360	400	426
Large Users	0	0	0	0	0
Valley					
Single-family/Duplex	5,261	5,261	5,261	5,261	8,985
Multifamily	4,377	5,037	5,679	6,585	6,585
Commercial	4,898	5,727	7,165	8,119	9,252
Mfg/Industry	674	723	772	871	937
Schools	445	480	516	569	604
City Accounts	74	79	85	94	100
Irrigation	1,577	1,796	2,134	2,402	2,692
Large Users	5,064	5,064	5,064	5,064	5,064
Lakeland Hills					
Single-family/Duplex	1,167	1,337	1,437	1,519	2,277
Multifamily	278	278	278	278	1,486
Commercial	59	71	80	97	140
Mfg/Industry	34	34	34	34	34
Schools	74	92	92	92	110
City Accounts	3	6	6	6	6
Irrigation	143	165	187	222	314
Large Users	0	0	0	0	0
Academy					
Single-family/Duplex	1,184	1,207	1,222	1,342	2,865
Multifamily	635	648	654	723	1,887
Commercial	126	148	169	191	285

Table 4.13 ERU Projections by Customer Class and Service Area – Medium Water Use Scenario Comprehensive Water Plan City of Auburn					
	2015 ERU	**2021 ERU**	**2025 ERU**	**2035 ERU**	**Ultimate ERU**
Mfg/Industry	34	34	34	50	67
Schools	111	111	111	111	128
City Accounts	9	9	9	9	9
Irrigation	120	142	164	181	273
Large Users	969	969	1,058	1,058	1,058
Total					
Single-family/Duplex	11,554	12,078	12,413	13,093	19,098
Multifamily	6,659	7,452	8,175	9,313	12,885
Commercial	5,164	6,036	7,517	8,517	9,797
Mfg/Industry	775	841	890	1,022	1,104
Schools	740	793	829	899	970
City Accounts	92	100	106	115	121
Irrigation	2,125	2,428	2,845	3,205	3,705
Large Users	6,033	6,033	6,122	6,122	6,122

4.8.4 Projected Retail Average Day and Maximum Day Demands

The ADD projections include the projected customer demands, unmetered use, and DSL. The customer demands were calculated by multiplying the projected ERUs shown in Table 4.13 by the average ERU water use (195 gpd/ERU). The unmetered water use, or authorized consumption, was estimated using the City's historical records. The City has accounted for an average of 0.03 mgd of unmetered use from 2008 through 2013. This equates to 0.44 percent of the retail water sales during the same time (5.99 mgd) as shown in Table 4.2. ADD projections were calculated by summing the customer demands, unmetered use, and applying a DSL as a percentage of total ADD. The following equation demonstrates this calculation:

$$\text{2035 ADD} = \frac{\text{(Customer Demands)} + \text{(Unmetered Use)}}{\text{(1 - DSL)}} = \frac{\text{8.25 mgd} + \text{0.04 mgd}}{(1 – 0.095)} = \text{9.15 mgd}$$

In this way, ADD projections were developed for the low, medium, and high demand scenarios. The resulting ADD projections are shown summarized in Table 4.14. The projected MDD is simply the projected ADD multiplied by the low, medium, and high MDD/ADD peaking factors shown in Table 4.11. The medium MDD projections are summarized in Table 4.15. The projected retail ADD and MDD for the low and high demand scenarios are provided in Appendix E.

Table 4.14 ADD Projections – Medium Water Use Scenario Comprehensive Water Plan City of Auburn					
	2015 (mgd)	**2021 (mgd)**	**2025 (mgd)**	**2035 (mgd)**	**Ultimate (mgd)**
Lea Hill					
Single-family/Duplex	0.769	0.833	0.876	0.969	0.969
Multifamily	0.267	0.29	0.305	0.337	0.571
Commercial	0.016	0.017	0.02	0.022	0.023
Mfg/Industry	0.007	0.01	0.01	0.013	0.013
Schools	0.022	0.022	0.022	0.025	0.025
City Accounts	0.001	0.001	0.001	0.001	0.001
Irrigation	0.056	0.063	0.07	0.078	0.083
Large Users	0	0	0	0	0
Unmetered	0.005	0.005	0.006	0.006	0.007
DSL	0.12	0.13	0.137	0.152	0.178
Valley					
Single-family/Duplex	1.026	1.026	1.026	1.026	1.752
Multifamily	0.854	0.982	1.107	1.284	1.284
Commercial	0.955	1.117	1.397	1.583	1.804
Mfg/Industry	0.131	0.141	0.151	0.17	0.183
Schools	0.087	0.094	0.101	0.111	0.118
City Accounts	0.014	0.015	0.017	0.018	0.019
Irrigation	0.308	0.35	0.416	0.468	0.525
Large Users	0.988	0.988	0.988	0.988	0.988
Unmetered	0.019	0.021	0.023	0.025	0.029
DSL	0.46	0.497	0.548	0.596	0.704
Lakeland Hills					
Single-family/Duplex	0.228	0.261	0.28	0.296	0.444
Multifamily	0.054	0.054	0.054	0.054	0.29
Commercial	0.011	0.014	0.016	0.019	0.027
Mfg/Industry	0.007	0.007	0.007	0.007	0.007
Schools	0.014	0.018	0.018	0.018	0.021
City Accounts	0.001	0.001	0.001	0.001	0.001
Irrigation	0.028	0.032	0.036	0.043	0.061
Large Users	0	0	0	0	0
Unmetered	0.002	0.002	0.002	0.002	0.004
DSL	0.036	0.041	0.043	0.046	0.09

Table 4.14 ADD Projections – Medium Water Use Scenario
Comprehensive Water Plan
City of Auburn

	2015 (mgd)	2021 (mgd)	2025 (mgd)	2035 (mgd)	Ultimate (mgd)
Academy					
Single-family/Duplex	0.231	0.235	0.238	0.262	0.559
Multifamily	0.124	0.126	0.128	0.141	0.368
Commercial	0.025	0.029	0.033	0.037	0.056
Mfg/Industry	0.007	0.007	0.007	0.01	0.013
Schools	0.022	0.022	0.022	0.022	0.025
City Accounts	0.002	0.002	0.002	0.002	0.002
Irrigation	0.023	0.028	0.032	0.035	0.053
Large Users	0.189	0.189	0.206	0.206	0.206
Unmetered	0.003	0.003	0.003	0.003	0.006
DSL	0.066	0.067	0.07	0.075	0.135
Total					
Single-family/Duplex	2.253	2.355	2.42	2.553	3.724
Multifamily	1.299	1.453	1.594	1.816	2.513
Commercial	1.007	1.177	1.466	1.661	1.91
Mfg/Industry	0.151	0.164	0.174	0.199	0.215
Schools	0.144	0.155	0.162	0.175	0.189
City Accounts	0.018	0.02	0.021	0.022	0.024
Irrigation	0.414	0.473	0.555	0.625	0.723
Large Users	1.176	1.176	1.194	1.194	1.194
Unmetered	0.029	0.031	0.034	0.036	0.046
DSL	0.681	0.735	0.8	0.869	1.106

Table 4.15 MDD Projections – Medium Water Use Scenario
Comprehensive Water Plan
City of Auburn

	2015 (mgd)	2021 (mgd)	2025 (mgd)	2035 (mgd)	Ultimate (mgd)
Lea Hill					
Single-family/Duplex	1.399	1.516	1.595	1.764	1.764
Multifamily	0.486	0.528	0.555	0.613	1.039
Commercial	0.029	0.032	0.036	0.039	0.043
Mfg/Industry	0.012	0.018	0.018	0.024	0.024
Schools	0.039	0.039	0.039	0.045	0.045
City Accounts	0.002	0.002	0.002	0.002	0.002
Irrigation	0.101	0.115	0.128	0.142	0.151
Large Users	0	0	0	0	0
Unmetered	0.009	0.01	0.01	0.012	0.014
DSL	0.218	0.237	0.25	0.277	0.324
Valley					
Single-family/Duplex	1.867	1.867	1.867	1.867	3.189
Multifamily	1.553	1.788	2.015	2.337	2.337
Commercial	1.738	2.032	2.543	2.881	3.284
Mfg/Industry	0.239	0.257	0.274	0.309	0.333
Schools	0.158	0.17	0.183	0.202	0.214
City Accounts	0.026	0.028	0.03	0.033	0.035
Irrigation	0.56	0.638	0.758	0.853	0.955
Large Users	1.797	1.797	1.797	1.797	1.797
Unmetered	0.035	0.038	0.042	0.045	0.054
DSL	0.837	0.904	0.998	1.084	1.28
Lakeland Hills					
Single-family/Duplex	0.414	0.475	0.51	0.539	0.808
Multifamily	0.099	0.099	0.099	0.099	0.527
Commercial	0.021	0.025	0.028	0.034	0.05
Mfg/Industry	0.012	0.012	0.012	0.012	0.012
Schools	0.026	0.033	0.033	0.033	0.039
City Accounts	0.001	0.002	0.002	0.002	0.002
Irrigation	0.051	0.058	0.066	0.079	0.111
Large Users	0	0	0	0	0
Unmetered	0.003	0.003	0.003	0.004	0.007
DSL	0.066	0.074	0.079	0.084	0.163

Table 4.15 MDD Projections – Medium Water Use Scenario Comprehensive Water Plan City of Auburn					
	2015 (mgd)	**2021 (mgd)**	**2025 (mgd)**	**2035 (mgd)**	**Ultimate (mgd)**
Academy					
Single-family/Duplex	0.42	0.428	0.434	0.476	1.017
Multifamily	0.225	0.23	0.232	0.257	0.67
Commercial	0.045	0.052	0.06	0.068	0.101
Mfg/Industry	0.012	0.012	0.012	0.018	0.024
Schools	0.039	0.039	0.039	0.039	0.045
City Accounts	0.003	0.003	0.003	0.003	0.003
Irrigation	0.042	0.05	0.058	0.064	0.097
Large Users	0.344	0.344	0.375	0.375	0.375
Unmetered	0.005	0.005	0.005	0.006	0.01
DSL	0.119	0.122	0.128	0.137	0.246
Total					
Single-family/Duplex	4.1	4.287	4.405	4.647	6.778
Multifamily	2.363	2.645	2.901	3.305	4.573
Commercial	1.833	2.142	2.668	3.023	3.477
Mfg/Industry	0.275	0.298	0.316	0.363	0.392
Schools	0.263	0.282	0.294	0.319	0.344
City Accounts	0.033	0.036	0.038	0.041	0.043
Irrigation	0.754	0.862	1.01	1.137	1.315
Large Users	2.141	2.141	2.173	2.173	2.173
Unmetered	0.052	0.056	0.061	0.066	0.084
DSL	1.24	1.338	1.455	1.582	2.013

4.8.5 Wholesale Demands

The City currently has wholesale water contracts with the City of Algona, Covington Water District (CWD), and King County Water District 111 (WD#111). The City is also planning to supply wholesale water for the Muckleshoot Indian Tribe's future fish hatchery. As stated in the Retail Water Service Policy, "the City will plan for and provide water service to all retail customers and wholesale customers with firm contracts. As supply permits, the City may provide water to wholesale customers without firm contracts unilaterally or as part of a capital improvement partnership agreement." The wholesale demands for the City are shown in Table 4.16.

Algona's current agreement allows for the sale of up to 525,000 gallons per day on a firm basis for the ADD and up to 1,114,00 gallons per day on a firm basis for the MDD. In 2013, Algona purchased an average of 325,690 gallons per day of water from the City. Algona's 2013 Water System Plan (WSP) projects 2032 ADD to be 413,067 gallons per day and 2032 MDD to be

1,032,668 gallons per day. The 2002 firm wholesale agreement expires at the end of 2014. Algona's WSP demand projections were used for projecting the wholesale water purchases by Algona, rather than the contractual amount, as shown in Table 4.16. The demands are projected to 2028 based on the assumption that the contract will be renewed and will continue after 2014.

Muckleshoot Indian Tribe plans to develop a fish hatchery on the White River. An agreement dated from 1986 (included in Appendix D) requires that the City provide the tribe with an average annual demand of 3.9 cfs (2.52 mgd) from Coal Creek Springs for the MIT's future fishery enhancement purposes. The agreement does not specify a MDD but rather states:

"The Tribe and the City agree to work in harmony toward a mutually satisfactory allocation of the Coal Creek waters. In furtherance of this goal, the City understands that the water requirements for fishery enhancement purposes are greatest in the winter and spring months. Accordingly, the City agrees to increase the amount of water above 3.9 cfs as needed for fishery purposes. The tribe understands that the City's requirement for water for domestic uses are greatest in the summer and fall months. Accordingly, the Tribe aggress to decrease its use of water below 3.9 cfs, as needed for domestic water purposes…It is further understood that the tribe requires a minimum of 3 cfs at all times for fishery enhancement purposes".

The intent of this agreement seems to indicate that the MIT demand will be at a minimum when the City's demands are at their maximum. Based on this understanding, the planned MDD for the MIT is 1.5 mgd and the ADD was 2.5 mgd. For planning purposes, the MIT demand was added to the Algona demand and included in the "Retail + firm wholesale" group of demands.

CWD and WD#111 have an interruptible (non-firm) wholesale contract that can be terminated at anytime and therefore represented separately. As discussed in the Historical Wholesale Water section, CWD has not purchased wholesale water in recent years. WD#111 currently purchases wholesale water to supplement its wells; however, low demand has substantially reduced purchases in recent years. Both CWD and WD#111 may purchase up to 2.5 mgd each of wholesale water per the Interlocal Agreement 2. The contract does not have an expiration date and therefore 5 mgd of interruptible wholesale demand is projected through 2035.

Table 4.16	Wholesale Water Demand Projections Comprehensive Water Plan City of Auburn						
Wholesale Customer	**Service Area**	**Contractual Delivery(1)**	**2015 (mgd)**	**2021 (mgd)**	**2025 (mgd)**	**2035 (mgd)**	**Ultimate (mgd)**
ADD							
Algona	Valley	Firm	0.35	0.37	0.39	0.43	0.53
MIT(2)	Valley	Firm	2.50	2.50	2.50	2.50	2.50
KCWD #111	Lea Hill	Non-Firm	2.50	2.50	2.50	2.50	2.50
CWD	Lea Hill	Non-Firm	2.50	2.50	2.50	2.50	2.50
MDD							
Algona	Valley	Firm	0.88	0.92	0.96	1.06	1.11
MIT	Valley	Non-Firm	1.50	1.50	1.50	1.50	1.50
KCWD #111	Lea Hill	Non-Firm	2.50	2.50	2.50	2.50	2.50
CWD	Lea Hill	Non-Firm	2.50	2.50	2.50	2.50	2.50

Notes:

(1) The City will plan for and provide water service to all retail customers and wholesale customers with firm contracts. As supply permits, the City may provide water to wholesale customers without firm contracts unilaterally or as part of a capital improvement partnership agreement.

(2) Muckleshoot Indian Tribe.

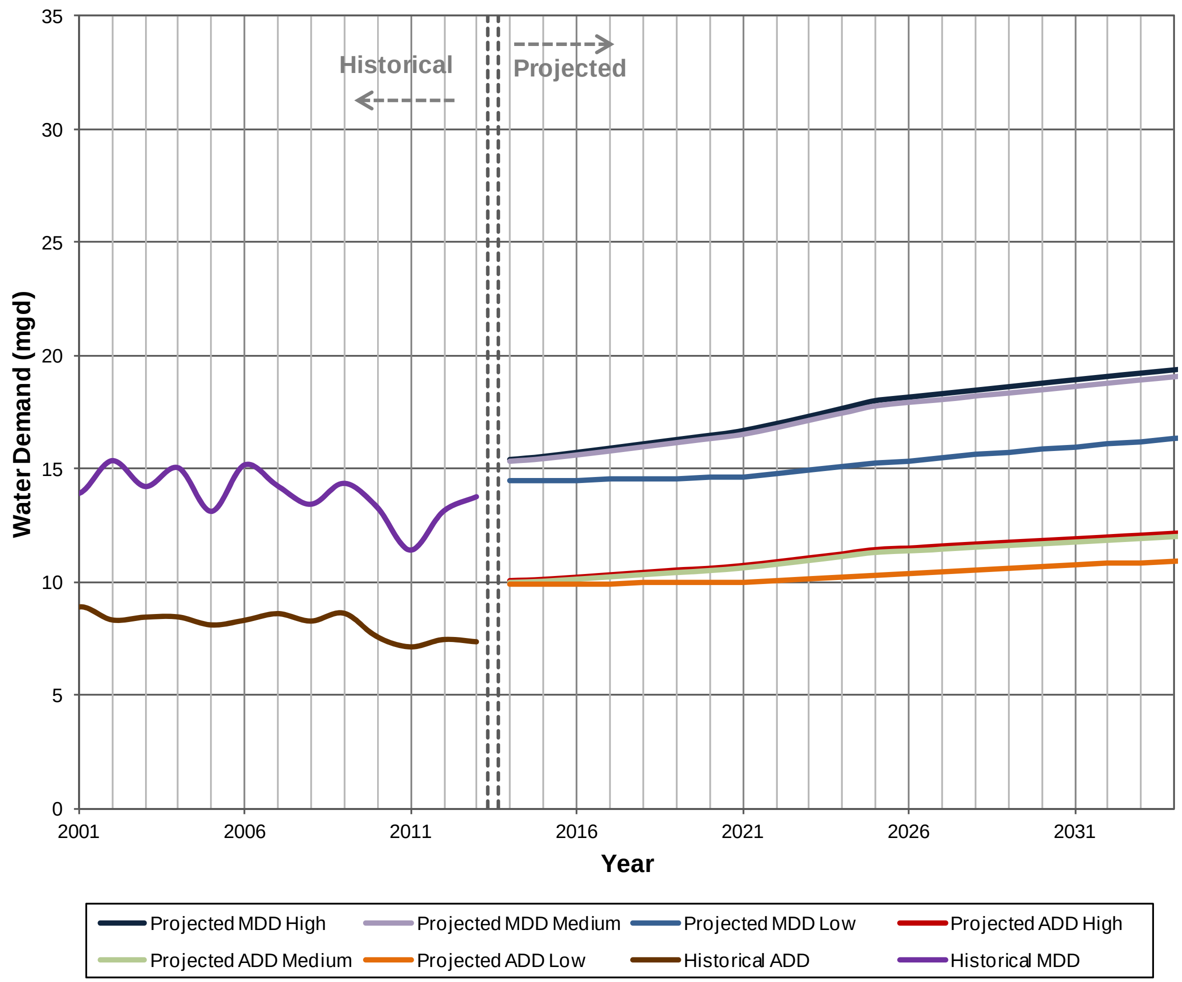
4.8.6 Total Demands

The total projected demands were tabulated for retail customers, firm wholesale, and interruptible wholesale in Table 4.17. The demands are presented separately to show the level of obligation to the City's customers. Projected retail ADD, MDD, and ERUs are presented by Service Area for the medium demand scenario. Additionally, the ADD and MDD are presented as the total of the projected retail demand and firm wholesale. The retail with firm wholesale represents the projected demand that is used as the basis for the system analysis and are shown in Figure 4.8. The difference between the historical demands and projected demands is largely due to the projected allocation of the supply to the proposed MIT Fish Hatchery, per the 1986 Stipulation Settlement Agreement.

In 2015, the retail customers for the entire water system is projected to have an ADD of 7.17 mgd. The 2035 retail ADD demand is projected at 9.15, which is a 28 percent increase from 2015. Throughout the planning period, approximately half of the City's demand may be from wholesale purchases when both firm and interruptible supply are considered. The MDD is projected to increase for the sum of firm wholesale customers and retail customers from 13.06 mgd in 2015 to 16.66 mgd in 2035, which is an increase of 26 percent.

Table 4.17 ADD, MDD, and ERUs Summarized for Each Service Area with Wholesale Included
Comprehensive Water Plan
City of Auburn

Area	2015 (mgd)	2021 (mgd)	2025 (mgd)	2035 (mgd)	Ultimate (mgd)
Lea Hill					
Average Day Demand, mgd	1.26	1.37	1.45	1.60	1.87
Maximum Day Demand, mgd	2.30	2.50	2.63	2.92	3.41
Equivalent Residential Units	5,829	6,343	6,687	7,411	8,647
Valley					
Average Day Demand, mgd	4.84	5.23	5.77	6.27	7.41
Maximum Day Demand, mgd	8.81	9.52	10.51	11.41	13.48
Equivalent Residential Units	22,370	24,169	26,677	28,964	34,218
Lakeland Hills					
Average Day Demand, mgd	0.38	0.43	0.46	0.49	0.94
Maximum Day Demand, mgd	0.69	0.78	0.83	0.89	1.72
Equivalent Residential Units	1,757	1,983	2,113	2,247	4,366
Academy					
Average Day Demand, mgd	0.69	0.71	0.74	0.79	1.42
Maximum Day Demand, mgd	1.26	1.29	1.35	1.44	2.59
Equivalent Residential Units	3,187	3,266	3,419	3,665	6,572
Total Retail Customers					
Average Day Demand, mgd	7.17	7.74	8.42	9.15	11.64
Maximum Day Demand, mgd	13.06	14.09	15.32	16.66	21.20
Equivalent Residential Units	33,142	35,761	38,897	42,287	53,803
Retail With Firm Wholesale (Algona)					
Average Day Demand, mgd	10.02	10.61	11.31	12.01	14.51
Maximum Day Demand, mgd	15.44	16.51	17.78	19.22	23.61
Retail With Firm & Interruptible Wholesale (CWD and KCWD #111)					
Average Day Demand, mgd	15.02	15.61	16.31	17.01	19.51
Maximum Day Demand, mgd	20.44	21.51	22.78	24.22	28.61



PROJECTED RETAIL PLUS FIRM WHOLESALE ADD AND MDD

FIGURE 4.8

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

Chapter 5
EXISTING SYSTEM

5.1 INTRODUCTION

The City of Auburn, WA (City) owns and operates a multi-source municipal water system (Department of Health (DOH) System Number 03350V), which includes supply, treatment, storage, and distribution of potable water to residential, commercial, and wholesale customers. Service is provided to four major service areas, which are further divided into pressure zones as required by local topography. The City's four major service areas and the location of key elements of the water system are shown in Figure 5.1 and discussed in this chapter. Figure 5.2 presents an overall hydraulic profile of the system and its various elements.

This Chapter reviews all of the facilities incorporated in the water supply system. A brief summary of each facility is provided, followed by a review of system components evaluated against the established policies and criteria standards (discussed in Chapter 3).

5.2 SERVICE AREAS

The City's existing water system has four major service areas organized by system pressure zones. The largest of the service areas is the Valley Service Area. Development of the City water utility began within this area, and other portions of the system were added as the City grew and demands for municipally supplied water expanded. Figure 5.3 presents the existing system pressure zones that make up the service areas. Table 5.1 lists the pressure zones in each service area, their nominal hydraulic grade line (HGL), and the minimum and maximum elevation served. A description of each Service Area is provided in this section.

5.2.1 Valley Service Area

The Valley Service Area is the City's oldest and largest service area. As the lowest service area in the system, the area consists of the broad valley floor between the White River to the south, the Green River to the east, and Mill Creek to the west. The Valley Service Area includes the majority of the City's commercial and industrial customers, as well as a significant portion of the City's residential customers.

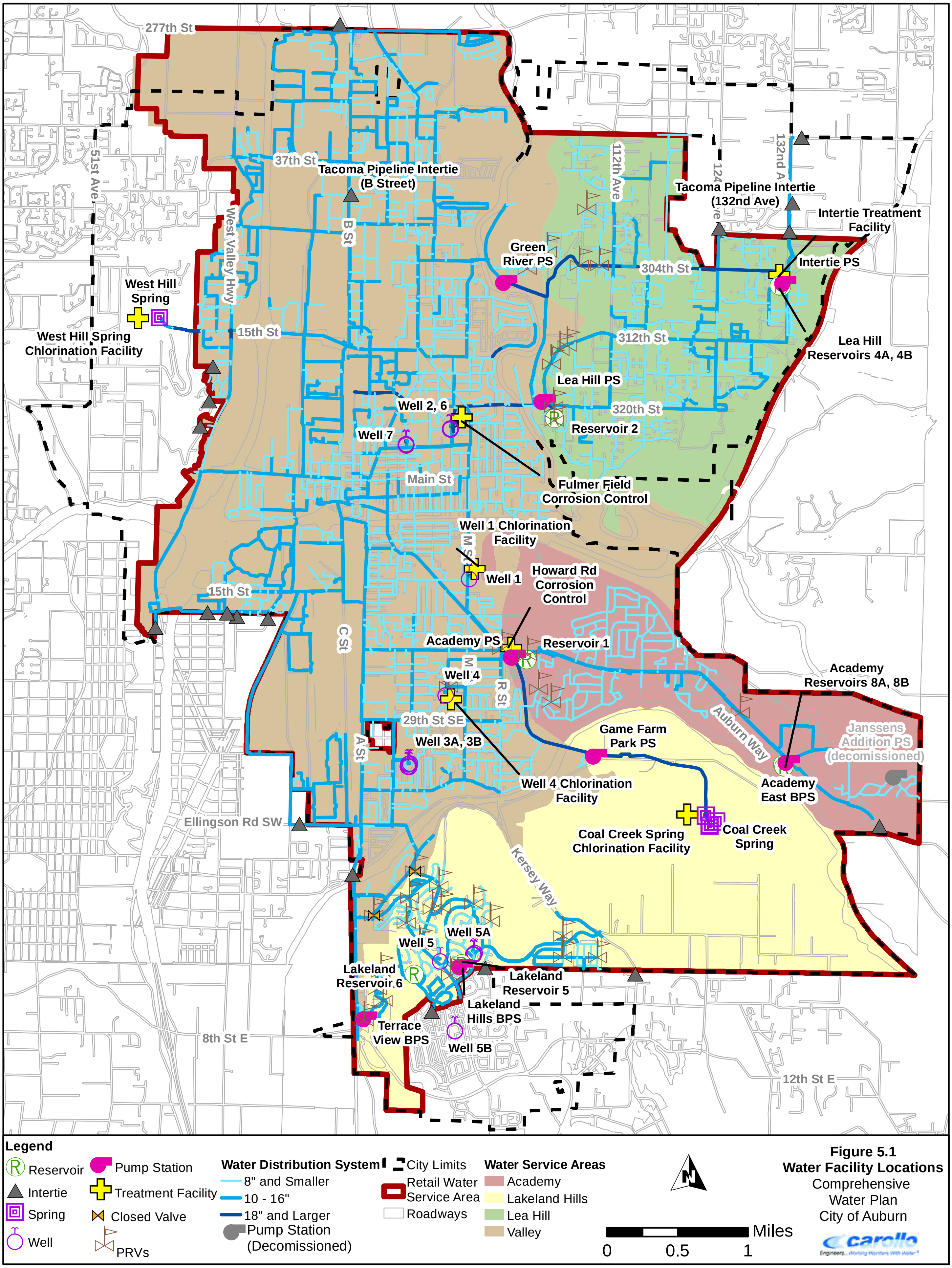


Figure 5.1
Water Facility Locations
Comprehensive
Water Plan
City of Auburn

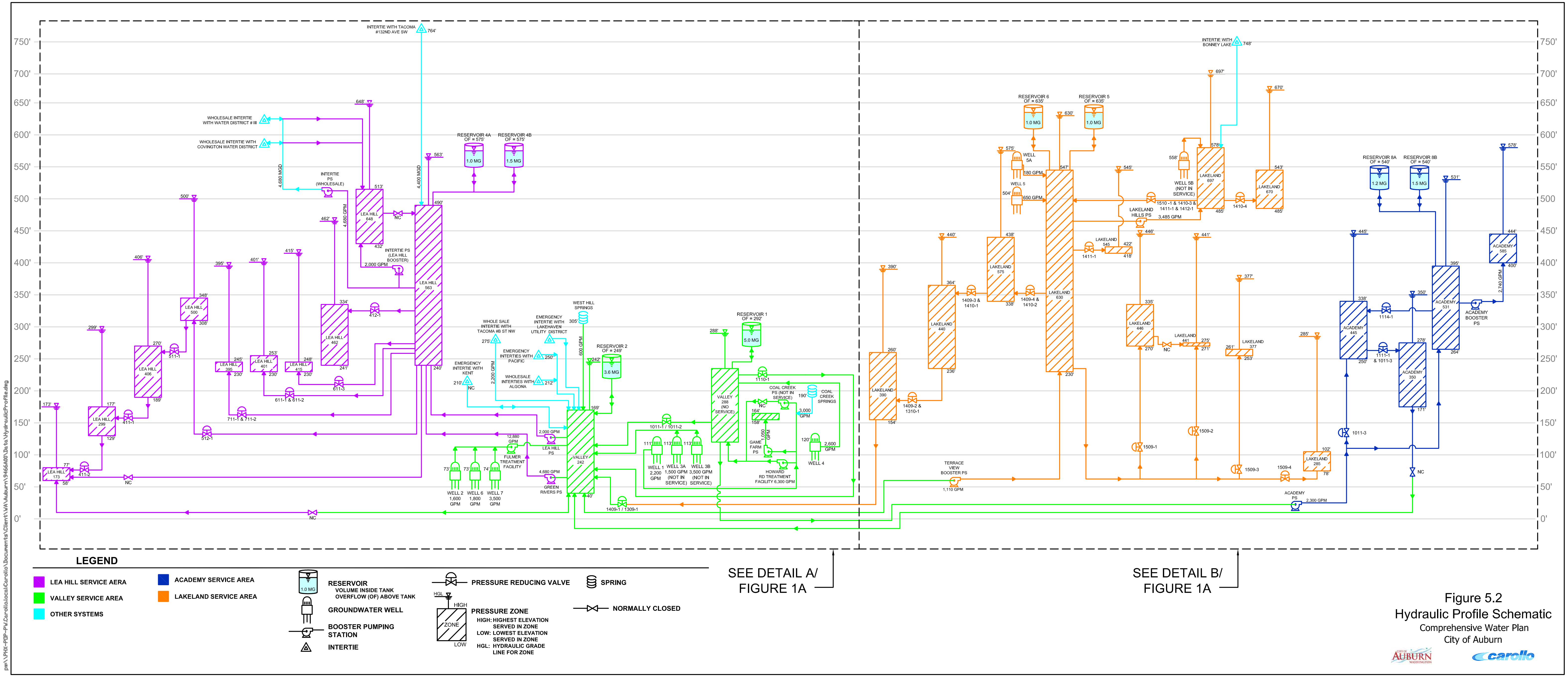


Figure 5.2
Hydraulic Profile Schematic
Comprehensive Water Plan
City of Auburn

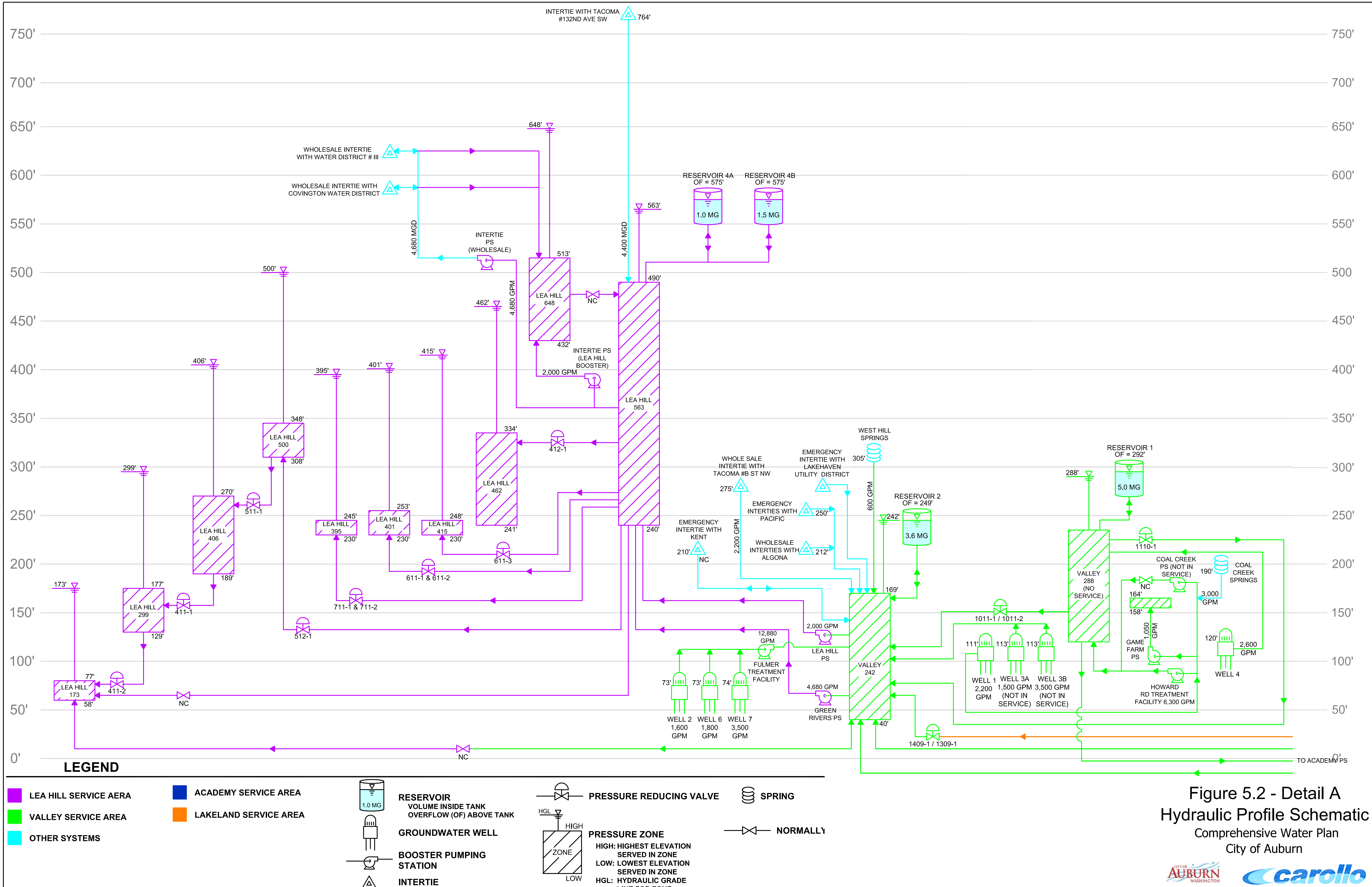


Figure 5.2 - Detail A
Hydraulic Profile Schematic
Comprehensive Water Plan
City of Auburn

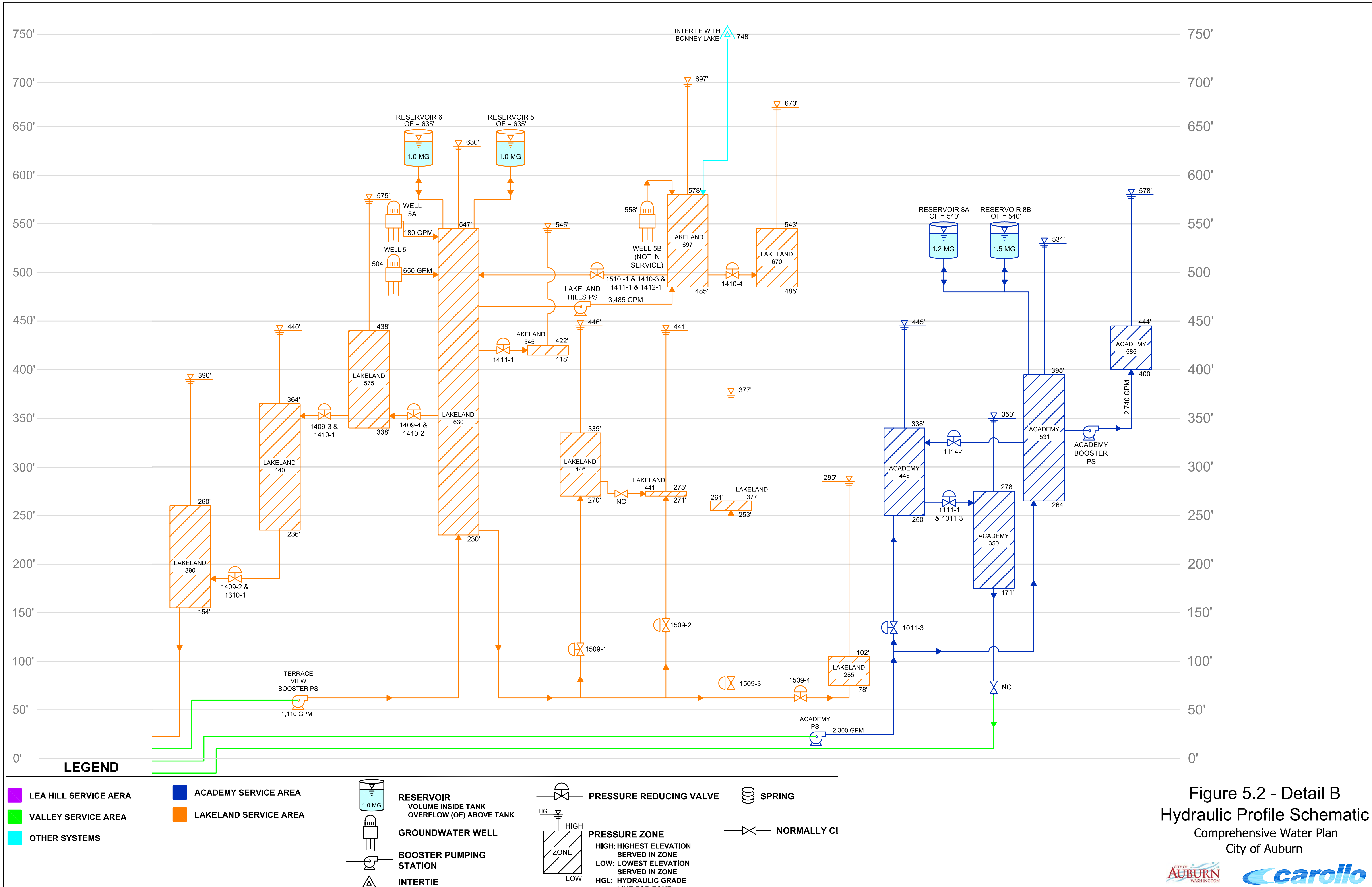


Figure 5.2 - Detail B
Hydraulic Profile Schematic
Comprehensive Water Plan
City of Auburn

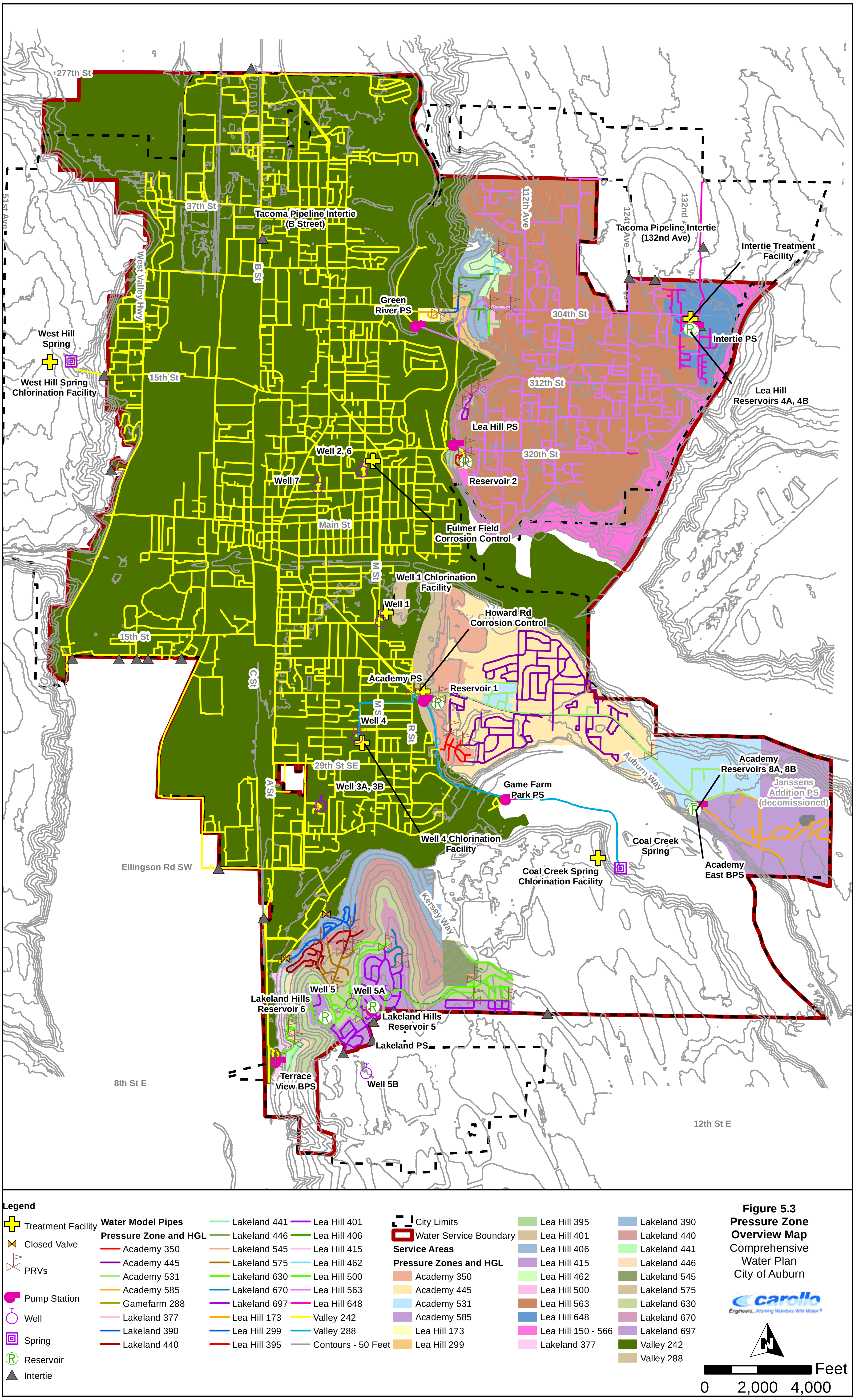


Figure 5.3
Pressure Zone Overview Map
Comprehensive Water Plan
City of Auburn

Table 5.1 Pressure Zones
Comprehensive Water Plan
City of Auburn

Pressure Zone	Water Service Area	Hydraulic Grade Line, ft	Maximum Elevation Served, ft (Static Pressure)	Minimum Elevation Served, ft (Static Pressure)
Academy 350	Academy	350	275 (32 psi)	171 (77 psi)
Academy 445	Academy	445	338 (46 psi)	250 (84 psi)
Academy 531	Academy	531	395 (59 psi)	259 (118 psi)
Academy 585	Academy	585	444 (61 psi)	400 (80 psi)
Lakeland 285	Lakeland	285	102 (79 psi)	78 (90 psi)
Lakeland 377	Lakeland	377	242 (58 psi)	261 (50 psi)
Lakeland 390	Lakeland	390	260 (56 psi)	154 (102 psi)
Lakeland 440	Lakeland	440	364 (33 psi)	236 (88 psi)
Lakeland 441	Lakeland	441	261 (78 psi)	247 (84 psi)
Lakeland 446	Lakeland	446	335 (48 psi)	225 (96 psi)
Lakeland 545	Lakeland	545	422 (53 psi)	418 (55 psi)
Lakeland 575	Lakeland	575	438 (59 psi)	340 (102 psi)
Lakeland 630	Lakeland	630	544 (37 psi)	230 (173 psi)
Lakeland 670	Lakeland	670	543 (55 psi)	485 (80 psi)
Lakeland 697	Lakeland	697	578 (52 psi)	485 (92 psi)
Lea Hill 173	Lea Hill	173	77 (42 psi)	58 (50 psi)
Lea Hill 299	Lea Hill	299	177 (53 psi)	129 (74 psi)
Lea Hill 395	Lea Hill	395	245 (65 psi)	230 (71 psi)
Lea Hill 401	Lea Hill	401	253 (64 psi)	230 (74 psi)
Lea Hill 406	Lea Hill	406	270 (59 psi)	189 (94 psi)
Lea Hill 415	Lea Hill	415	248 (72 psi)	230 (80 psi)
Lea Hill 462	Lea Hill	462	334 (55 psi)	286 (76 psi)
Lea Hill 500	Lea Hill	500	348 (66 psi)	308 (83 psi)
Lea Hill 563	Lea Hill	563	491 (31 psi)	209 (153 psi)
Lea Hill 648	Lea Hill	648	513 (58 psi)	401 (107 psi)
Lea Hill 150-566	Lea Hill	566	None	None
Valley 242	Valley	242	144 (42 psi)	39 (88 psi)
Valley 288	Valley	288	235 (23 psi)	118 (74 psi)

The Valley Service Area is currently connected to the Lea Hill, Academy, and Lakeland Hills Service Areas through a series of booster pumps, valves, and pressure reducing valves (PRVs). Water to serve the Valley and other Service Areas comes from the two spring sources, Valley Well Field and the B Street Wholesale Intertie with Tacoma Public Utilities (TPU), as described in Chapter 6.

The Valley Service Area has two large reservoirs (Reservoirs 1 and 2) and two treatment sites, Howard Road Corrosion Control Treatment (CCT) Facility and Fulmer Field CCT Facility. There are active interties in the Valley Service Area to Algona, as well as emergency interties with Pacific, Lakehaven, and Kent.

The Valley Service Area consists of service mainly in one pressure zone, with a nominal HGL of 242 feet. Ground elevations in the area vary from 39 to 144 feet. Wells 1, 3A, 3B, and West Hill Spring directly serve the Valley 242 Pressure Zone. Wells 2, 6, and 7 are treated at the Fulmer Field CCT Facility and are pumped to the Valley 242 Pressure Zone. The Valley Service Area contains a small boosted zone at the elevation of Reservoir 1 (288 feet), as seen in Figure 5.3. Coal Creek Springs is treated at the Howard Road CCT Facility and then re-pumped to the Valley 288 Pressure Zone. Well 4 is pumped directly to Reservoir 1 and the Valley 288 Pressure Zone. Well 1 has historically discharged directly into the Valley 242 Pressure Zone, but will be routed to the Howard Road CCT Facility upon completion of the ongoing improvements. The Valley Service Area contains another small boosted zone at the Game Farm Park.

5.2.2 Lea Hill Service Area

The Lea Hill Service Area is the City's second largest service area based on consumption. Located east of the Valley Service Area on the East Hill Plateau, the largely residential area was constructed in the mid-1960s. The service area was largely annexed into the City in 2008; however, limited areas along the eastern and southern borders remain in unincorporated King County. Water is supplied to serve the area from the 132nd Ave SE Intertie and from the Valley 242 Pressure Zone through the Lea Hill Booster Pump Station and the Green River Pump Station.

A booster pump station, the Intertie Pump Station, provides water through an intertie to neighboring water purveyors, King County Water District #111 (WD #111) and Covington Water District (CWD). The Intertie Treatment Facility near the reservoirs provides treatment to the intertie supply.

The Lea Hill Service Area’s largest pressure zone operates at a nominal HGL of 563 feet, maintained by Lea Hill Reservoirs (4A and 4B). Other pressure zones in this area can be seen in Figure 5.4. Ground elevations in the Lea Hill Service Area vary from 58 to 513 feet. As seen on Figure 5.2, the Lea Hill Service Area includes several sub-zones to provide suitable service pressures to customers located at lower elevations.

In addition, one boosted sub-zone operating at an HGL of 648 feet is provided to serve a higher elevation area.

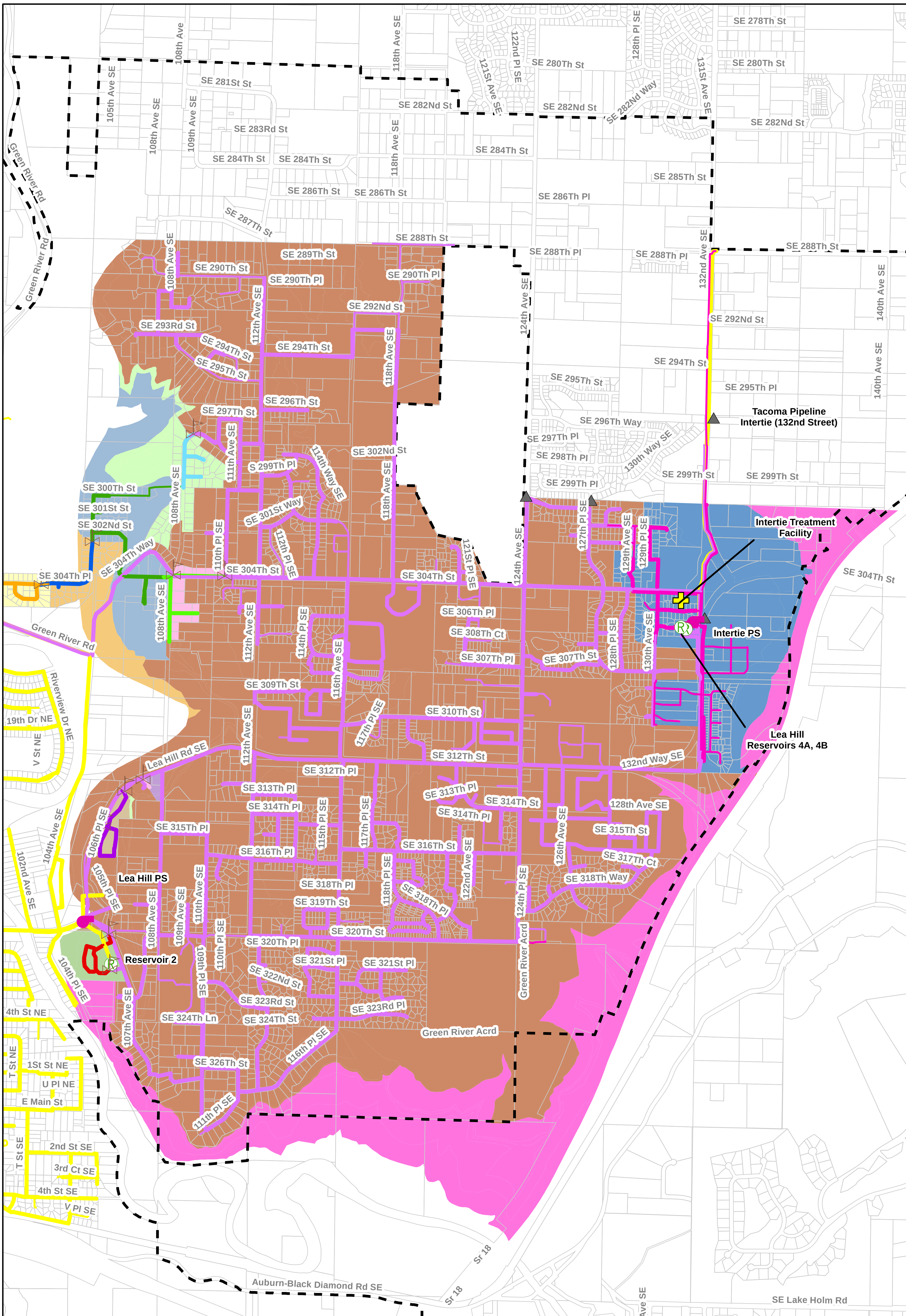
5.2.3 Academy Service Area

The Academy Service Area is located along SR 164 on the Enumclaw Plateau, southeast of the Valley Service Area. The system was constructed in the early 1960s and is the City's third largest service area based on consumption. Water is supplied to serve this area via two booster pump stations that bring a portion of the water produced in the Valley up to the elevation of the Academy Service area. Academy Reservoirs (8A and 8B) provide storage to the service area.

The pressure zones in the Academy Service Area have recently been reconfigured and simplified, as the City has completed a Pressure Rezone since the last capital improvement plan. The Academy Service Area's pressure zones are shown in Figure 5.5. As seen in Figure 5.2, the nominal HGL of the main Academy pressure zone is 531 feet, maintained by the two Academy storage reservoirs operating together. Ground elevations in the Academy pressure zones vary from 171 to 444 feet. The service area includes a large sub-zone at 445 feet and two smaller sub-zones to serve local developments that would experience high pressures if served directly from the 531 foot HGL. Additionally, the service area has a boosted zone served by the Academy East Booster Pump Station commissioned in 2014. The Janssen's Addition Booster Pump Station was decommissioned with the completion of the Academy East Booster Pump Station.

5.2.4 Lakeland Hills Service Area

The City's newest service area is the Lakeland Hills Service Area. Constructed in the early 1980s, the Lakeland Hills system is located south of the Valley Service Area and primarily serves residential customers south of the White River. Wells 5 and 5A directly supply the area and storage is provided from Reservoir 5 and Reservoir 6 at a nominal 630 feet. The Terrace View Booster Pump Station, installed in 2011, was built at the base of the service area near East Valley Highway SE to boost water from the Valley Service Area to Lakeland 630 Pressure Zone. Water can flow from the Lakeland Hills Service Area into the Valley



Legend

Treatment Facility	Intertie	**Water Model Pipes Pressure Zone and HGL**	Lea Hill 415	**Lea Hills Service Area Pressure Zones and HGL**	Lea Hill 415	
Reservoir	Pump Station	Lea Hill 173	Lea Hill 462	Lea Hill 173	Lea Hill 462	
Closed Valve	Well	Lea Hill 299	Lea Hill 500	Lea Hill 299	Lea Hill 500	
PRVs	Spring	Lea Hill 395	Lea Hill 563	Lea Hill 395	Lea Hill 563	
		Lea Hill 401	Lea Hill 648	Lea Hill 401	Lea Hill 648	
		Lea Hill 406	Valley 242	Lea Hill 406	Lea Hill 150 - 566	
					City Limits	
					Parcels	

Feet
0 1,000 2,000

Figure 5.4
Lea Hill Service Area
Pressure Zones and HGL
Comprehensive
Water Plan
City of Auburn

carollo
Engineers...Working Wonders With Water

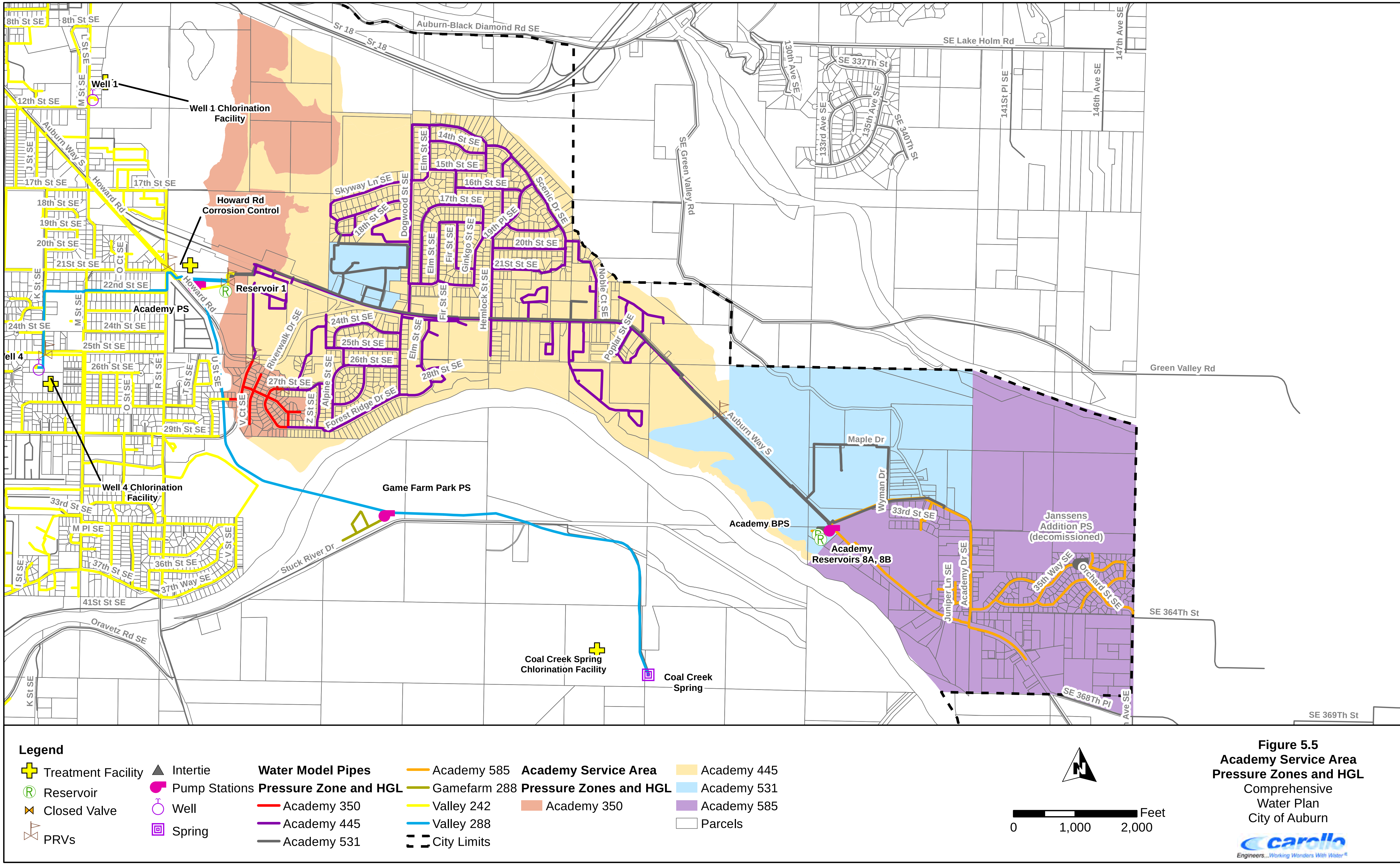


Figure 5.5
Academy Service Area Pressure Zones and HGL
Comprehensive Water Plan
City of Auburn

Service Area during a large fire demand by opening a normally closed valves. Therefore, the City does not rely on this flow. The Lakeland Hills Pump Station provides service to a boosted zone of 697 feet. The Lakeland 697 Pressure Zone has two emergency interties with Bonney Lake.

The Lakeland Hills Service Area has several sub-zones at lower elevations as seen on Figure 5.2. The pressure zones are shown in Figure 5.6. The Lakeland 630 Pressure Zone can be served from Reservoir 5 and Reservoir 6 or from the Lakeland 697 Pressure Zone via two PRVs. A series of PRVs are used to serve zones lower on the northern portion of the hill. Additionally, the service area supplies water to several sub-zones on the west side of the hill through several PRVs. A new Lakeland 545 Pressure Zone has been created to serve a portion of the Kersey III and Lakeland Hills Estates developments. The pressure zone is fed by PRVs from the Lakeland 630 Pressure Zone.

5.3 PRESSURE REDUCING STATIONS

The City operates many pressure reducing (PR) stations to provide service to portions of the Academy, Lea Hill, and Lakeland Hills pressure zones at pressures below the nominal service area HGL. Use of PRVs and a series of pressure sub-zones are necessary because of the topographic variation within each of the service areas. The PRVs for each of the four service areas are summarized in Table 5.2. The locations of PRVs and their connection to other system components can be seen in Figures 5.1 through 5.6.

5.3.1 Control Valve 1

Control Valve 1 is a special application PRV that is equipped for remote control from the Water Control Center in the Maintenance and Operation Facility. Control Valve 1 regulates the flow of water from Reservoir 1 (HGL 292) into the Valley Service Area (HGL 242). Without the valve, the difference in HGL would result in Reservoir 1 “emptying” into the 242 zone. The PRV makes it possible for the Howard Road CCT Facility to fill Reservoir 1, to supply the Valley Service Area, and to supply Reservoir 2. As more water is needed in the Valley Service Area, the PRV is opened to provide more water from Reservoir 1 into the Valley. The valve is located at the Howard Road CCT Facility.

5.3.2 Valley Service Area Pressure Reducing Stations

As the lowest and primary service area, most of the City sources and customers are located in the Valley Service Area, and most are served at a single level of 242 feet. The only PRV stations considered to be in the Valley Service Area connect the Valley 288 Pressure Zone to the Valley 242 Pressure Zone. A PRV is located at the Well 4 that when open will allow supply to bypass Reservoir 1 and enter the Valley 242 Pressure Zone directly.

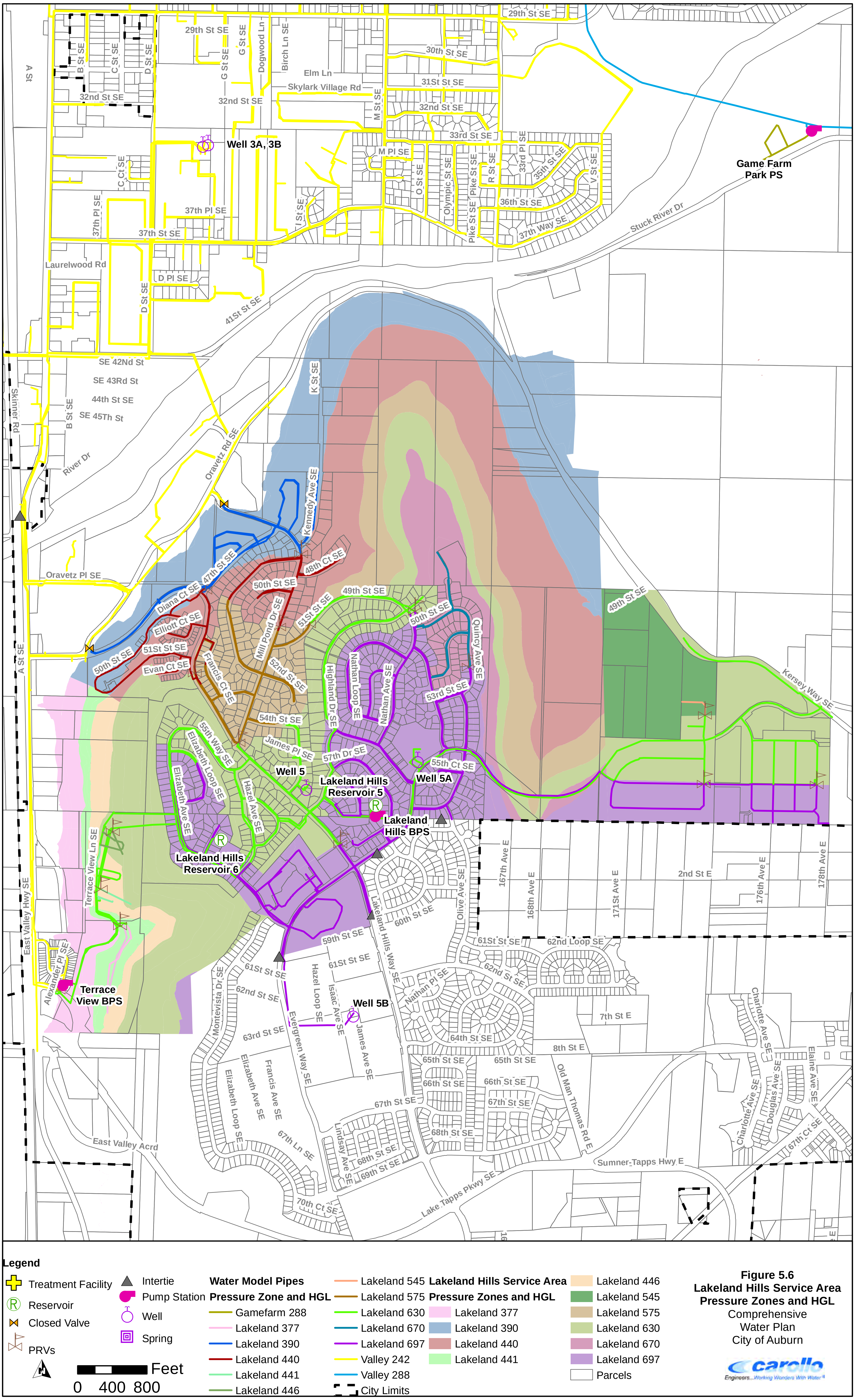


Figure 5.6
Lakeland Hills Service Area Pressure Zones and HGL
Comprehensive Water Plan
City of Auburn

Table 5.2 Pressure Reducing Valve Summary
Comprehensive Water Plan
City of Auburn

Location Description	Valve #	Connection	Valve Size: Primary/ Fire Flow	Valve Size: Secondary	Inlet Pressure (psi)	Outlet Pressure (psi)
Valley						
Howard Rd CCF	1011-10	16-90G-01ABKC	16"		82	55-64
Howard Rd CCF	1011-20	8-90G-01ABKC		8" (bypass)	Off	Off
Well 4/25th & K St SE	1110-10		10"		Off	Off
Well 4/25th & K St SE	1110-20			4"	Off	Off
Lea Hill						
104th Ave SE/SE 302nd St Cobble Creek Upper	411-10	8-90G-01AB	8"		94	55
104th Ave SE/SE 302nd St Cobble Creek Upper	411-11	2-90G-01AS		2"	94	60
104th Ave SE/SE 302nd St Cobble Creek Upper	411-12	1 1/2-50G-01		1.5"	94	60
103rd Ct SE/SE 304th Pl Cobble Creek Lower	411-20	6-90G-01AB	6"		86	40
103rd Ct SE/SE 304th Pl Cobble Creek Lower	411-21	2-90G-01AS		2"	86	46
103rd Ct SE/SE 304th Pl Cobble Creek Lower	411-22	1 1/2-50-01B		1.5"	46	56
109th Ave SE/SE 298th St	412-10	4-90G-01AB	8''		85	45
108th Ave SE/SE 304th St	511-10	6-90G-01AB	6”		70	45
110th Pl SE/SE 304th St	512-10	8-90G-01AB	8”		82	50
110th Pl SE/SE 304th St	512-11	8-90G-01AB		6”	82	50
Lea Hill Rd Carriage Square Apts Lower	611-10	8-90G-01AB	8”		160	65
106th Pl SE/Lea Hill Rd Carriage Square Apts Middle	611-20	8-90G-01AB	8"		140	65
106th Pl SE/Lea Hill Rd Carriage Square Apts Middle	611-21	2-90G-01AS		2"	140	70

Table 5.2 Pressure Reducing Valve Summary
Comprehensive Water Plan
City of Auburn

Location Description	Valve #	Connection	Valve Size		Inlet Pressure (psi)	Outlet Pressure (psi)
			Primary/ Fire Flow	Secondary		
107th Pl SE/Lea Hill Rd Carriage Square Apts Upper	611-30	6-90G-01AB	6”		140	60
107th Pl SE/Lea Hill Rd Carriage Square Apts Upper	611-31	2-90G-01AS		2"	140	65
107th Pl SE/Lea Hill Rd Carriage Square Apts Upper	611-32	1 1/2-50-01B		1.5"	140	74
105th Pl SE/SE 320th Pl Amberview Apts N	711-10	8-90G-01AB	8"		140	65
105th Pl SE/SE 320th Pl Amberview Apts S	711-20	8-90G-01AB	8”	8"	140	60
105th Pl SE/SE 320th Pl Amberview Apts S	711-21	2-90G-01		2”	140	65
Academy						
2003 Auburn Way South	1011-30	10-90G-01-YBS	8"		138	75
2003 Auburn Way South	1011-31	3-90G-01-YBS		3"	138	85
2003 Auburn Way South	1011-32	3-50A-01-YB		3"	130	Air Relief Valve
Howard Rd/Riverwalk	1111-10	6-90G-01-YBS	6"		109	55
Howard Rd/Riverwalk	1111-11	2-90G-01-YBS		2"	109	60
Howard Rd/Riverwalk	1111-12	2-50A-01-YB		2"	109	Air Relief Valve
27th St SE Riverwalk Development	1111-20	6-90G-01ABCS	6"		90	50
27th St SE Riverwalk Development	1111-21	2-90G-01AB		2"	90	60
27th St SE Riverwalk Development	1111-22	1/2-50-01		1.5"	90	Air Relief Valve
4500 Auburn Way South	1114-10	10-90-01-YBS	8”		95	56
4500 Auburn Way South	1114-11	3-90-01-YBS		3”	87	65
4500 Auburn Way South	1114-12	3-50A-01-YB		3"	95	Air Relief Valve

Table 5.2 Pressure Reducing Valve Summary
Comprehensive Water Plan
City of Auburn

Location Description	Valve #	Connection	Valve Size Primary/ Fire Flow	Valve Size Secondary	Inlet Pressure (psi)	Outlet Pressure (psi)
Lakeland Hills						
Mill Pond Dr/Orvetz Rd	1309-10	10-90G-01AB	10"		105	55
Mill Pond Dr/Orvetz Rd	1309-11	3-90G-01AS		3"	105	60
Mill Pond Dr/Orvetz Rd	1309-12	2 1/2-50-01		2.5"	65	0
Mill Pond Lp/Mill Pond Dr	1310-10	10-90-01AB	10"		130	55
Mill Pond Lp/Mill Pond Dr	1310-11	3-90-01AS		3"	130	60
Mill Pond Lp/Mill Pond Dr	1310-12	2 1/2-50-01		2.5"	130	Air Relief Valve
Lakeland Hills Way/Oravetz Rd	1409-10	8-90G-01-AB	8"		110	40
Lakeland Hills Way/Oravetz Rd	1409-11	4-90G-01AB		2"	110	50
Lakeland Hills Way/Oravetz Rd	1409-12	2-90G-01AS		2"	110	Air Relief Valve
47th/Lakeland Hills Way	1409-20	8-90-01-AB	8"		140	56
47th/Lakeland Hills Way	1409-21	4-90-01ABS		4"	140	66
47th/Lakeland Hills Way	1409-22	1 1/2-90-01AS		1.5"	65	Air Relief Valve
47th/Lakeland Hills Way	1409-23	1 1/2-90-01AS		1.5"	140	72
Lakeland Hills Way/Lakeland Hills Lp Upper 51st	1409-30	10-90G-01YBS	10"		95	70
Lakeland Hills Way/Lakeland Hills Lp Upper 51st	1409-31	3-90G-01YBS		3"	95	75
Lakeland Hills Way/Lakeland Hills Lp Upper 51st	1409-32	3-50A-01B		3"	75	Air Relief Valve
Lakeland Hills Way/Mill Pond Dr	1409-40	10-90-01AB	10"		85	55
Lakeland Hills Way/Mill Pond Dr	1409-41	3-90-01AS		3"	85	60
Lakeland Hills Way/Mill Pond Dr	1409-42	2 1/2-50-01		2.5"	60	Air Relief Valve
Mill Pond Dr/4900 Blk	1410-10	10-90G-01YBS	10"		103	50
Mill Pond Dr/4900 Blk	1410-11	3-90G-01YBS		3"	103	60
Mill Pond Dr/4900 Blk	1410-12	2 1/2-50A-01B		2.5"	103	Air Relief Valve

Table 5.2 Pressure Reducing Valve Summary
Comprehensive Water Plan
City of Auburn

Location Description	Valve #	Connection	Valve Size: Primary/ Fire Flow	Valve Size: Secondary	Inlet Pressure (psi)	Outlet Pressure (psi)
51st St. SE/East of Mill Pond Lp	1410-20	8-90-01AB	8"		120	60
51st St. SE/East of Mill Pond Lp	1410-21	4-90-01ABS		4"	120	70
51st St. SE/East of Mill Pond Lp	1410-22	1 1/2-90-01AS		1.5"	80	70
51st St. SE/East of Mill Pond Lp	1410-23	1 1/2-90-01AS		1.5"	90	Air Relief Valve
Nathan Ave/Highland Dr	1410-30	8-90-01AB	8"		125	62
Nathan Ave/Highland Dr	1410-31	4-90-01ABS		4"	125	67
Nathan Ave/Highland Dr	1410-32	1 1/2-90-01AS		1.5"	125	72
Nathan Ave/Highland Dr	1410-33	1 1/2-50-01		1.5"		
Quincy Ave	1410-40	8-90-01AB	8"		75	55
Quincy Ave	1410-41	4-90-0AB		4"	75	58
Quincy Ave	1410-42	1 1/2-90-01AS		1.5"	75	63
Quincy Ave	1410-43	1 1/2-50G01		1.5"	55	Air Relief Valve
Terrace View Apt #6170 Lower	1509-10	10-90G-01-YBS	10"		174	60
Terrace View Apt #6170 Lower	1509-11	3-90G-01-YBS		3"	174	65
Terrace View Apt #6170 Lower	1509-12	3-50A-01-YB		3"	174	Air Relief Valve
Terrace View Apt #5960 Middle	1509-20	10-90G-01-YBS	10"		160	72
Terrace View Apt #5960 Middle	1509-21	3-90G-01-YBS		3"	160	78
Terrace View Apt #5960 Middle	1509-22	3-50A-01-YB		3"	160	Air Relief Valve
Terrace View Apt #5810 Upper	1509-30	10-90G-01-YBS	10"		138	47
Terrace View Apt #5810 Upper	1509-31	3-90G-01-YBS		3"	138	52
Terrace View Apt #5810 Upper	1509-32	3-50A-01-YB		3"	138	Air Relief Valve
Alexander Pl SE/Terrace View Dr SE	1509-40	10-90G-01BCSY	10"		230	70
Alexander Pl SE/Terrace View Dr SE	1509-41	3-90G-01BCSY		3"	230	80
Alexander Pl SE/Terrace View Dr SE	1509-42	3-100-01-54E		3"	200	Air Relief Valve

Table 5.2 Pressure Reducing Valve Summary
Comprehensive Water Plan
City of Auburn

Location Description	Valve #	Connection	Valve Size: Primary/ Fire Flow	Valve Size: Secondary	Inlet Pressure (psi)	Outlet Pressure (psi)
Lakeland Hills Way/Evergreen	1510-10	8-90-01AB	8"		75	52
Lakeland Hills Way/Evergreen	1510-11	4-90-01ABS		4"	75	57
Lakeland Hills Way/Evergreen	1510-12	1-90-01AS		1.5"	75	62
Lakeland Hills Way/Evergreen	1510-13	1 1/2-50-01		1.5"	75	Air Relief Valve
Bennett Ave SE & 56th Ave SE	1411-10	6-90-01-BSY	6"		80	42
Bennett Ave SE & 56th Ave SE	1411-11	2-90-01-BSY		2"	80	47
Bennett Ave SE & 56th Ave SE	1411-12	2-50A-01 B		2"	80	Air Relief Valve
5314 Bennett Ave SE	1411-20	6-90-01-BSY	6"		82	42
5314 Bennett Ave SE	1411-21	2-90-01-BSY		2"	82	47
5314 Bennett Ave SE	1411-22	2-50A-01 B		2"	82	Air Relief Valve
Lakeland Hills Estates - 5100 Kersey Way	1411-30	9-90G-01BSVY	6"		155	73
Lakeland Hills Estates - 5100 Kersey Way	1411-31	2-90G-01BSVY		2"	155	78
Lakeland Hills Estates - 5100 Kersey Way	1411-32	2-50A-01B		2"		Air Relief Valve
Lakeland Hills Estates - 54th St SE	1411-40	10-90G-01BSVY	10"		92	52
Lakeland Hills Estates - 54th St SE	1411-41	3-90G-01BSVY		3"	92	57
Lakeland Hills Estates - 54th St SE	1411-42	3-50A-01B		3"		Air Relief Valve
Lakeland Hills Estates - Westly Ave SE	1411-50	9-90G-01BSVY	6"		85	44
Lakeland Hills Estates - Westly Ave SE	1411-51	2-90G-01BSVY		2"	85	44
Lakeland Hills Estates - Westly Ave SE	1411-52	2-50A-01B		2"		Air Relief Valve
5539 Franklin Ave SE	1412-10	6-90-01-BSY	6"		82	55
5539 Franklin Ave SE	1412-11	2-90-01-BSY		2"	82	60
5539 Franklin Ave SE	1412-12	2-50A-01 B		2"	82	Air Relief Valve

5.3.3 Lea Hill Service Area Pressure Reducing Stations

The Lea Hill Service Area has eight sub-zones at lower elevations that serve customers on the transition from the hill to the valley. PR stations in this pressure zone include two to three PRVs to provide service during low and high flows. Several stations serve large apartment complexes. The remainder of the PRV stations provides service to the 500, 406, 299, and 173 pressure zones. In the boosted pressure zone, some customers are served directly from the transmission pipeline supplying the Lea Hill Reservoirs. Individual PRVs are installed on some of these service connections to reduce pressure to a suitable range, which are not listed in Table 5.2.

5.3.4 Academy Service Area Pressure Reducing Stations

As seen in Figure 5.5, the Academy Service Area contains four PRV stations to the 445 and 350 sub-zones, which are served by parallel PRVs to provide redundancy. The Janssen's Addition PRV was recently removed as a result of the completion of the new Academy East Booster Pump Station. A new PRV was installed at the booster station.

5.3.5 Lakeland Hills Service Area Pressure Reducing Stations

The Lakeland Hills Service Area has multiple PRVs as seen in Figures 5.2 and 5.6. The main pressure zone in this service area is the Lakeland 630 Pressure Zone, which can be served from both Reservoir 5 and Reservoir 6. Below the Lakeland 630 Pressure Zone are four sub-zones: a 575 sub-zone, two 440 sub-zones, and a 390 sub-zone. Two PRV stations connect the 390 sub-zone to the Valley 242 Pressure Zone; these valves are normally closed. Additionally, PRV stations serve the Terrace View development area from the transmission/distribution line in the Lakeland 630 Pressure Zone.

The Lakeland Hills Booster Pump Station pumps to a boosted Lakeland 697 Pressure Zone from the Lakeland 630 Pressure Zone. The Lakeland 697 Pressure Zone serves the Lakeland 670 Pressure Zone, as well as two PRV stations between the zone and the Lakeland 630 Pressure Zone. These PRV stations typically do not operate as the Lakeland Hills Booster Pump Station pressure is regulated. During emergencies, these PRVs allow supply from the two emergency interties with Bonney Lake to reach lower pressure zones.

The Lakeland 545 Pressure Zone is served by multiple PRVs from the Lakeland 630 Pressure Zone.

5.4 WATER SUPPLY FACILITIES

The City uses a combination of springs and wells to supply the system. The City's water supplies are summarized in Table 5.3. Each facility is described below. Further review of capacity of these sources is discussed in Chapter 6.

Table 5.3	Water Supply Facilities Summary Comprehensive Water Plan City of Auburn						
Well/ Spring	**Location**	**Elevation (ft)**	**Date Constructed/Rehabilitated**	**Pumping Capacity (gpm)**	**Power (hp)**	**Backup Power Source**	**Head (ft)**
Coal Creek	3401 Stuck River Road	190	1964, 1998	3,500	Gravity		190
West Hill	1900 15th St NW	305	1960	600	Gravity		305
1	1106 M St SE	111	2013	2,200	125	Yes	111
2	1109 5th St NE	73	2000	1,600	125	Yes	73
3A(1)	401 37th St SE	113	1983	0	125	Yes	113
3B(1)	401 37th St SE	113	1984	0	125	Yes	113
4	950 25th St SE	120	1985	2,600	300	No(3)	120
5	5530 James Ave SE	504	1983	650	125	No	504
5A	5401 Olive Ave SE	558	1990	180	60	Yes	558
5B(2)	1100 63rd St SE		2005	600		Yes	0
6	1109 5th St NE	73	2000	1,800	200	Yes	73
7	405 E St NE	74	1997	3,500	500	No	74

Notes:
(1) Well 3A and 3B are not operated due to water quality.
(2) Well 5B does not sustain production due to aquifer limitations.
(3) Backup power will be added as part of the Well 4 Emergency Power Improvements Project.

5.4.1 Coal Creek Springs

Coal Creek Springs is a primary water supply for the City due to its capacity and because it is more economical to operate than other sources. The spring's collection system is located at the base of the Lake Tapps Upland at an elevation of approximately 190 feet. The system includes approximately 2,300 feet of collector pipe. Much of the system, including the south and middle collectors, was constructed in 1964. The south collector includes about 138 feet of 24-inch perforated concrete pipe connected to seven, 10-foot long, 8-inch well-screen laterals extending from the perforated concrete collection pipe into the foothill. The middle collector includes about 980 feet of 8-inch to 15-inch perforated concrete pipe and is located about 100 feet northeast of the south collector. The south and middle collectors are approximately five feet below the ground surface.

A third collector, the north collector, was added in 1998 to enhance system performance and to provide increased reliability. The north collector is about 15 feet below the ground surface and is located approximately 150 feet to the northeast of the middle collector. The

24-inch north collector is about 1,100 feet long and is constructed of perforated PVC pipe. Currently, the flow from this collector is by gravity. A large manhole was installed in the line to provide for a future pump station that could increase the flow from the line.

Each of the collectors is connected to an overflow structure before connection to a 24-inch transmission line to the chlorination station. Currently, the overflow from each of the collectors flows into an overflow pond, which discharges into nearby Coal Creek. Water supplied from Coal Creek Springs is chlorinated as described later in this Chapter.

Flow from Coal Creek Springs varies depending on aquifer conditions. The City estimates Coal Creek Springs has produced up to 4,500 gpm of supply in recent years. However, The City typically produces 3,000 gallons per minute (gpm) of supply from the Springs.

From the Coal Creek Springs headworks, water flows by gravity through a 24-inch concrete pipe to the Howard Road CCT Facility where it is pumped into Reservoir 1. Between the Coal Creek Springs headworks and the Howard Road CCT Facility is a single connection that supplies potable water to Game Farm Wilderness Park.

5.4.2 West Hill Springs

West Hill Springs is located near the extension of 15th Street NW, at an elevation of 305 feet. Water continuously flows into collection boxes, which are then piped through a 10-inch, ductile iron pipe that carries the supply to the West Hill Spring Chlorination Facility, where chlorine is continuously added. Water then flows by gravity into the Valley Service Area.

Although the use of West Hill Springs as a potable water supply dates from before 1907, most of the current facilities and equipment have been completed since 1960. The most recent improvements included replacement of the collection boxes, as recommended in the 1995 Comprehensive Water Plan and a partial fencing of the watershed as recommended by the 2000 Water Comprehensive Plan. West Hill Springs has a capacity of 600 gpm, where supply may vary depending on aquifer conditions.

5.4.3 Well 1

Well 1 is located on M Street SE near 12th Street SE. Constructed in 1960, substantial renovations are under way as recommended in previous plans. The existing well pump has remained operational through late 2014 and will be off-line during renovated that are expected to be completed in 2015. Renovations include transmission to Howard Road CCT Facility, site improvements, a new well house, new pumping system, disinfection with sodium hypochlorite, on-site emergency power, and upgraded electrical and SCADA controls. The new well pumping system is a two-stage, vertical turbine pump with a capacity of 2,200 gpm, driven by a 100-HP motor and controlled by a variable frequency drive (VFD). Well 1 renovations also will install permanent chlorination as described in Section 5.7. Supply from Well 1 will be routed along the recently constructed transmission main in M Street SE, 17th Street SE, R Street SE, and Howard Road SE to convey supplies to the Howard Road CCT Facility. The pump will normally be controlled by the water level in Reservoir 1.

In 1998, the well output began to fall as a result of decreasing water levels, which led the well to be shut down. A hydrogeological investigation of the well was conducted in 2009, which indicated the declining output could be addressed through infrastructure improvements. The identified improvements have been implemented and Well 1 is expected to be returned to full capacity in 2015.

5.4.4 Wells 2 & 6

Wells 2 and 6 are located on the extension of K Street NE near 5th Street NE at Fulmer Field, a City park. Well 2 and the Well 2 house were replaced in 2000 with a new masonry building and pumping equipment as part of the City's corrosion control strategy. The new facility houses both wells; a two-stage 1,600 gpm pump powered by a 125-HP motor (Well 2) and a 1,800 gpm, two-stage, vertical-turbine pump driven by a 200-HP motor (Well 6). Under the City's corrosion control strategy, Wells 2 and 6 pump to the Fulmer Field CCT Facility, an air-stripping tower, located near the Wells.

Since, the Fulmer Field CCT Facility is required to re-pump the water from Wells 2 and 6 into the Valley Service Area and to Reservoir 2, Wells 2 and 6 are functional only with operation of the Fulmer Field CCT Facility. Chlorination and emergency power for both Wells 2 and 6 are housed in the Fulmer Field CCT Facility.

5.4.5 Wells 3A & 3B

Wells 3A and 3B are located at the same site, off 37th Street SE on the extension of E Street SE. The wells are about 50 feet apart and were constructed respectively in 1983 and 1984. The wells pump into the Valley Service Area.

Each well is equipped with a four-stage, centrifugal pump driven by a 125-HP motor, each with a capacity of about 1,650 gpm when pumping individually. Each well is enclosed in a manufactured metal building. A standby generator capable of running one pump at a time is available on site. The system is equipped with an automatic transfer switch.

The chlorination facilities at Wells 3A and 3B have been removed. Currently, Wells 3A and Well 3B are not operated because they produce water that contains high concentrations of manganese and treatment facilities do not exist.

5.4.6 Well 4

Well 4, located off 25th Street SE on the extension of K Street SE, was constructed in 1985. The well is equipped with a 2,600-gpm, four-stage, centrifugal, turbine pump driven by a 300-HP motor. The well and equipment are housed in a masonry building. Well 4 normally pumps directly to Reservoir 1, but may pump into the valley distribution system through a

PRV. Well 4 serves as a primary backup to the Coal Creek Springs supply and is an important supply to the south end of the City's distribution system. The well is normally controlled by the water level in Reservoir 1. The Well 4 Emergency Power Improvements Project will install an emergency power generator at Well 4 in 2015, along with hypochlorite chlorination to replace the existing chlorine gas system.

5.4.7 Well 5

Well 5 is one of three City wells that were constructed to serve the Lakeland Hills Development within the City's Lakeland Hills Service Area. Well 5 is located off Lakeland Hills Way SE and James Avenue SE and pumps into the Lakeland Hills distribution system and the Lakeland Hills Reservoirs. The well was constructed in 1983 by the Lakeland Hills developer. It is equipped with a seven-stage submersible turbine pump, driven by a 125-HP motor. Although the pump is capable of delivering 1,000 gpm, pumping at that rate results in a large water level drawdown. Currently, Well 5 has a maximum production capability of 650 gpm. The well and equipment are housed in a double-high concrete vault. Well 5 does not have the facilities to support an emergency power supply and is not chlorinated.

5.4.8 Well 5A

Well 5A, the second well serving the Lakeland Hills Service Area, was constructed in 1990 to supplement Well 5. Well 5A, located in Lakeland Hills Park, also pumps into Lakeland Hills distribution system and the Lakeland Hills Reservoirs. The well is equipped with a ten-stage submersible turbine pump, driven by a 60-HP motor. The pump has a capacity of 180 gpm. The Well 5A controls and ancillary equipment are located in a masonry building, which houses the park restrooms, about 100 feet from the well itself.

Well 5A is equipped with chlorination facilities. A manual transfer switch is provided to allow operation of Well 5A using a portable emergency generator. Since the Well 5A facilities are located in a public park, the facility is not secured.

5.4.9 Well 5B

Well 5B was constructed in 2005 and consists of a 600 gpm pump. The pumped water then proceeds through 4 ATEC media filters to remove iron and manganese prior to disinfection. The treated water is then re-boosted with three small booster pumps with a total capacity of 700 gpm and a firm capacity of 420 gpm. The boosted water is stored in a 27,000 gallon treated water storage tank. The Well 5B facility is equipped with a 500 kW generator that can power the facility if power is interrupted.

Once Well 5B came on-line the City, discovered that the aquifer was not recovering. Well 5B was operated intermittently in 2005 and 2006, but has not been in operation since 2006.

5.4.10 Well 7

Well 7 is located at E Street NE and Park Avenue in a city park inside the Backyard Idea Garden. The well was constructed in 1997. The well is housed in a masonry building equipped with a 3,500-gpm variable-stage, vertical-turbine pump driven by a 500-HP motor.

Well 7 pumps directly to the Fulmer Field CCT Facility. The treated water is re-pumped into the valley distribution system and Reservoir 2. If necessary, Well 7 can pump untreated water directly to the Valley distribution system. Well 7 has elevated levels of manganese and is operated intermittently when additional capacity is needed.

5.4.11 Algona Well

In 1996, the City acquired the title to Algona Well 1 as a condition of meeting Algona's water supply needs. Because of pump operational problems the Algona Well was taken off-line. The 500-gpm pump and associated piping have been removed from the well house, the building has been demolished, but the well casing is still standing and the well is plugged.

5.5 PUMP STATIONS

The City operates and maintains several pump stations to move water throughout the piping network and to provide water at the required service pressures. A summary of City booster pump stations is provided in Table 5.4, and locations are shown in Figure 5.1. Table 5.4 presents the firm pump station capacity assuming the largest pump is out of service. As stated in Chapter 3, City pump stations are expected to meet the MDD with the largest pump out of service. The resulting capacity is referred to as the “firm” capacity. The criteria also recommend an on-site or portable generator. A description of each pump station is provided herein.

5.5.1 Academy Pump Stations 1 and 2

The City maintains two pump stations that pump water from Reservoir 1 into the Academy Service Area. Both of the Academy Pump Stations are located on the Reservoir 1 site. These stations are separate from the Academy East Booster Pump Station presented in Section 5.5.9.

The primary Academy Pump Station (Pump Station 2) was constructed in 1980 and houses Pumps 3 and 4. The station consists of a masonry block building, two can-type pumps, a piping system and control. Space was provided in the building for a future third pump. The original Academy Pump Station (Pump Station 1), constructed in 1960, houses two can-type pumps (Pumps 1 and 2). The station consists of a masonry block building, two can-type pumps, a piping system and control.

Table 5.4 Existing Booster Pump Stations
Comprehensive Water Plan
City of Auburn

Booster Pump Station	Location	Source	Supplies	Firm Capacity (mgd)	Pump Number	Pump Capacity (gpm)	Hp	Constructed/ Installed	Standby Power	Elevation (ft)
Academy Pump Station 1	2003 Auburn Way S	Reservoir 1	Academy 531 Pressure Zone	0.43				1960	Yes	
					1	500	50	1960		277
					2	300	30	1960		277
Academy Pump Station 2	2003 Auburn Way S	Reservoir 1	Academy 531 Pressure Zone	1.08				1980	Yes	
					3	750	75	1980		277
					4	750	75	1980		277
Green River Pump Station	29621 Green River Road SE	Valley 242 Pressure Zone	Lea Hill 563 Pressure Zone	5.04				1999	No	
					1	1,170	150	1999		56
					2	1,170	150	1999		56
					3	1,170	150	1999		56
					4	1,170	150	1999		56
Game Farm Park Pump Station	2401 Stuck River Rd	Coal Creek Springs	Game Farm Park	0.07				1988	No	
					1	50	5	1992		164
					2	1,000	50	1993		164
Intertie Pump Station	30502 132nd Avenue SE	Lea Hill 563 Pressure Zone	Wholesale	5.05				1999	No	
					1	1,170	60	1999		505
					2	1,170	60	1999		505
					3	1,170	60	1999		505
					4	1,170	60	1999		505
			Lea Hill 648 Pressure Zone	1.44				1999		
					1	500		2005		505
					2	500		2005		505
					3	1,000		2005		505
Lea Hill Pump Station	10406 Lea Hill Road SE	Valley 242 Pressure Zone	Lea Hill 563 Pressure Zone	1.73				1965	Yes	
					1	600	75	1982		120
					2	600	75	1982		120
					3	800	100	1982		120
Lakeland Hills Pump Station	1326 57th Dr SE	Lakeland Hills 630 Pressure Zone	Lakeland Hills 697 Pressure Zone	4.67				2012	Yes	
					1	360	20	2012		560
					2	360	20	2012		560
					3	360	20	2012		560
					4	3,125	150	2012		560
					5	3,125	150	2012		560

Table 5.4 Existing Booster Pump Stations
Comprehensive Water Plan
City of Auburn

Booster Pump Station	Location	Source	Supplies	Firm Capacity (mgd)	Pump Number	Pump Capacity (gpm)	Hp	Constructed/ Installed	Standby Power	Elevation (ft)
Academy East Booster Pump Station	5031 Auburn Way S	Academy 531 Pressure Zone	Academy 585 Pressure Zone	4.38				2014	Yes	
					1	70-180	7.5	2014		465
					2	70-180	7.5	2014		465
					3	70-180	7.5	2014		465
					4	750-1,250	40	2014		465
					5	750-1,250	40	2014		465
					6	750-1,250	40	2014		465
Terrace View Booster Pump Station	6134 Alexander Pl SE	Valley 242 Pressure Zone	Lakeland Hills 630 Pressure Zone	1.58				2010	Yes	
					1	550	100	2010		102
					2	550	100	2010		102
					3	550	100	2010		102

The pumps of both stations are computer controlled from the Water Control Center at the Maintenance and Operations (M&O) facility, however manual control at the pump station is also available. Primary control is based on the level of the Academy Reservoirs. Emergency power is provided to both of the Academy Pump Stations from a 250 kW diesel engine generator set that is housed in a separate metal enclosure. The engine generator set is capable of operating both pumps, in either station (or one pump in each pump station) and includes an automatic transfer switch to operate when line power fails. Fuel for the engine generator set is stored in a 1,000 gallon above ground fuel tank installed in 1998.

5.5.2 Green River Pump Station

The Green River Pump Station boosts water from the Valley 242 Pressure Zone into the Lea Hill 563 Pressure Zone. The pump station was constructed as part of the Interlocal Agreement 2 (IA2) project to supply water to CWD and WD#111. The Green River Pump Station was constructed in 1999. The station is equipped with 4 can-type pumps, each with a capacity of 1170 gpm. Two of the pumps are equipped with variable-speed 150 HP drives (Pumps 1 and 2), and two with fixed speed 150 HP motors (Pumps 3 and 4).

The Green River Pump Station is located in Isaac Evans Park adjacent to the Green River. The pump station includes a block building with houses pumps, controls, and necessary piping. Space within the station was provided for chlorination; however, the chlorination equipment was not installed. Space was also provided for a fifth pump.

On-site emergency power generation is not provided at the Green River Pump Station because IA2 partners indicated that they could accommodate service interruptions caused by power failure.

The primary control for the Green River Pump Station is linked to the Intertie Pump Station. City operators set flows for both stations based on the wholesale water demand requests for IA2 partners. Currently, the Green River pump station pumps water to the Lea Hill Reservoirs, and the Lea Hill Reservoirs then serve the IA2 partners. Settings may be adjusted daily from the Water Control Center at the Maintenance and Operational Facility. Other automated modes of operation and manual control at the pump station are also available through the programmable controller located at the pump station.

5.5.3 Game Farm Park Pump Station

The Game Farm Wilderness Park Pump Station was constructed in 1988 to provide domestic water supply and fire protection to the Game Farm Wilderness Park on the south bank of the White River. The station pumps water from the Coal Creek gravity supply line. The station is located in an underground concrete vault and includes a horizontal, split-case fire pump, rated at 1,000 gpm installed in 1993, and an end-suction domestic pump with a capacity of 60 gpm, installed in 1992. Hydro-pneumatic tanks provide pressure when the small pump is not operating. The system is locally controlled based on pressure.

The Game Farm Wilderness Park Pump Station requires that the City maintain a nearly full pipe hydraulic condition in the Coal Creek supply line to prevent loosing suction at the station.

5.5.4 Janssen’s Addition Pump Station

The Janssen's Addition Pump Station was decommissioned as part of the Academy East Booster Pump Station project.

5.5.5 Intertie/Lea Hill Booster Pump Station and Chlorination Facility

The Intertie Pump Station houses pumps that provide two separate functions for the water system. The first function is to pump water from the Lea Hill 563 Pressure Zone to the IA2 partners: WD#111 and CWD. Four can-type pumps accomplish this function, two of which have variable-speed drives, and two have fixed speed motors. The second function of the pump station is to boost water to a smaller area at the top of Lea Hill using a “package” type booster-pump system.

The Intertie Pump Station was designed to be operated in conjunction with the Green River Pump Station with City operators setting the flows for both stations based on the wholesale water demand from the IA2 partners. Although control of the station is through the programmable controller located at the pump station, settings may be adjusted daily from the Water Control Center at the Maintenance and Operational Facility. Manual control of the station is also available through the programmable controller located at the pump station.

As with the Green River Pump Station, on-site emergency power generation is not provided at the Intertie Pump Station because the IA2 partners indicated that they could accommodate service interruptions caused by power failure. The Intertie Pump Station was constructed in 1998 and is in excellent condition.

5.5.6 Lea Hill Pump Station

The Lea Hill Pump Station boosts water from the Valley Service Area into the Lea Hill Service Area. The Lea Hill Pump Station was constructed in 1965 and was remodeled in 1982. The station is equipped with three can-type pumps, two of which have capacities of 600 gpm and one that has a capacity of 800 gpm.

The Lea Hill Pump Station is located adjacent to Lea Hill Road and includes a block building that houses pumps, controls, and necessary piping. A portable trailer mounted generator is located at the site. The unit uses a manual transfer and has an integral fuel tank.

The Lea Hill Pump Station is logic controlled from the Water Control Center, with manual control at the pump station. Primary control is based on the level of the Lea Hill Reservoirs.

5.5.7 Lakeland Hills Pump Station

The Lakeland Hills Pump Station pumps water from the Lakeland Hills Reservoir, to the Lakeland Hills Service Area.

The old Lakeland Hills Pump Station was completed in 1990 and upgraded in 1998. A new Lakeland Hills Pump Station was constructed in 2012. The new pump station is located on the existing Lakeland Hills Reservoir 5 site owned by the City. The facility was constructed of a block building that contains three pressure booster system pumps and two additional pumps that provided higher fire flows. The three low-flow pumps have a firm capacity of 720 gpm and the two fire flow pumps have a firm capacity of 3,125 gpm. VFD technology powers each of the three low flow pumps allowing for flexibility in flow rate and total dynamic head conditions.

The Lakeland Hills Pump Station is controlled through the programmable controller located at the station using a pressure-control logic. Alarms and status of the Lakeland Hills Pump Station are returned to the Water Control Center at M&O facility. Remote operation of the larger pumps is possible from the Control Center. A permanently installed 300 kW generator provides emergency power to the station in case of loss of power. The generator is sized to provide full station flow capacity as well as miscellaneous station loads such as lighting, heating and controls. The generator is a packaged unit with an external 1,000 gallon fuel tank.

5.5.8 Terrace View Booster Pump Station

The Terrace View Pump Station is located within the Lakeland Hills Service Area at the northeast corner of Alexander Place SE and Terrace View Drive SE intersection. The booster pump station supplies water to Lakeland Hills 630 Pressure Zone by pumping from Valley 242 Pressure Zone. This booster pump station was constructed in 2010. The station provides a minimum of 500 gpm with a station firm capacity of 1,100 gpm. VFD technology powers each of the three identical 550 gpm pumps allowing for flexibility in flow rate and total dynamic head conditions. Start and stop of the pumps are based on level in either Reservoir 5 or Reservoir 6, with operator controls for pump alternation and level settings. Reservoirs 5 and 6 provide fire flows in the service area; therefore, this station does not serve fire flows.

5.5.9 Academy East Booster Pump Station

In 2009, the City Comprehensive Plan identified the need for improvements to the Academy Service Area, served at the time by the existing Janssen's Addition Booster Pump Station. The new Academy East Booster Pump Station is required to provide adequate pressure and fire flow to the elevated area that was served by the Janssen's Addition Pump Station. With the new facility in place, the Janssen's Addition Pump Station was decommissioned, mechanical and electrical appurtenances removed, and the existing structure abandoned in place.

The new Academy East Booster Pump Station was completed in 2014 and is located at 5031 Auburn Way South on the City's existing Academy Reservoirs 8A and 8B parcel. The Academy East Booster Pump Station pumps water from both Reservoirs 8A and 8B into a new expanded pressure zone (Academy 585). The station comprises three domestic pumps with a firm capacity ranging from 70 to 180 gpm and three fire flow pumps with a firm capacity ranging from 750 to 1,250 gpm. The BPS is expected to serve a very wide range of flows over its usable life; therefore, its pumps were sized to serve a range of flow. The pump name-plate states the lowest design point for the pumps. This Pump Station also required offsite piping modifications in Auburn Way South, 32nd Street SE, Lemon Tree Lane, and adjacent City right-of-way to redefine the pressure zones.

5.6 STORAGE FACILITIES

The City currently maintains a total of 15.8 million gallons (MG) of water storage in eight water reservoirs located throughout the service area. Storage is provided in each of the City's major service areas. Figure 5.1 provides the location of each of the City storage reservoirs. A summary of the City storage reservoirs is provided in Table 5.5. Note, total storage volumes represent the maximum tank volume; however, the City commonly operates its reservoirs at below maximum levels.

5.6.1 Reservoir 1

Reservoir 1, located in the southeast end of the Valley Service Area, is the primary storage location for water from the City's Coal Creek Springs supply. Constructed in 1975, this reservoir is a covered, pre-stressed concrete tank with a capacity of 5 MG. The reservoir serves as the water supply for the Academy Pump Stations and serves the Valley Service Area through Control Valve 1. Reservoir 1 is 184.5 feet in diameter and has an overflow elevation of 292.5 feet. The main purpose of Reservoir 1 is to provide storage for the Valley Service Area; therefore, Control Valve 1 is essential to limit the flow from the reservoir into the zone while still maintaining the essential supply into the south end of the Valley Service Area. In addition to water pumped from the Howard Road CCT Facility, Reservoir 1 can be filled by water from the City' s Well 4.

Table 5.5 Existing Storage Facilities
Comprehensive Water Plan
City of Auburn

Reservoir Name	Location	Service Area	Pressure Zone	Total Volume (MG)	Year Const	Height (ft)	Base Elevation (ft)	Diameter (ft)	Overflow Elevation (ft)	Draw/Fill Lines (common/separate)
Reservoir 1	2003 Auburn Way S	Valley	288	5	1975	25	267.5	184.5	292.5	Common
Reservoir 2	32115 105th Place SE	Valley	242	3.6	1975	29.75	219.42	143	249.2	Common
Reservoir 4A	30502 132nd Ave SE	Lea Hill	563	1	1965	77	498	46	575	Common
Reservoir 4B	30502 132nd Ave SE	Lea Hill	563	1.5	1983	77	498	58	575	Common
Reservoir 5	1326 57th Dr SE	Lakeland Hills	630	1	1981	60.5	575	53.25	635.5	Common
Reservoir 6	5718 Francis Ct SE	Lakeland Hills	630	1.0	2012	63.4	575.5	53.25	638.9	Separate
Reservoir 8A	5031 Auburn Way S	Academy	531	1.2	1973	72.5	468	52.75	540.5	Common
Reservoir 8B	5031 Auburn Way S	Academy	531	1.5	1980	72.5	468	60	540.5	Common

5.6.2 Reservoir 2

Reservoir 2, located on the northeast side, also serves the Valley Service Area. Reservoir 2, a 3.6-MG, underground, pre-stressed concrete tank, has public tennis courts on the concrete roof. The reservoir, constructed in 1975, has a diameter of 143 feet and an overflow elevation of 249.17 feet. Reservoir 2 "floats" on the system servicing the Valley Service Area. Reservoir 2 is filled by the City's sources and from Reservoir 1, through Control Valve 1.

5.6.3 Lea Hill Reservoirs 4A and 4B

Storage in the Lea Hill Service Area is provided in two steel standpipes located along 132nd Avenue SE in the northeast corner of the Service Area. The reservoirs, designated Reservoir 4A and Reservoir 4B, have capacities of 1.0 MG and 1.5 MG respectively. Both reservoirs have overflow elevations of 575 feet. Reservoir 4A, constructed in 1965, has a diameter of 46 feet. Reservoir 4B, constructed in 1983, has a diameter of 58 feet. Water is supplied to the Lea Hill reservoirs from the City's Valley Service Area through the Lea Hill Pump Station and Green River Pump Station.

5.6.4 Lakeland Hills Reservoir 5

Reservoir 5 is one of two reservoirs providing storage for the Lakeland Hills Service Area. Reservoir 5 is a 53.25-foot diameter steel standpipe, with a total volume of 1.0 MG and an overflow elevation of 635.5 feet. Constructed in 1981, Reservoir 5 is located near the top of the Lakeland Hills development. Well 5, Well 5A, and the Terrace View Booster Pump Station supply the reservoir.

5.6.5 Lakeland Hills Reservoir 6

The new Reservoir 6 is located within the boundary of the Lakeland Hills 697 Pressure Zone, but is connected to the Lakeland Hills 630 Pressure Zone distribution system piping. Reservoir 6 was constructed in 2012 and has a capacity of 1.0 MG. This reservoir has an overflow elevation of 638.9 feet and a diameter of 53.25 feet. Water is supplied by the City's Well 5, Well 5A, and the Terrace View Booster Pump Station.

5.6.6 Academy Reservoirs 8A and 8B

Two steel standpipes located just off Auburn Way South provide storage for the Academy Service Area. The reservoirs are normally operated in parallel. The Academy Reservoirs have an overflow elevation of 540.5 feet. The smaller reservoir, Academy Reservoir 8A, has a diameter of 52.75 feet and a total storage volume of 1.2 MG and was constructed in 1973. Academy Reservoir 8B has a diameter of 60 feet and a total storage volume of 1.5 MG and was constructed in 1980. Water is pumped to the Academy Reservoirs from City Reservoir 1 by the Academy Pump Stations.

5.7 WATER TREATMENT

The City's water treatment includes chlorination, corrosion control, and metals removal. The specific treatment facilities at each source is discussed in this section.

5.7.1 Chlorination Facilities

The goal of the chlorination system is to maintain a minimum chlorine residual of 0.55 mg/L in the system. The City uses gaseous chlorine or hypochlorite systems at its sources, except Well 5, to disinfect the supplies.

5.7.1.1 <u>Coal Creek Springs Chlorination</u>

Coal Creek Springs chlorination station achieves 4-log treatment of the supply, except at Game Farm wilderness Park. The chlorination station is housed in a masonry building approximately 300 feet north from the collectors. As a major source of chlorinated water, Coal Creek Springs is used to maintain chlorine residuals in the Academy Service Area and south end of the Valley Service Area.

This chlorination station is equipped with two chlorinators. Gaseous chlorine is stored on site in a separate room. Alarms from the chlorination equipment are transmitted back to the Water Control Center at the M&O Facility. A chlorine residual analyzer provides high and low alarms to the M&O Facility.

Chlorine is dosed into the water at a range of 0.75-0.80 mg/L and is adjusted based on the chlorine residual measured in the Academy and the south end of the Valley Service Area.

5.7.1.2 <u>West Hill Springs Chlorination</u>

At West Hill Springs, water continuously flows from the collection boxes to the on-site chlorination station, housed in a wood building.

Control is manually based on the average flow from the West Hill Springs and the desired chlorine dosage. Chlorine dosages typically range from 0.75-0.80 mg/L and is adjusted based on the measured chlorine residual in the north end of the Valley Service Area. From the chlorination station, the supply flows by gravity into the Valley Service Area. Gaseous chlorine is stored on site in a separate room.

5.7.1.3 <u>Well 1</u>

Supply from Well 1 is currently not chlorinated. Permanent sodium hypochlorite treatment will be installed with the current renovations. The anticipated chlorine dose is 0.75-0.80 mg/L. A residual monitoring system will be tied into the City's existing SCADA system.

5.7.1.4 <u>Wells 2 & 6</u>

Pumped water from Wells 2 and 6 is treated and chlorinated at the Fulmer Field CCT Facility and is discussed in Section 5.7.1.11.

5.7.1.5 Wells 3A & 3B

The chlorination facilities at Wells 3A and 3B have been removed. Currently, Wells 3A and Well 3B are not operated because they produce water that contains high concentrations of manganese.

5.7.1.6 Well 4

Well 4 has historically been equipped with gaseous chlorination facilities that were operated whenever the well was in service. As part of the Emergency Power Improvements project, the gaseous chlorination system was replaced with a sodium hypochlorite chlorination system. The chlorination range is 0.75-0.80 mg/L.

5.7.1.7 Well 5

Pumped water from Well 5 is not chlorinated.

5.7.1.8 Well 5A

Well 5A is equipped with a chlorination system. Hypochlorite is added at a range of 0.75 to 0.80 mg/L and is adjusted based on the chlorine residual measured in the Lakeland Hills Service Area.

5.7.1.9 Well 5B

Well 5B is not currently in service. The Well 5B facility was designed with hypochlorite generation to add chlorine at a range of 0.75 to 0.80 mg/L prior to the metal removal filters described in Section 5.7.3.

5.7.1.10 Well 7

Pumped water from Well 7 is treated and chlorinated at the Fulmer Field CCT Facility.

5.7.1.11 Fulmer Field Corrosion Control Treatment Facility

The Fulmer Field CCT Facility was constructed in 2004 and is located adjacent to the Fulmer Field City Park and Wells 2 and 6. Chlorination at Fulmer Field CCT, along with B Street Intertie, is the major source of chlorine residual in the north end of the Valley Service Area and in the Lea Hill Service Area. The Fulmer Field CCT Facility is housed in a masonry building and treats the water from Wells 2, 6, and 7. Chlorine is introduced into the system prior to the air-stripping towers at a dose of approximately 0.95 mg/L. The chlorine is adjusted based on measured chlorine residual at the station analyzer. The treated water is then stored in the clearwell and boosted into the distribution system and Reservoir 2. Alternatively, chlorine can be manually introduced into the clearwell rather than prior to the towers. Chlorine is generated on site.

5.7.1.12 Intertie Pump Station

The Intertie pump Station is equipped with a hypochlorite chlorination station. Chlorine is added into the wholesale water at a dose of approximately 0.75 mg/L.

5.7.1.13 Terrace View Booster Pump Station

The pump station is equipped with a hypochlorite feed pump adding 6 percent solution to the discharge piping of the station with an approximate dose of 0.75 mg/L.

5.7.2 Corrosion Control Facilities

To limit the corrosion of lead and copper in the system, the City treats major supplies. The treatment increases the pH of the water, which reduces the solubility of lead and copper, allowing the water to be in compliance with the Lead and Copper Rule. The goal of the corrosion control facilities is to adjust the water leaving the facility to a pH of approximately 7.5.

5.7.2.1 Fulmer Field Corrosion Control Treatment Facility

The Fulmer Field CCT Facility adjusts the pH of the water from its sources to approximately 8.0 by air-stripping in three 33,000 gallon air-stripping towers. Three 10,000 cubic feet per minute (CFM) blowers provide air. As the carbon dioxide is stripped from the water, the treated water is then stored in the clearwell and boosted through four 3,200 gpm booster pumps back into the distribution system and Reservoir 2. The firm capacity of the facility is 9,600 gpm. The facility also includes a 1,000 kW electric generator with a diesel fuel capacity of 2,000 gallons. This generator provides backup power for the treatment facility and Wells 2 and 6.

5.7.2.2 Howard Road Corrosion Control Treatment Facility

The Howard Road CCT Facility was constructed in 2004 and is located near the existing Coal Creek Springs Pump Station. This Facility is housed in a masonry building and treats the water from Coal Creek Springs, as well as Well 1 upon completion of the improvements. The pH of the water from the wells is then adjusted to approximately 7.8 by air-stripping in two 33,000 gallon air-stripping towers. Two 9,300 CFM blowers provide air. The treated water is then stored in the clearwell and re-boosted through three 2,100 gpm booster pumps into Reservoir 1. The total capacity of the facility is 6,300 gpm and the firm capacity of the facility is 4,200 gpm. Also included is a 600 kW electric generator with a diesel fuel capacity of 1,000 gallons.

5.7.3 Metals Removal

Iron and manganese removal treatment is available at Well 5B, which is not currently in service. The goal of the metals removal at Well 5B is to reduce the concentration of iron and manganese to 50 percent or less of the design secondary MCLs of 0.3 mg/L for iron and 0.05 mg/L for manganese. Water from Well 5B proceeds through four ATEC media filters to remove iron and manganese prior to disinfection.

5.8 DISTRIBUTION SYSTEM

5.8.1 Existing System

In 2014, the City water transmission and distribution system includes nearly 250 miles of pipeline. Pipe size varies from 2 to 30 inches, with predominance of 8- and 12-inch diameter pipe. Table 5.6 provides a summary of the pipe sizes and materials within the Auburn system. This information is based on a combination of mapping data and existing knowledge of facility conditions observed from previous field maintenance activities.

The City continues to conduct field and records investigations to improve the accuracy and completeness of the system data regarding water main size, material and age. The existing data show that over 90 percent of the distribution system is ductile-iron (DI) pipe. Pipes made of asbestos-cement, steel, and concrete cylinder pipe make up the remaining pipes in the system. Some areas within the City system have distribution piping made of old cast iron with lead joint connections. The majority of this pipe is 4 to 6-inch diameter and typically has a shallow bury (2 to 3 feet of cover).

**Table 5.6 Pipe Size and Material
Comprehensive Water Plan
City of Auburn**

Diameter	Ductile Iron (LF)	Cast Iron (LF)	Asbestos Cement (LF)	Other (LF)	Total (LF)	Percentage (%)
<4-inch	25,978	401	0	0	**26,379**	**1.81%**
4-inch	52,449	6,017	883	0	**59,349**	**4.08%**
6-inch	124,660	48,607	5,820	0	**179,087**	**12.31%**
8-inch	601,040	6,090	5,140	0	**612,270**	**42.09%**
10-inch	32,293	0	0	0	**32,293**	**2.22%**
12-inch	414,220	3,388	0	0	**417,608**	**28.71%**
14-inch	12,263	0	0	0	**12,263**	**0.84%**
16-inch	88,426	0	0	0	**88,426**	**6.08%**
18-inch	184	0	0	0	**184**	**0.01%**
20-inch	17,326	0	0	0	**17,326**	**1.19%**
24-inch	7,717	0	0	878	**8,595**	**0.59%**
>24-inch	885	0	0	0	**885**	**0.06%**
Total	**1,377,441**	**64,503**	**11,843**	**878**	**1,454,665**	
Percentage (%)	**94.69%**	**4.43%**	**0.81%**	**0.06%**		

5.9 CONTROL SYSTEM

The City controls operation and maintenance records of the water system using a Supervisory Control and Data Acquisition (SCADA) system in the Water Control Center located in the M&O building. The system includes equipment designed to monitor the status of all system wells, reservoirs, and primary booster pumps. In addition, the system includes programming logic that allows automatic operation of water system components in response to system demands for water.

The City has made extensive improvements to the SCADA system that were completed in 2014. Additional information on SCADA is provided in Chapter 12.

5.10 BRAUNWOOD SATELLITE SYSTEM

Braunwood Satellite system, also known as the Hidden Valley Acres development, is a small satellite water system that serves twelve 5-acre lots, as well as an irrigation meter. All residence have fire sprinkler systems. The system is located south of the White River and east of Kersey Way. The water supply and storage infrastructure consists of a well, a 33,000-gallon reservoir (for fire storage), hydro-pneumatic tanks to maintain system pressure, and a booster pump station. Because of its location, this system is not connected to the City distribution network.

The system is supplied by a well located off 47th Street SE, which the City acquired in 1989. The Braunwood Well Certificate No. G1-25173C was issued in 1988 to the developer of a small development in the Auburn Retail Water Service Area. The City acquired the well as part of a Satellite Management Agreement with the developer, Summersett E & L. The water right has a Qi of 20 gpm (0.03 mgd) and a Qa of 6.5 ac-ft/year (0.01 mgd). The place of use for the water right is a forty-acre area around the well.

The well was constructed in 1989 to a depth of 352 feet by the developer. The well screen is open to the aquifer between a depth of 280 and 300 feet. The well is housed in a concrete block building with a wood roof. An emergency generator system was added in 1998. The well was redeveloped and refurbished in 2004 with a new 20 gpm submersible pump.

The booster pump station consists of two 2 HP low-flow pumps and a 7.5 HP fire flow pump. The booster pumps are operated off system pressure and are not metered.

The Braunwood Satellite system is adequately sized for the existing development under normal average day demands. No future development is expected in the planning horizon. The City believes the Braunwood supply and storage infrastructure will require full replacement within the 20-year planning period. The City would like to connect the Braunwood Satellite System to the City distribution system during the long-term planning horizon (2025-2035), rather than replace the infrastructure.

WATER RESOURCES

6.1 INTRODUCTION

The City of Auburn (City) has diverse water supply sources, including wells, springs, and connections to the regional water system. To meet future demands, the City will be required to fully use its water resources to continue to provide a high level of service. The City currently receives its water from two springs, ten wells, and the Tacoma regional water supply. This chapter presents an evaluation of these supplies to identify any future deficiencies in the City's water rights and in its supplies' ability to produce reliable water supplies. These deficiencies are addressed by the City's water supply strategy summarized in this Chapter.

6.2 SUPPLY SOURCES

The City relies upon its springs and groundwater wells to meet all of its current supply needs. Water rights for these wells are administered by the Washington State Department of Ecology (Ecology). Source water protection is regulated by the Washington State Department of Health (DOH). The City's water system (DOH ID 03350V) currently has four sources: Coal Creek Springs, West Hill Springs, the Valley Well Field (Wells 1, 2, 3A, 3B, 4, 6 and 7), and the Upland Well Field (Wells 5, 5A and 5B). In addition, the City purchases wholesale supplies from Tacoma Public Utilities (Tacoma) via the Regional Water Supply System (RWSS), formerly known as the Second Supply Pipeline. The City operates one satellite facility: the Braunwood Well located in the Hidden Valley Acres development. Additionally, the City owns Algona Well 1, which is not currently connected to a water system. The City water supply facilities are shown on Figure 6.1. Water rights are summarized Table 6.1. Copies of the water right certificates for each well are included in Appendix F. The City's 2013 Water Facility Inventory (WFI) is provided in Appendix G. The source capacities in this chapter reflect the current values, which have changed since 2013 in some cases due to ongoing studies and improvement projects. The 2014 WFI will be updated to reflect the capacities in this Chapter. Each operating well is visited daily by City staff, and the mechanical and electrical equipment is maintained regularly.

6.2.1 Spring Sources

6.2.1.1 <u>Coal Creek Springs</u>

Coal Creek Springs is the City's main water source and is used consistently throughout the year. The springs are located at the base of the Lake Tapps Upland at an elevation of 190 feet, where water is collected by a perforated, concrete pipe placed parallel to the base of the upland. The collection system and the transmission line were reconstructed in 1964 and

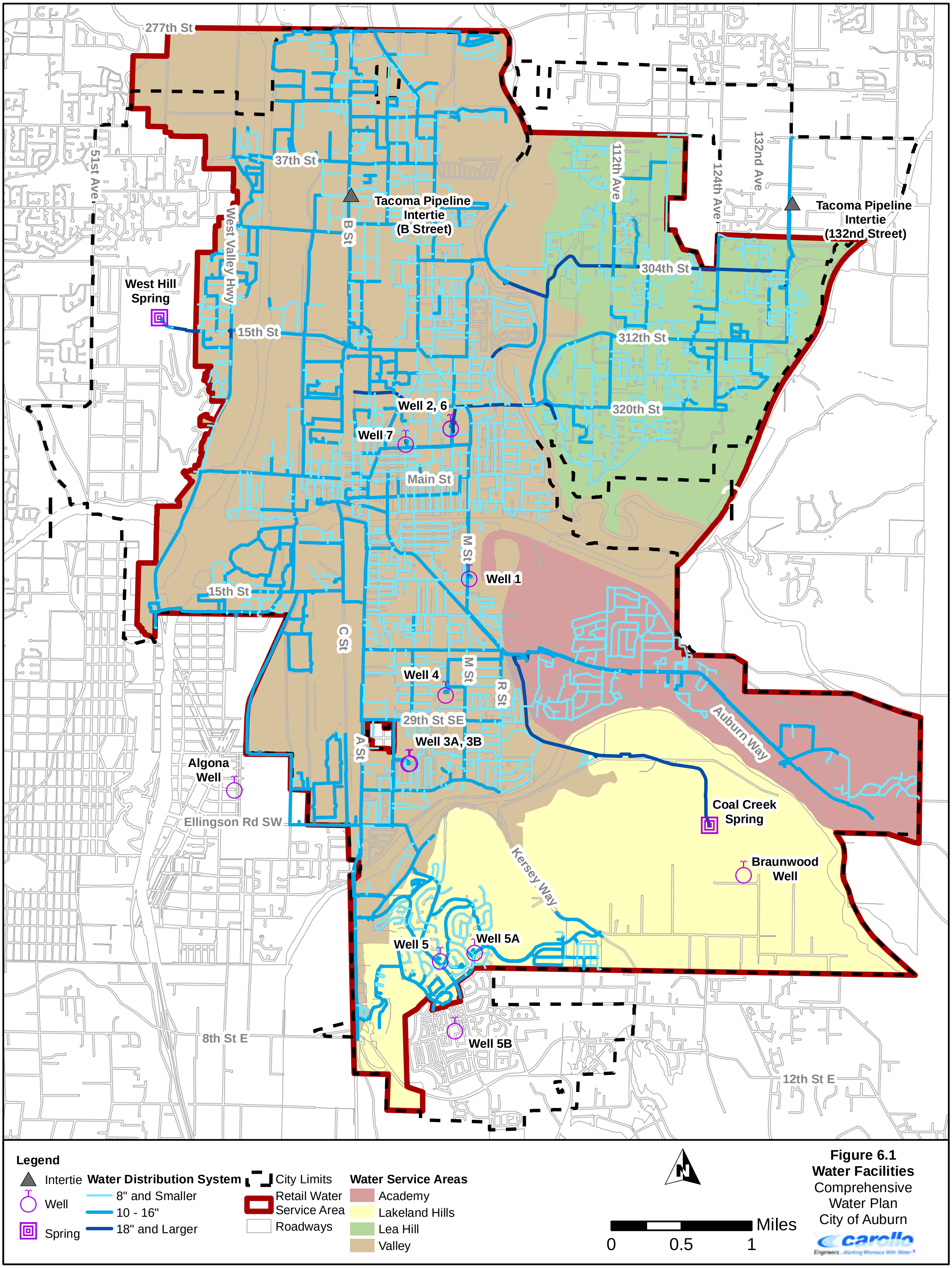


Figure 6.1
Water Facilities
Comprehensive Water Plan
City of Auburn

Table 6.1 Water Rights and Intertie Summary
Comprehensive Water Plan
City of Auburn

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary or Additive	Maximum Instantaneous Flow Rate (Qi), gpm [(1)]	Maximum Annual Volume (Qa), AFY [(2)]
Permits/ Certificates						
1. 857	City of Auburn	1925	Coal Creek Springs	Primary	6,730	9,410
1. 3560-A	City of Auburn	1960	Well 1	Primary	2,200	1,120
2. G1-00277C	City of Auburn	1972	Well 2	Primary	2,400	1,360
3. G1-23629C	City of Auburn	1980	Wells 3A & 3B	Primary	2,800	3,600
4. G1-20391C	City of Auburn	1972	Well 4	Primary	2,800	3,600
5. G1-23633C	City of Auburn	1980, 1989, 2004	Wells 5, 5A, 5B	Primary	1,000	720
6. Additive to Wells 1, 2, 3A, 3B and 4	City of Auburn	1995	Well 6	Additive	3,500	-
7. Additive to Wells 1, 2, 3A, 3B and 4	City of Auburn	1995	Well 7	Additive	3,500	-
8. Additive to Well 1 and Coal Creek Springs	City of Auburn	1972	Well 2	Additive	-	2,480
9. G1-22769C [(3)]	City of Auburn	1976	Algona Well 1	Primary	500	175
10. G1-25173C	City of Auburn	1988	Braunwood	Primary	20	6.5

Table 6.1 Water Rights and Intertie Summary
Comprehensive Water Plan
City of Auburn

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary or Additive	Maximum Instantaneous Flow Rate (Qi), gpm (1)	Maximum Annual Volume (Qa), AFY (2)
Claims						
1. S1-049354CL	City of Auburn	1907	West Hill Springs	Primary	625	1,010
Total Primary					**19,075**	**21,002**
Wholesale Interties						
1. B St NW (4)	Tacoma Public Utilities				3,694	3,920
2. 132 Ave SE (4)	Tacoma Public Utilities				3,694	3,920
Pending Water Rights						
1. G1-28404	City of Auburn	Submitted 01/05/06		Primary	12,500	13,433

Notes:
(1) Qi reported in gpm (gallons per minute).
(2) Qa reported in acre-feet per year.
(3) Algona Well 1 has no existing production capacity.
(4) Not a water right. Wholesale Agreement with Tacoma Public Utilities allows a total annual supply 3,920 AFY, with a maximum instantaneous flow rate of 3,560 gpm, from the combination of the City's interties.

updated in 1998. Work done in 1998 was largely in response to landslide damage and included a new, third collector (south collector) that provides greater system reliability in the event of future seismic/slide events.

The City has a primary water right (certificate number 857) with priority date of 1925, which allows a maximum instantaneous withdrawal (Qi) of 15 cubic feet per second (cfs) (6,730 gallons per minute [gpm] or 9.70 million gallons per day [mgd]) and an annual quantity withdrawal (Qa) of 9,410 acre feet per year (AFY) (8.4 mgd). However, the City has indicated that the capacity of Coal Creek springs is more commonly producing 3,000 gpm (4.2 mgd).

6.2.1.2 West Hill Springs

The West Hill Springs are located near the extension of 15th Street NW at an elevation of 305 feet. Water continuously flows into collection boxes that directly discharge into a 10-inch, ductile-iron pipe. The collection facilities were replaced in 1999.

The West Hill Springs is a claim-based water right (Claim No. S1-049354CL) filed in 1973 for a Qi and Qa of 625 gpm (0.9 mgd) and 1,010 AFY (1.0 mgd), respectively. This source of supply was developed and applied by the City to beneficial use prior to 1907. The City has indicated that the Spring typically produces 600 gpm (0.84 mgd). The capacity varies based on aquifer conditions and achieves its Qi given sufficient groundwater levels.

6.2.2 Valley Well Field

Pursuant to a determination by the Ecology, Wells 1, 2, 3A, 3B, 4, 6 and 7 are considered a well field. This designation allows the City substantial flexibility in its management and use of its Valley Well Field. Wells 1, 2, 3A, and 4 are authorized as primary, certificated water rights. Wells 3B, 6, and 7 are authorized as additive water rights. Overall, the City's Valley Well Field primary groundwater rights authorize a Qi of 10,200 gpm (14.70 mgd), and a Qa of 12,160 AFY (10.86 mgd).

6.2.2.1 Well 1

Well 1 is located on M Street SE near 12th Street SE. Well 1 was constructed in 1960 to a depth of 134 feet with an 18-inch diameter casing and screen. The screen is open to the aquifer between a depth of 103 and 134 feet.

Well 1 is a primary, certificated water right (Certificate No. 3560-A) with a priority date of 1957. Well 1 has an authorized Qi of 2,200 gpm (3.17 mgd) and a Qa of 1,120 AFY (1.0 mgd). Well 1 will have a capacity of 2,200 gpm upon completion of the ongoing Well 1 Improvement Project summarized in Section 6.4.1.1.

6.2.2.2 Well 2

Well 2 is located on the extension of K Street NE near 5th Street NE in Fulmer Field. The well was constructed in 1970 to a depth of approximately 291 feet with a 24-inch diameter casing and screen. The screen is open to the aquifer between a depth of 242 and 291 feet.

Well 2 is a primary, certificated water right (Certificate No. G1-00277C) with a priority date of 1972. Well 2 has an authorized Qi of 2,400 gpm (3.46 mgd). In 2013, Ecology issued a determination reducing the Primary Qa from 3,840 AFY (3.43 mgd) to 1,360 AFY (1.9 mgd). Well 2 is additive Qa to Well 1 and Coal Creek Springs of 2,480 AFY. Historically, the well has had operational issues that limits its safe yield to 1,800 gpm and leads to increased rates of fouling. With the recent increase in wholesale RWSS capacity, the City no longer plans to operate Well 2 in the short-term and medium-term planning horizons, unless it is needed for emergency use.

6.2.2.3 Wells 3A and 3B

Wells 3A and 3B are located on the same site, near 37th Street SE on the extension of E Street SE. The wells, which are located about 50 feet apart, were constructed to a depth of 394 feet in 1983 and 1984. The screens are open to the aquifer between a depth of 285 and 360 feet and 307 and 368 feet, respectively.

Well 3A is a primary, certificated water right (Certificate No. G1-23629C) with a priority date of 1980. Well 3A has an authorized Qi of 2,800 gpm (4.03 mgd) and a Qa of 3,600 ac-ft/year (3.12 mgd). Well 3B was developed concurrently with Well 3A to serve as an additive point of withdrawal to Well 3A. The City has indicated that the capacity of Well 3A and 3B are each 1,500 gpm. The City does not commonly operate Wells 3A and 3B due to elevated manganese concentrations.

6.2.2.4 Well 4

Well 4 is located near 25th Street SE on the extension of K Street SE near Cedar Lanes City Park. The well is 293 feet deep and was constructed in 1985. The well screen is open to the aquifer between a depth of 272 and 334 feet.

Well 4 is a primary, certificated water right (Certificate No. G1-20391C) with a priority date of 1972. Well 4 has a Qi of 2,800 gpm (4.03 mgd) and a Qa of 3,600 AFY (3.21 mgd). Well 4 has a capacity of 2,800 gpm, however the well more typically supplies 2,600 gpm.

6.2.2.5 Well 6

Well 6 is located on the extension of K Street NE near 5th Street NE in Fulmer Field. Constructed in 1999, the well was drilled to a depth of 303 feet and completed with a 24-inch telescopic well screen open to the naturally developed aquifer between depths of 245 to 288 feet. A twenty four-inch steel casing extends from the well screen to the ground surface.

Well 6 was approved by Ecology in 1995 to serve as an additive right and source of supply to the existing primary rights for Wells 1, 2, 3A and 4. Well 6 has a Qi of 3,500 gpm (5.0 mgd) and no additional Qa.

Well 6 has a pumping capacity of 3,500 gpm. However, the City has indicated that the safe yield of Well 6 is actually 1,900 gpm due to the proximity of Well 2. City is currently in the process of studying the Fulmer Well Field to address well capacity and operational issues.

6.2.2.6 Well 7

Well 7 is located on the extension of E Street NE near 4th Street NE and Park Avenue in City Park. The well was constructed in late 1996 through early 1997. It was drilled to a depth of 303 feet and completed with an 18-inch pipe-sized well screen with a silica-sand filter pack. The screen is open to the aquifer between depths of 240 to 297 feet. A twenty four-inch steel casing extends from the well screen to the ground surface.

Well 7 was approved by Ecology in 1995 to serve as an additive right and source of supply to existing primary rights for Wells 1, 2, 3A and 4. Well 7 has a Qi of 3,500 gpm (5.0 mgd) and no additional Qa.

Historically, the well was only operated by the City in the summer when additional capacity was needed. With the recent increase in wholesale RWSS capacity, the City no longer plans to operate Well 7 until manganese treatment is installed in the medium-term planning horizon, unless it is needed for emergency use.

6.2.3 Upland Well Field

The Upland Well Field consists of three existing wells (5, 5A and 5B) and one potential future well (5C) currently consisting of casing only. In 2004, Ecology issued a combined water right (Certificate No. G1-23633C) for the Upland Well Field allowing Well 5B and a future Well 5c as additive wells to Well 5; however, the water right was limited to a combined Qi to 1,000 gpm (1.44 mgd) and a combined Qa to 720 AFY (0.64 mgd). This represented a net decrease of 167 gpm of Qi from the previous Upland Wells' water rights.

6.2.3.1 Well 5

Well 5, located off Lakeland Hills Way and James Avenue SE, serves the Lakeland Hills area. It was constructed in 1983 to a depth of 434 feet by the Lakeland Hills developer. The screen is open to the aquifer between a depth of 320 and 335 feet.

Well 5 has a design capacity of 1,000 gpm. However, the City has noted a drop in capacity of the aquifer, resulting in a decrease in safe yield from the well to 650 gpm.

6.2.3.2 Well 5A

Well 5A is located on Evergreen Way in Lakeland Hills Park and was constructed in 1990 to a depth of 570 feet. The screen is open to the aquifer between a depth of 510 and 570 feet.

Well 5A has a capacity of 250 gpm. However, similar to Well 5, the safe yield of Well 5A is has decreased to 180 gpm due to a drop in capacity of the aquifer.

6.2.3.3 Well 5B

Well 5B is located off 63rd Street SE and was drilled to a depth of 781 feet in November 1991, and is now 746 feet deep after regrading in 2000-2001 as part of ongoing residential development in the area. The screen is open to the aquifer between a depth of 706 and 746 feet.

Well 5B has a capacity of 600 gpm, however, as soon as the well was turned on the City found that the aquifer was not recovering and produced sand. Well 5B has not been operated since 2006.

6.2.3.4 Algona Well 1

In 1996, the City acquired the title to Algona Well 1 as a condition of meeting Algona's water supply needs on a firm, uninterruptible basis, as agreed upon in the Wholesale Supply Interlocal Agreement 3 (IA3). The "Algona" well consists of a 10-inch casing to approximately 65 feet below ground surface. The agreement between the City and Algona was necessitated due to well pump operational problems at Algona Well 1 that led to the well being taken off line. The 500-gpm pump and associated piping have been removed from the well house and the building demolished. The well casing is still standing, where the City plans to cap the well in the short-term planning horizon.

Algona Well 1 is a certificated water right (Certificate No. G1-22769C) with a priority date of 1976. This well has a Qi of 500 gpm (0.72 mgd) and a Qa of 175 AFY (0.16 mgd).

6.2.4 Water Supply Interties

Interties provide a tool that water utilities use to move water between systems to meet supply needs, increase reliability, and respond to emergencies. The City has wholesale and emergency interties. Wholesale interties provide substantial supplies from the City to adjacent purveyors and constitute the second largest source of supply to the City. The City has emergency interties with five different entities. The City's interties are described in Chapter 2 and detailed below. Potential future interties are also discussed.

6.2.4.1 Wholesale Interties

The City of Auburn maintains wholesale supply interties to both receive and provide water supply, as presented in Table 6.1. A description of the contractual limits of the interties are provided below.

1. City of Algona (Algona): The City is the primary source of supply for Algona. Algona may use up to 0.53 mgd on average annually and peak supplies up to 1.11 mgd (IA3A, from October 2002) from four interties. In the event that the City experiences

any failure or decreased capacity, the supply of water to Algona may be decreased by the same percentage that is experienced by the City.

2. Tacoma RWSS: Tacoma has agreed to provide wholesale water to the City from the RWSS via two interties. In 2012, the City entered into agreement for 1.0 mgd (694 gpm) average day use and 1.8 mgd (1,250 gpm) peak use, and 1.62 mgd (1,125 gpm) four-day use. Supply may be withdrawn simultaneously from both interties. In 2014, the City executed an agreement for an additional 2.5 mgd (1,736 gpm) of average use and 3.32 mgd (2,305 gpm) of peak use. The combined agreements allow up to 3,556 gpm (5.12 mgd) on the MDD and an annual average of 2,430 gpm (3.5 mgd). Additionally, the interties may provide emergency supplies. These values include a new wholesale water agreement that was executed between Tacoma and the City 2014.

3. King County Water District #111 (WD#111) and Covington Water District (CWD): An intertie between the City and CWD and WD#111 was constructed in 1996 as part of IA2, to enable the Districts to purchase water from the City. The intertie also allows the City to provide an emergency supply to Kent's East Hill service area through WD#111. A provision of the IA2 agreement calls for either of the Districts to send an emergency supply of water to the City when needed for the Lea Hill service area. As part of the IA2 the City agrees to provide water, not to exceed a total maximum day demand (MDD) of 2.5 mgd to each CWD and WD#111 (total MDD of 5.0 mgd).

The City also has a supply contract with the MIT and the Indian Health Service dating from 1972 for services along a pipeline at 368th Street SE extending from the City Limits into the reservation.

Table 6.2 Wholesale Water Supply Interties
Comprehensive Water Plan
City of Auburn

Name	Type of Intertie	Meter Size	Location	Maximum Flow Rate (gpm)
Algona	Wholesale			1.1 mgd
		8	1149 Industry Drive SW	-
		8	Boundary Boulevard and Milwaukee Ave	-
		8	Iowa Drive and West Valley Highway	-
		8	1st Avenue	-
Tacoma	Wholesale Purchase	6	3240 B St NW	2,200
		8	29598 132nd Ave SE	4,500
WD#111	Wholesale	12	30502 132nd Avenue SE	5 mgd

6.2.4.2 Emergency Interties

The City has emergency interties with five different entities as summarized below and in Table 6.2:

1. Algona: The City and Algona have two emergency interties in addition to their wholesale interties.
2. City of Bonney Lake (Bonney Lake): The City and Bonney Lake have four emergency interties. One intertie is located on Evergreen Way SE southwest of Lakeland Hills Way and provides support for the Bonney Lake water system only in the event of a fire at three multi-family development sites in the service area. The remaining interties provide two-way emergency supply.
3. City of Kent (Kent): The City and Kent have an emergency intertie at South 277th Street. The City’s hydraulic grade line at the intertie location is higher than Kent's therefore the only time water can flow from Kent into the City is during emergency conditions when the pressure in the City’s system drops below that of Kent’s.
4. City of Pacific (Pacific): The City supplies water to Pacific on an emergency basis through two interties.
5. Lakehaven Utility District (LUD): LUD and the City have a 6-inch intertie located at Aaby Drive NW and Knickerbocker Drive NW for emergency service to the higher elevations within Auburn’s Valley Service Area. In 2002, LUD and the City entered into an agreement that grants the City the right to connect a future intertie to the LUD at the end of the 16-inch water main located in the vicinity of 15th Street NW and Terrace Drive.
6. WD#111: WD#111 and the City have four emergency interties, as well as the wholesale intertie. The interties located near the intersection of 124th Avenue SE and SE 300th and the intersection of 127th Place SE and SE 300th between the City and WD#111 boundaries are for emergency use only and are two-way.

Table 6.3 Emergency Water Supply Interties
Comprehensive Water Plan
City of Auburn

Name	Type of Intertie	Meter Size	Location
Algona	Emergency		Boundary Boulevard and Celery Ave
Algona	Emergency		Boundary Boulevard and O Street
Bonney Lake	Emergency	8	Evergreen Way, southwest of Lakeland Hills Way
Bonney Lake	Emergency		Lakeland Hills Way & 59th Avenue
Bonney Lake	Emergency		Evergreen Way and Nathan Avenue
Bonney Lake	Emergency		Olive Avenue, south of Evergreen Loop

Table 6.3 Emergency Water Supply Interties Comprehensive Water Plan City of Auburn			
Name	**Type of Intertie**	**Meter Size**	**Location**
Kent	Emergency	6	78th Avenue S and S 277th Street
Pacific	Emergency	4	Ellingson Road near Pacific Ave
Pacific	Emergency		A St SE, north of White River
Lakehaven Utility District	Emergency	6	Aaby Drive and Knickerbocker Dr
WD#111	Emergency		127th Place SE, south of SE 299th Place
WD#111	Emergency		124th Avenue SE and SE 300th Way
WD#111/ Duberry	Emergency		SE 300th & 132nd Ave SE
WD#111/ Covington	Emergency		SE 288th St & 132nd Ave SE

6.2.4.3 Potential Interties

The City would consider additional interties that would provide increased supply and reliability to itself and adjacent purveyors. The City has identified the potential for a second intertie with the RWSS in the Valley Service Area; however, the City is not pursuing a third intertie at this time. The City has not identified other interties at this time.

6.2.5 Braunwood Satellite System

The Braunwood system is discussed in detail in Chapter 5, including its water resources. The Braunwood Well is a certificated water right (Certificate No. G1-25173C) with a priority date of 1988. This well has a Qi of 20 gpm (0.03 mgd) and a Qa of 6.5 AFY (0.006 mgd).

6.2.6 Pending Water Right Applications

In 1996, CWD and WD#111 executed the IA2 with the City of Auburn that included the development of primary water rights and construction of Wells 6 and 7. In the event that the primary water rights are approved, CWD and WD#111 would receive 5.0 mgd (2.5 mgd each) on a firm basis and the City would be entitled to the remaining 2.0 mgd. The agreement also established interruptible wholesale purchases that are described in Chapter 2.

On April 26, 1996, the City submitted an application to Ecology (application number G1-27735) for two new primary rights in the Valley Well Field. The application requested a combined Qi of 8,000 gpm (11.52 mgd) and a Qa of 7,840 AFY (7.00 mgd). Wells 6 and 7 would be used to withdraw the requested quantities. This water right application was withdrawn from consideration.

A new application was submitted on January 5, 2006. This new water right application (application number G1-28404) is for primary water rights for a Qi of 12,500 gpm (18.00 mgd) and a Qa of 13,433 AFY (11.99 mgd) from a combined Well 6, 7 and a future

Well 8. In the application, the City indicated that 6.0 mgd of the 18.0 mgd request was to support the estimated future needs of the Muckleshoot Indian Tribe (MIT).

6.3 WATER RIGHT EVALUATION

Groundwater supply sources represent the City's largest water resource. The capacity of these supplies during the MDD and throughout the year is set by water rights, as well as the constraints that are presented in the Ability to Pump analysis. Therefore, the City's water rights were evaluated to determine if they are sufficient to supply the future demand.

As described in the previous section, the City currently holds seven certificated groundwater rights, three additive groundwater rights, one certificated surface (spring) water right, and one claim (spring). The City currently holds certificated, primary water rights and/or claims Qi water right to 19,075 gpm (27.47 mgd) and their Qa water right to 21,002 AFY (18.75 mgd). This total includes the Algona well and Braunwood Satellite System water rights, but does not include the long-term wholesale water contract with Tacoma.

The City's water rights were compared to current (2013) and future (2035) production, which is summarized in Table 6.3, to establish excess or deficiencies in water rights for both Qi and Qa. The maximum instantaneous well pumping capacity in 2013 is shown in Table 6.3. Not all the City's wells were used during this period and no well reached its Qi. Overall, the City has an existing excess Qi of 7,960 gpm (11.46 mgd) and an existing excess Qa of 14,246 AFY (12.72 MGD).

For the future water rights status in Table 6.3, the instantaneous well pumping capacity was based on the water supply strategy described later in this Chapter. Based on this strategy, the City will have redundant and reliable capacity to supply the 2035 MDD. The medium scenario, as presented in Chapter 4, was used in all system analyses. Since the maximum instantaneous use of the City's source may occur on different days, the future Qi (17,630 gpm) is expected to be greater than the 2035 MDD of 13,264 gpm. The City has an excess of Qi of 1,445 gpm (2.08 mgd) in 2035, which equates to 8 percent of the total Qi.

The future Qa was also based on water supply strategy. In 2035 the maximum annual volume is expected to equal the 2035 medium scenario ADD, which has been converted to units of AFY for this analysis. The city will have an excess Qa of 7,515 AFY (6.71 MGD) in 2035, which equates to 36 percent of the total Qa.

Due to the excess of both Qi and Qa in 2035, no new water rights are required during the planning period to serve retail and firm wholesale customers (Algona and existing agreements with the Muckleshoot Indian Tribe). Detailed results are provided in Appendix H, which are analogous to "Table 3" and "Table 4" in the DOH Water System Planning Handbook.

Note, demands for Covington Water District (CWD), King County Water District #111 (WD#111), and future needs of the Muckleshoot Indian Tribe (MIT) in addition to the Coal Creek Springs supplies are not included in the evaluation.

The City's policy is to have sufficient supplies to meet demand with the largest source out of service, referred to as the redundancy scenario. The City does not currently have sufficient water rights to meet the ultimate demands (16,400 gpm) under the redundancy scenario. The City's pending water right would provide sufficient supply to meet the ultimate demand.

Table 6.4 Water Rights Status Summary
Comprehensive Water Plan
City of Auburn

Year	Water Rights		Water Use from Sources		Water Right Status (Excess/Deficiency)	
	Maximum Instantaneous Flow Rate (Qi), gpm	Maximum Annual Volume (Qa), AFY	Maximum Instantaneous Flow Rate (Qi), gpm	Maximum Annual Volume (Qa), AFY	Maximum Instantaneous Flow Rate (Qi), gpm	Maximum Annual Volume (Qa), AFY
2013	19,075	21,002	11,115	6,756	7,960	14,246
2035	19,075	21,002	17,630	13,487	1,445	7,515

6.4 SUPPLY EVALUATION

The City's supplies were further evaluated for meeting future demands given source limitations in addition to water rights. The City's actual supply capacity or "Ability to Pump" for each source was considered. This provides a comprehensive approach that included physical, water quality, and regulatory limitations. The resulting total Ability to Pump was compared to demands to determine the supply excess or deficiencies. Supply improvements are proposed to eliminate all deficiencies. As with the Water Right Evaluation, the supply evaluation considered both MDD and ADD conditions. Further, the Ability to Pump was evaluated for a standard scenario and a redundancy scenario for each demand condition. The redundancy scenario evaluated the supplies considering the redundancy criteria presented in Chapter 3. A detailed evaluation of supply limitations to specific pressure zones and in the distribution system is presented in Chapter 9.

6.4.1 Ability to Pump

The Ability to Pump was determined for each of the City's sources. The Ability to Pump is the maximum capacity of a source considering water rights, pumping capacity, treatment capacity, and aquifer or regulatory limitations. Note, the City's springs do not require pumping; however, the term "Ability to Pump" was used in these cases to be consistent with other sources. The Ability to Pump analyses are presented separately for the MDD and ADD.

6.4.1.1 Ongoing Source Improvement Projects

The City has a number of ongoing or planned projects that are to be completed by the end of 2016 to improve operations; provide reliability; and enhance treatment. The improvement projects include:

- Well 1 On-site Improvements project.
- Well 4 Emergency Power Improvements project.
- Well 6 VFD pump.
- West Hill Springs Flow Control Improvements.

Details of the projects are presented in Table 6.4. Due to imminent nature of these projects, they were incorporated into the existing Ability to Pump and were not considered to increase capacity.

Table 6.5 Ongoing Source Improvements
Comprehensive Water Plan
City of Auburn

Planning Period	Year	Supply Improvement	Improved Capacity (gpm)	Project Elements
Short-term	2015	Well 4 Emergency Power Improvements Project	2,600	Emergency power generator and hypochlorite chlorination.
Short-term	2015	Well 1 On-site Improvements Project	2,200	Transmission to Howard Road CCT Facility, site improvements, a new well house, new pumping system, on-site emergency power, chlorination, and upgraded electrical and SCADA controls.
Short-term	2016	Well 6 VFD Pump	1,900	Replace pump with VFD for operational flexibility.
Short-term	2016	West Hill Springs Flow Control Improvements	600	Control valve for automatic shut-down with upgrades to SCADA controls, and Tide-flex valve on overflow.

6.4.1.2 MDD Ability to Pump

The MDD Ability to Pump was compared to the projected medium MDD, as developed in Chapter 4, under two scenarios: standard and redundancy. The standard scenario represents the City's ability to meet MDD with all sources pumping continuously (24 hours per day). This represents the maximum quantity of water that can be produced.

However, the City's source reliability criteria, as described in Chapter 3, states: "Since any of the City's supply facilities (a single well, spring supply, or wholesale intertie) might fail as a result of a rare or catastrophic emergency event, it is the City's goal to have sufficient system-wide supply facilities (including both permanent and emergency interties) to meet the MDD with the largest active water supply source out of service."

Therefore, the redundancy scenario represents the City's ability to meet MDD with the single largest source offline. Demands above the MDD (such as peak hour demands or fire flow) are met from storage and are evaluated in Chapter 9.

The City's existing Ability to Pump is tabulated for the standard scenario in Table 6.5 and the redundancy scenario in Table 6.6. The tables consists of the following components:

- Pumping Capacity: The pump or physical capacities at each source.
- Instantaneous Water Right (Qi): The sum of instantaneous water rights or contractual maximum at each source.
- Treatment Capacity: The available treatment capacity for each applicable source. Treatment capacities were considered at the Fulmer and Howard Road CCT facilities.
- Other Limitations: Limitations due to water quality in sources without treatment, well field water right limitations (rather than a well specific Qi), and aquifer limitations.

The pumping or physical capacity of the source is the primary limiting component in the MDD Ability to Pump evaluation. The City's existing Ability to pump is 14,686 gpm (21.15 mgd) in the standard scenario and 11,130 gpm (16.03 mgd) in the redundancy scenario. This equates to approximately 65 percent of the Qi in the standard scenario and approximately 49 percent of the Qi in the redundancy scenario. This finding is consistent with past evaluations and the City's current operations.

The MDD Ability to Pump was compared with the projected MDD for the planning period to evaluate if the City has sufficient supply, as shown in Figure 6.2. The top blue line represents the maximum instantaneous supply allowed by the City's water rights and wholesale water contract with Tacoma. The solid green and red lines represent the existing MDD ability to pump for the standard and redundancy scenarios, respectively. The demands are divided into three groups: retail (pink line), retail plus firm wholesale (tan line), and retail plus total wholesale (black line). City policy is to provide supplies for retail and firm wholesale customers; therefore, a deficiency occurs when the tan line is greater than the green or red lines.

Table 6.6 MDD Ability to Pump – Standard Scenario
Comprehensive Water Plan
City of Auburn

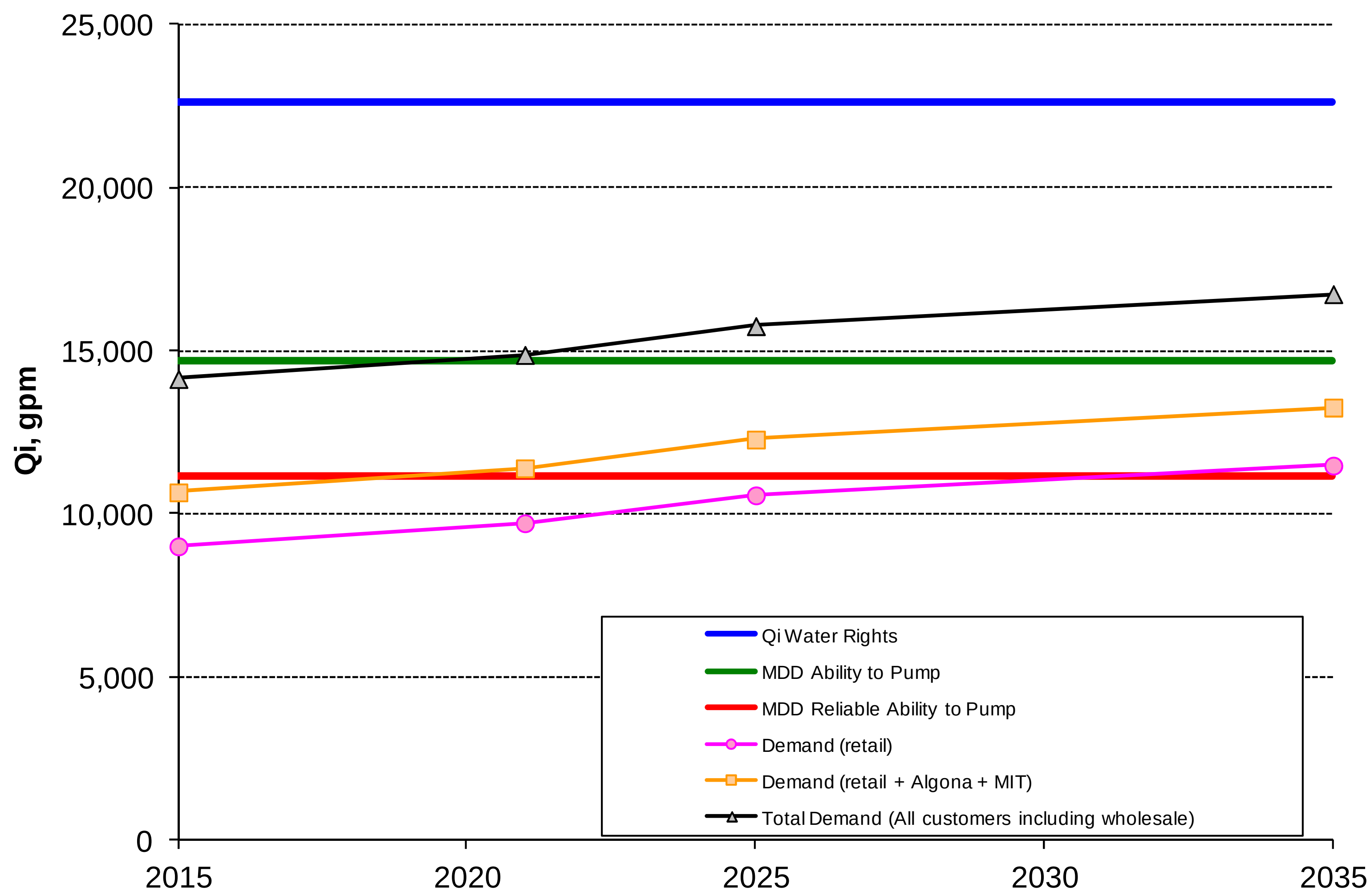
Supply Source	Pumping Capacity (gpm)	Instantaneous Water Right (Qi) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	3,000 (1)	6,730	4,800 (2)	NA	3,000	Pumping
West Hill Springs	600 (3)	625	NA	NA	600	
Well 1	2,200	2,200	2,200 (2)	NA	2,200	
Well 2	0 (4)	2,400	2,400 (5)	NA	0	Pumping
Well 3A/B	0	2,800	NA	0 (6)	0	Aquifer
Well 4	2,600	2,800	NA	NA	2,600	Pumping
Well 6	1,900	3,500	3,500 (5)	1,900 (7)	1,900	Pumping & Aquifer
Well 7	0 (4)	3,500	3,500 (5)	3,500 (7)	0	Pumping
Well 5, 5A, 5B	830	1,000	NA	NA	830	Pumping & Aquifer
Algona Well	0	500	NA	NA	0	Pumping
B Street Intertie	1,250	1,250 (8)	NA	NA	1,250	
132nd Intertie	2,306	2,306 (8)	NA	NA	2,306	
Total	**14,686**	**22,611**			**14,686**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Well is out of service until operational and maintenance issues are resolved.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B are not commonly operated due to elevated levels of manganese.
(7) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(8) Not a water right. Values based on contractual wholesale agreement with Tacoma.

Table 6.7 MDD Ability to Pump – Redundancy Scenario Comprehensive Water Plan City of Auburn

Supply Source	Pumping Capacity (gpm)	Instantaneous Water Right (Qi) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	3,000 (1)	6,730	4,800 (2)	NA	3,000	Pumping
West Hill Springs	600 (3)	625	NA	NA	600	
Well 1	2,200	2,200	2,200 (2)	NA	2,200	
Well 2	0 (4)	2,400	2,400 (5)	NA	0	Pumping
Well 3A/B	0	2,800	NA	0 (6)	0	Aquifer
Well 4	2,600	2,800	NA	NA	2,600	Pumping
Well 6	1,900	3,500	3,500 (5)	1,900 (7)	1,900	Pumping & Aquifer
Well 7	0 (4)	3,500	3,500 (5)	3,500 (7)	0	Pumping
Well 5, 5A, 5B	830	1,000	NA	NA	830	Pumping & Aquifer
Algona Well	0	500	NA	NA	0	Pumping
B Street Intertie	0 (8)	1,250 (9)	NA	NA	0	Redundancy Criteria
132nd Intertie	0 (8)	2,306 (9)	NA	NA	0	Redundancy Criteria
Total	**11,130**	**22,611**			**11,130**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Well is out of service until operational and maintenance issues are resolved.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B are not commonly operated due to elevated levels of manganese.
(7) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(8) Interties considered a single source. As the largest source, the interties were assumed to be out of service for redundancy scenario.
(9) Not a water right. Values based on contractual wholesale agreement with Tacoma.



MDD ABILITY TO PUMP
FIGURE 6.2

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

carollo

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The City currently has sufficient supplies to meet the projected demands throughout the planning period for the standard scenario (green line). However, the City is not able to supply the MDD for the redundancy scenario (red line) starting in approximately 2019. The City will need an additional 2,100 gpm of redundant supplies by the end of the planning period to correct this deficiency.

6.4.1.3 ADD Ability to Pump

The ADD Ability to Pump evaluation confirms the ability of the City to supply its demand throughout the year. The ADD was used to represent the average conditions expected to occur. Similar to the MDD Ability to Pump evaluation, standard and redundancy scenarios were considered for the ADD. The standard scenario represents the City's ability to meet the ADD with all sources pumping continuously. The City's ADD source reliability criteria, as summarized in Chapter 3, states:

> Source of Supply reliability is critical to providing an uninterrupted level of service to City utility customers. Malfunction of any of several supply components could cause a temporary limitation of the supply capacity.

A source of supply failure is assumed to last for 6 months. Therefore, the redundancy scenario represents the City's ability to meet ADD with the single largest source offline for 6 months. This was represented by a 50 percent reduction in pumping capacity of the largest source.

The City's existing Ability to Pump is tabulated for the standard scenario in Table 6.7 and the redundancy scenario in Table 6.8. The tables consist of the following components:

- Pumping Capacity: The pump or physical capacities at each source.
- Primary Water Right (Qa): The sum of Primary annual water rights or contractual limitations at each source.
- Additive Water Right (Qa): The sum of Additive annual water rights at each source.
- Treatment Capacity: The available treatment capacity for each applicable source. Treatment capacities were considered at the Fulmer and Howard Road CCT facilities.
- Other Limitations: Limitations due to water quality in sources without treatment, well field water right limitations, and aquifer limitations.

Similar to the MDD Ability to Pump evaluation, the pumping or physical capacity of the source is the primary limiting component in the ADD Ability to Pump evaluation. However, water rights are limiting for Well 1 and Upland Well Field (Well 5, 5A, and 5b) for the ADD. The City's existing Ability to pump is 10,603 gpm (15.27 mgd) in the standard scenario and 9,103 gpm (13.11 mgd) in the redundancy scenario. This equates to approximately 68

Table 6.8 ADD Ability to Pump – Standard Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Primary Water Right (Qa) (gpm)	Additive Water Right (Qa) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	3,000 (1)	5,833		4,800 (2)	NA	3,000	Pumping
West Hill Springs	600 (3)	626		NA	NA	600	
Well 1	2,200	694		2,200 (2)	NA	694	
Well 2	0 (4)	843	1,537	2,400 (5)	NA	0	Pumping
Well 3A/B	0	2,232		NA	0 (6)	0	Aquifer
Well 4	2,600	2,232		NA	NA	2,232	Pumping
Well 6	1,900	0 (7)		3,500 (5)	1,201 (8)	1,201	Pumping & Aquifer
Well 7	0 (4)	0 (7)		3,500 (5)	0 (9)	0	Pumping
Well 5, 5A, 5B	830	446		NA	NA	446	Pumping & Aquifer
Algona Well	0	108		NA	NA	0	Pumping
B Street Intertie	1,250	1,250 (10)		NA	NA	1,250	
132nd Intertie	2,306	1,180 (10)		NA	NA	1,180	
Total	**14,686**	**15,445**				**10,603**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Well is out of service until operational and maintenance issues are resolved.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B are not commonly operated due to elevated levels of manganese.
(7) Wells 6 and 7 are additive to the other wells.
(8) Wells 6 pumping is limited to unused primary water rights in the Valley Well Field.
(9) Well 7 is used for peak demand periods only due to water quality reasons; therefore, it was not considered as an annual source.
(10) Not a water right. Values based on contractual wholesale agreement with Tacoma.

Table 6.9 ADD Ability to Pump – Redundancy Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Primary Water Right (Qa) (gpm)	Additive Water Right (Qa) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	1,500 (1)	5,833		4,800 (2)	NA	1,500	Pumping
West Hill Springs	600 (3)	626		NA	NA	600	
Well 1	2,200	694		2,200 (2)	NA	694	
Well 2	0 (4)	843	1,537	2,400 (5)	NA	0	Pumping
Well 3A/B	0	2,232		NA	0 (6)	0	Aquifer
Well 4	2,600	2,232		NA	NA	2,232	Pumping
Well 6	1,900	0 (7)		3,500 (5)	1,201	1,201	Pumping & Aquifer
Well 7	0 (4)	0 (7)		3,500 (5)	0 (8)	0	Pumping
Well 5, 5A, 5B	830	446		NA	NA	446	Pumping & Aquifer
Algona Well	0	108		NA	NA	0	Pumping
B Street Intertie	1,250	1,250 (10)		NA	NA	1,250	
132nd Intertie	2,306	1,180 (10)		NA	NA	1,181	
Total	**14,686**	**15,445**				**9,103**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1. As the largest source, it is assumed to be offline for 6 months per the City's redundancy criteria.
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Well is out of service until operational and maintenance issues are resolved.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B are not commonly operated due to elevated levels of manganese.
(7) Wells 6 and 7 are additive to the other wells.
(8) Wells 7 pumping is limited to unused primary water rights in the Valley Well Field.
(9) Well 7 is used for peak demand periods only due to water quality reasons; therefore, it was not considered as an annual source.
(10) Not a water right. Values based on contractual wholesale agreement with Tacoma.

percent of the Qa in the standard scenario and approximately 59 percent of the Qa in the redundancy scenario. Therefore, the City is able to use a larger portion of its Qa than its Qi, which is consistent with the identified pumping limitations.

Similar to the MDD, the ADD Ability to Pump was compared with the projected ADD for the planning period to evaluate if the City has sufficient supply, as shown in Figure 6.3. This Figure uses the same coloring as Figure 6.2, where the blue line represents the Primary Qa, rather than the Qi. The City currently has sufficient supplies to meet the projected demands throughout the planning period for both the standard scenario (green line) and the redundancy scenario (red line). The City will have a relatively small excess, 742 gpm, for the redundancy scenario by 2035. Source of supply projects may require long lead times to conduct the necessary studies and legal processes, potentially requiring an ADD project during the planning period. However, the improvements needed to correct the MDD Ability to Pump scenario deficiency starting in 2019 will also increase the ADD Ability to Pump. With this additional pumping capacity, no additional projects are recommended.

6.5 WATER SUPPLY STRATEGY

The City has sufficient supplies to meet the ADD and MDD through 2035. However, deficiencies occur under the redundancy scenario for the MDD starting in 2019. The City will need to provide a minimum additional supply of 2,100 gpm by the end of the planning period. The City's water supply strategy has five parts:

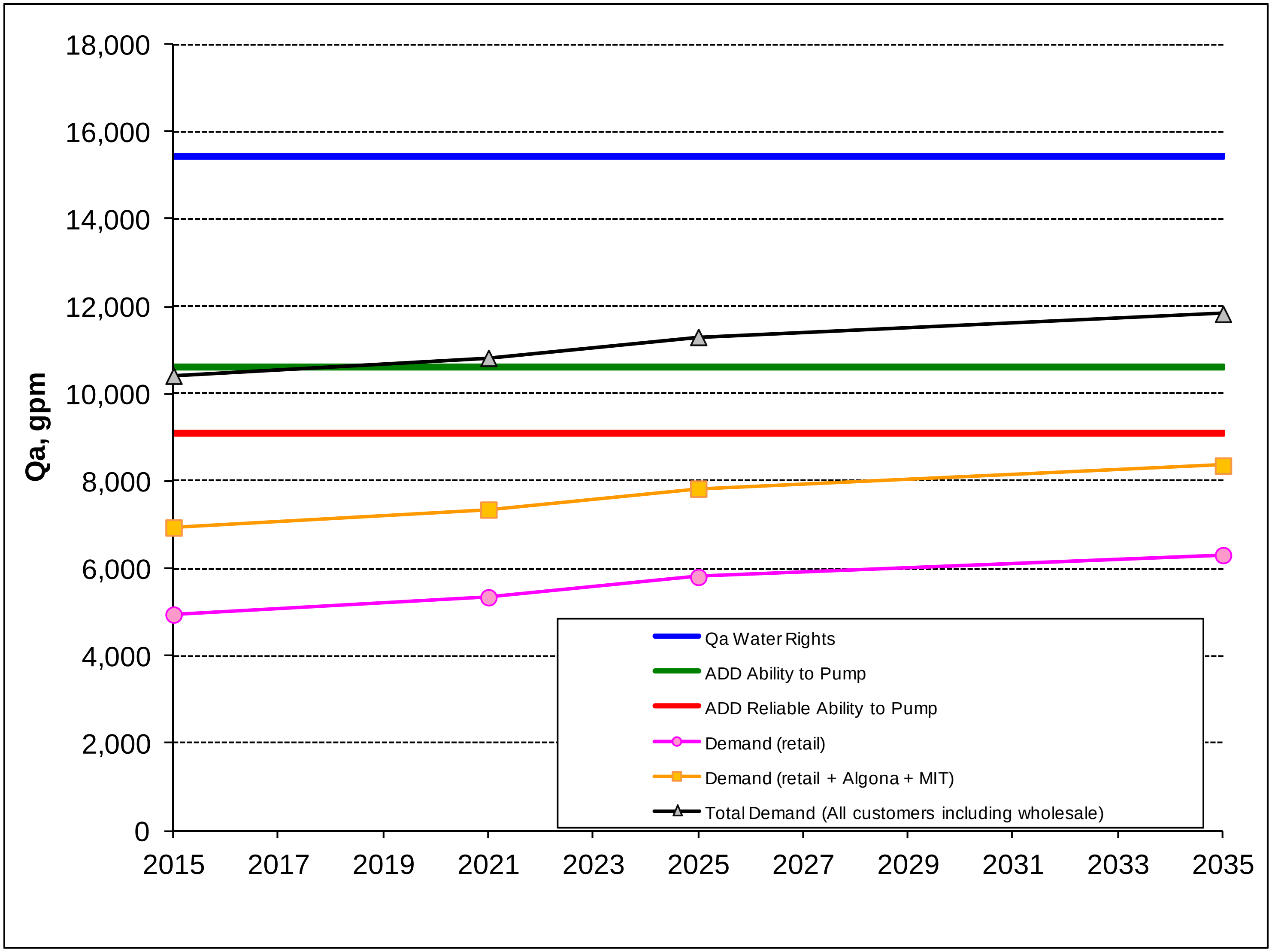
- Improve existing supply facilities.
- Use cost-effective wholesale supplies from Tacoma to their full extent.
- Secure additional water rights.
- Consider opportunities for water reuse.
- Continue an aggressive Water Use Efficiency Program.

The improvements are grouped by planning horizons: short-term (2015-2020), medium-term (2021-2024), and long-term (2025-2035).

6.5.1 Improve Existing Supply Facilities

The City has unused supply capacity due to the limitations presented in the Ability to Pump evaluation. The City goal is to make full use of all its water rights by the end of the planning period, which will both meet the redundancy scenario deficiencies and provide additional redundancy and operational flexibility. The City has developed a strategy to improve the existing supply facilities in order to meet the short- and medium-term deficiencies, as well as accomplish its long-term goals. The strategy can be summarized as the following:

- Address the short-term deficiency by rehabilitating Coal Creek Springs.



ADD ABILITY TO PUMP
FIGURE 6.3

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

- Address the medium-term deficiency by providing manganese treatment to Well 7.
- Make full use of the City's groundwater and spring supply sources to provide both redundant capacity and operational flexibility and meet the long-term deficiency.
- Decommission Algona Well 1 in the short-term and study options for using water right.

Individual improvements are summarized in Table 6.9. Projects are grouped by planning horizons: short-term (2015-2020), medium-term (2021-2024), and long-term (2025-2035). The resulting improved ability to pump is presented in Figure 6.4 and Figure 6.5 for the MDD and ADD Ability to Pump, respectively. The dashed red and green lines remain at or above the tan line (demands), showing the deficiency has been eliminated.

Planned improvements in 2018-2019 to Coal Creek Springs will eliminate the identified short-term deficiency. The Coal Creek Springs Collector Improvement Project is expected to double the existing capacity of the source to 6,000 gpm. The project will focus on rehabilitating the middle collector and additional flow control improvements. In the short-term, the capacity of the source will be limited to 4,800 gpm due to the treatment capacity at Howard Road CCT facility.

Note, Coal Creek Springs (4,800 gpm) will be the largest source of supply after the 2018-2019 improvements; therefore, it is assumed to be out of service during the redundancy scenario. The Coal Creek Springs existing capacity of 3,000 gpm was removed and the 3,694 gpm supply from Tacoma was added; resulting in a net increase of only 694 gpm for the redundancy scenario. Similarly, treatment improvements to Howard Road CCT in 2025 do not impact the redundancy scenario, as Coal Creek Springs is assumed to be out of service.

To meet medium-term deficiencies, manganese treatment is proposed to be a phased improvement to Well 7. This initial phase will treat half of the well's capacity (1,750 gpm), where phase 2 in the long-term planning horizon will treat the entire well capacity. Additionally, Howard Road CCT facility is to be expanded to its full capacity in the medium-term planning horizon to allow full use of both Coal Creek Springs and Well 1. The expansion will add a fourth 2,100 gpm pump, for a total of 8,400 gpm, and a third air-stripping tower. The facility was design for the expansion; therefore significant site work is not expected. The expanded capacity of 8,400 gpm is sufficient to treat both Coal Creek Springs and Well 1 simultaneously. The firm capacity of 6,300 gpm is sufficient to treat the improved Coal Creek Spring supply capacity.

The Valley Well Field will be further improved in the long-term planning horizon by replacing Well 2 and Wells 3A/B. These wells have historically had operational issues that the City will address through the new wells. With these improvements, the Valley Well Field will be able to produce the well fields full Qi with one or more wells offline.

Table 6.10 Improved Supply Facilities MDD Ability to Pump – Standard Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Instantaneous Water Right (Qi) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	0 [1]	6,730	6,000 [2]	NA	6,000	Pumping
West Hill Springs	600 [3]	625	NA	NA	600	
Well 1	2,200	2,200	2,200 [2]	NA	2,200	
Well 2	2,400	2,400	2,400 [4]	NA	2,400	
Well 3A/B	2,800	2,800	2,800 [5]	NA	2,800	
Well 4	2,600	2,800	NA	NA	2,600	Pumping
Well 6	1,900	3,500	3,500 [4]	200 [6]	200	Pumping & Aquifer
Well 7	3,500	3,500	3,500 [4]	0 [6]	0	
Well 5, 5A, 5B	830	1,000	NA	NA	830	Pumping & Aquifer
Algona Well	0	500	NA	NA	0	Pumping
B Street Intertie	1,250	1,250 [7]	NA	NA	1,250	
132nd Intertie	2,306	2,306 [7]	NA	NA	2,306	
Total	**26,386**	**22,611**			**21,186**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Fulmer Road CCT Facility.
(5) Well 3A & 3B will require manganese treatment.
(6) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(7) Not a water right. Values based on contractual wholesale agreement with Tacoma.

Table 6.11 Improved Supply Facilities MDD Ability to Pump – Redundancy Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Instantaneous Water Right (Qi) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	0 (1, 2)	6,730	6,000 (3)	NA	0	Redundancy Criteria
West Hill Springs	600 (4)	625	NA	NA	600	
Well 1	2,200	2,200	2,200 (3)	NA	2,200	
Well 2	2,400	2,400	2,400 (5)	NA	2,400	
Well 3A/B	2,800	2,800	2,800 (6)	NA	2,800	
Well 4	2,600	2,800	NA	NA	2,600	Pumping
Well 6	1,900	3,500	3,500 (5)	200 (7)	200	Pumping & Aquifer
Well 7	3,500	3,500	3,500 (5)	0 (7)	0	
Well 5, 5A, 5B	830	1,000	NA	NA	830	Pumping & Aquifer
Algona Well	0	500	NA	NA	0	Pumping
B Street Intertie	1,250	1,250 (8)	NA	NA	1,250	
132nd Intertie	2,306	2,306 (8)	NA	NA	2,306	
Total	**11,130**	**22,611**			**15,186**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) As the largest source, the Coal Creek Springs was assumed to be out of service for redundancy scenario.
(3) Howard Road CCT Facility.
(4) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B will require manganese treatment.
(7) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(8) Not a water right. Values based on contractual wholesale agreement with Tacoma.

Table 6.12 Improved Supply Facilities ADD Ability to Pump – Standard Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Primary Water Right (Qa) (gpm)	Additive Water Right (Qa) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	6,000 (1)	5,833		6,000 (2)	NA	5,833	Water Rights
West Hill Springs	600 (3)	626		NA	NA	600	
Well 1	2,200	694		2,200 (2)	NA	694	Water Rights
Well 2	2,400	843	1,537	2,400 (4)	NA	843	Water Rights
Well 3A/B	2,800	2,232		2,800 (5)	NA	2,232	Water Rights
Well 4	2,600	2,232		NA	NA	2,232	Water Rights
Well 6	1,900	0 (6)		3,500 (4)	0 (6)	0	Water Rights
Well 7	3,500	0 (6)		3,500 (4)	0 (6)	0	Water Rights
Well 5, 5A, 5B	830	446		NA	NA	446	Water Rights
Algona Well	0	108		NA	NA	0	Pumping
B Street Intertie	1,250	1,250 (7)		NA	NA	1,250	
132nd Intertie	2,306	1,180 (7)		NA	NA	1,180	
Total	**26,386**	**15,445**				**15,311**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1
(2) Howard Road CCT Facility.
(3) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(4) Fulmer Road CCT Facility.
(5) Well 3A & 3B will require manganese treatment.
(6) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(7) Not a water right. Values based on contractual wholesale agreement with Tacoma.

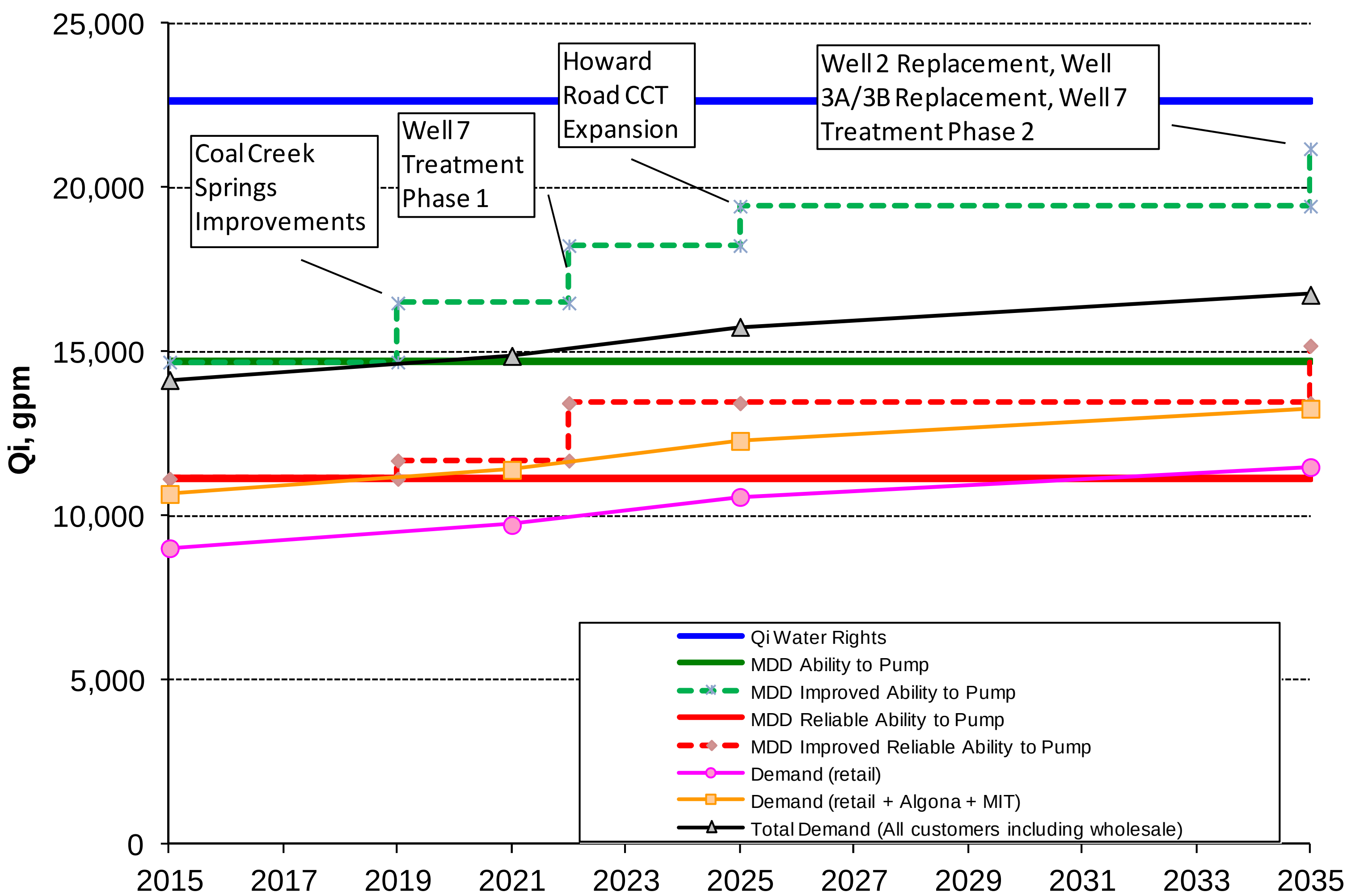
Table 6.13 Improved Supply Facilities ADD Ability to Pump – Redundancy Scenario
Comprehensive Water Plan
City of Auburn

Supply Source	Pumping Capacity (gpm)	Primary Water Right (Qa) (gpm)	Additive Water Right (Qa) (gpm)	Treatment Capacity (gpm)	Other Limitations (gpm)	Ability to Pump (gpm)	Limiting Component
Coal Creek Springs	3,000 [1, 2]	5,833		6,000 [3]	NA	1,500	Redundancy Scenario
West Hill Springs	600 [4]	626		NA	NA	600	
Well 1	2,200	694		2,200 [3]	NA	694	Water Rights
Well 2	2,400	843	1,537	2,400 [5]	NA	0	Water Rights
Well 3A/B	2,800	2,232		2,800 [6]	NA	0	Water Rights
Well 4	2,600	2,232		NA	NA	2,232	Water Rights
Well 6	1,900	0 [7]		3,500 [5]	0 [7]	1,201	Water Rights
Well 7	3,500	0 [7]		3,500 [5]	0 [7]	0	Water Rights
Well 5, 5A, 5B	830	446		NA	NA	446	Water Rights
Algona Well	0	108		NA	NA	0	Pumping
B Street Intertie	1,250	1,250 [8]		NA	NA	1,250	
132nd Intertie	2,306	1,180 [8]		NA	NA	1,181	
Total	**14,686**	**15,445**				**9,103**	

Notes:
(1) Coal Creek Springs flows by gravity to the Howard Road CCT Facility, where it is treated and pumped to Reservoir 1.
(2) As the largest source, it is assumed to be offline for 6 months per the City's redundancy criteria.
(3) Howard Road CCT Facility.
(4) West Hill Springs flows by gravity to the Valley Service Area, 242 Pressure Zone.
(5) Fulmer Road CCT Facility.
(6) Well 3A & 3B will require manganese treatment.
(7) Wells 6 and 7 are additive to Wells 1, 2, 3A, 3B, and 4; therefore the pumping cannot exceed unused primary water rights in the Valley Well Field.
(8) Not a water right. Values based on contractual wholesale agreement with Tacoma.

Table 6.14 Water Supply Improvements
Comprehensive Water Plan
City of Auburn

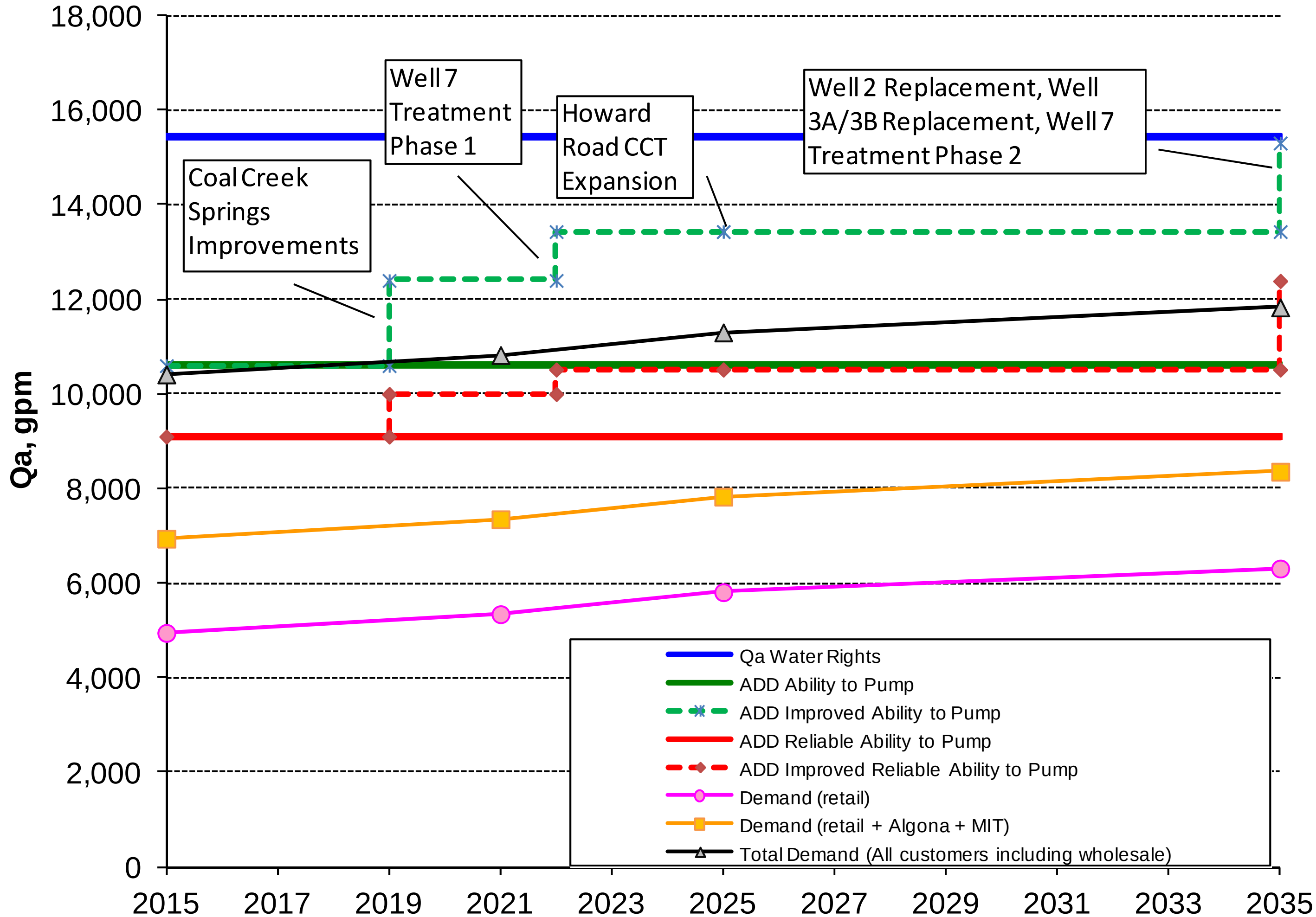
Planning Period	Year	Supply Improvement	Existing Total Capacity (gpm)	Improved or Expanded Total Capacity (gpm)	Increase in Ability to Pump (gpm)	Comment
Short-term	2018	Algona Well 1 Decommissioning	0	0	0	Decommission well and conduct study to identify options for using the water right.
Short-term	2019	Coal Creek Springs Collector Improvements	3,000	6,000	1,800	Due to limitation in Howard Road CCT capacity, the Ability to Pump will be limited to 4,800 gpm.
Medium-term	2022	Well 7 Water Quality Treatment Phase 1	0	1,750	1,750	Removal of manganese. Detailed study is required for selection of treatment technology and sizing. Implementation of treatment will be in phases.
Medium-term	2025	Howard Road CCT Expansion	6,300	8,400	2,100	Expand to full capacity with an additional air stripper and booster pump.
Long-term	2035	Well 2 Replacement	0	2,400	2,400	New large diameter well per Golder & Associates recommendations.
Long-term	2035	Well 3A/B Replacement	0	2,800	2,800	New well(s) to provide better site for treatment facilities.
Long-term	2035	Well 7 Water Quality Treatment Phase 2	1750	3,500	1,750	Expand existing treatment system to treat all of Well 7.



IMPROVEMENTS TO MDD ABILITY TO PUMP

FIGURE 6.4

CITY OF AUBURN
COMPREHENSIVE WATER PLAN



IMPROVEMENTS TO ADD ABILITY TO PUMP

FIGURE 6.5

CITY OF AUBURN

COMPREHENSIVE WATER PLAN

carollo

Algona Well 1 has historically had substantial issues, ultimately leading to Algona obtaining their supplies from the City in 1996. The existing well casing cannot reliably produce supplies and the City plans to decommission it in the short-term planning horizon. The City will conduct a study to identify potential options to use the water right in conjunction with the well decommissioning. Based on the results of the study, the City will update its water supply strategy.

6.5.2 Use of Wholesale Supplies

As part of the water supply strategy, the City intends to use cost-effective wholesale supplies from Tacoma to their full extent. By using these supplies, the City gains more flexibility in phasing the Valley Well Field improvements.

6.5.3 Secure Additional Supplies and Water Rights

The City has an application into the Ecology for new primary water rights. The new rights will provide supply for the City, Algona, MIT, Covington Water District, and KC WD#111. The City may also consider securing additional regional supplies.

6.5.4 Water Reuse

Reclaimed water, in the form of wastewater reuse, is a potential source of supply. The most likely potential uses of reclaimed water are for irrigation and landscape purposes. However, there are other potential uses, such as manufacturing, industrial operations and aquifer recharge, depending on the degree to which reclaimed water is treated.

The City has a contract to send all of its sewage to the King County Metro sewer system, placing prime responsibility to future wastewater reuse opportunities with the County, which is the final manager of the sewage. One of King County's goals in the Regional Water Supply Planning effort is to explore the use of reclaimed water as a potential water supply. The City has several potential end users for reclaimed water including golf courses, cemeteries, and parks, as documented in the King County Reclaimed Water Checklist provided in Appendix I. The City will continue to participate in local and regional wastewater reuse planning efforts.

6.5.5 Continue an Aggressive Water Use Efficiency Program

The final element of the City's supply strategy is to continue to reduce demand through an aggressive water use efficiency program. The City has observed declining per account water use for over a decade. The average water use per account has decreased 17 percent from 2007 to 2013. Additionally, the current projections assume a MDD peak factor of 1.72 while the previous plan assumed a value of 1.8. The observed drop in the water use and MDD peak factor can be attributed in part to the City's water use efficiency program. which is summarized in Chapter 8.

6.5.6 Summary

The City plans to pursue a five-pronged water supply strategy to meet future demands. The strategy includes improving existing supply sources, using cost-effective wholesale supplies, securing new water rights, evaluating potential reuse opportunities and continuing an aggressive water use efficiency program. Improvements include:

- Rehabilitate Coal Creek Springs in the short-term.
- Complete Well 7 Water Quality Treatment Phase 1 in the medium-term.
- Make full use of the City's Valley Well Field in the long-term.

Flexibility in implementing the Valley Well Field improvements can be gained through continued use of cost-effective wholesale water. Continued water use efficiency gains may also provide additional flexibility and allow improvements to be delayed. However, the City will need to secure new water rights or additional regional supplies to meet its ultimate demand. Reclaimed water should continue to be considered as a potential new supply in addition to traditional sources.

6.6 GROUNDWATER MANAGEMENT

The City's wellhead protection plan was updated as part of the Plan. Section 1428 of the 1986 Amendments to the Federal Safe Drinking Water Act (SDWA) mandates that each state develop a wellhead protection program and that all federally defined public water systems (in Washington, Group A systems) using groundwater as its source implement a wellhead protection plan. In July 1994, the Washington Administrative Code (WAC) addressed requirements for Group A public water systems (WAC 246-290) and was modified to include mandatory wellhead protection measures. The legislative authority to require wellhead protection (WHP) planning can be found in the Revised Code of Washington (RCW) Chapters 43.20.050, 70.119A.060, and 70.119A.080.

6.6.1 Wellhead Protection Program

The overall goal of the state WHP program is to prevent the contamination of groundwater used by Group A public water systems. This is to be accomplished by providing management zones around public wells, identifying existing groundwater contamination sources, and managing potential sources of groundwater contamination prior to their entry into the drinking water system. Under the WAC, local public water systems have the primary responsibility for developing and implementing local wellhead protection plans (WHPP). However, due to the limited jurisdictional and regulatory authority afforded most purveyors, coordination with other local, State, and Federal agencies is essential to the successful implementation of a WHPP.

The DOH has developed regulations that require Group A water systems using groundwater sources to develop and implement the WHPP (WAC 246-290-135). The objective is to prevent releases of contaminants to groundwater in areas that contribute water to the public supply systems. The City's Well Head Protection Report is included in Appendix J.

The basic elements of a WHPP include:

- Assessment of initial groundwater susceptibility for each water supply source.
- Delineation of the WHP area that directly contributes groundwater to each water supply well.
- Inventory of land uses and identification of potential sources of contamination within each WHPA.
- Documentation of notification to owner/operators of known or potential hazards.
- Development of spill prevention plans and water contingency plans that minimize or eliminate the possibility of contamination to the groundwater supply and also development of options for maintaining water supply in the event the aquifer contributing to a source is contaminated.

The State of Washington WHPP applies to the City's wells.

6.6.2 Wellhead Protection Area

The updated WHPP maintained the City's existing Wellhead Protection Areas (WHPA). Pacific Groundwater Group (PGG) initially delineated the City's WHPAs in 1997, and later updated them in 2000. Robinson, Noble, & Saltbush Inc. used these modeled capture zones to perform a hazard assessment within the wellhead protection area. Therefore, the WHPA are consistent with the King County critical areas ordinances and reflected in critical aquifer recharge areas as described in the 2012 King County Comprehensive Plan.

The US Geological Survey is currently completing groundwater flow modeling of the Puyallup River Watershed, and the model area will cover the WHPP study area. The resulting numerical computer model will likely allow the WHP areas to be refined, which will capture updated aquifer characteristics, groundwater flow patterns, and increased detail in the location of aquitard-deposits. During the next update of the WHP plan, we recommend using the USGS model to re-define the WHPAs as the new model will represent an expansion of and improvement over the older PGG work.

6.6.3 Existing and Potential Contamination Hazard Identification

The inventory of potential contamination sources within the WHPA was performed according to the DOH publication: "*Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas (1993)*." Parcel Insight (PI), an environmental database research company, reviewed 27 federal and state databases for any known or potential contaminant sites within a 5-mile radius of the center of the City of Auburn's service area. The sites in this radial search were narrowed further by their location in relation to WHPAs. An evaluation of various land-use categories and activities was also performed. The results of the contamination source inventory include a list of potential and known environmental hazards in proximity to the Auburn water system. From this process, 513 sites or categories of land-use activities were identified as known or potential hazards to the City's wells. . A field verification or "windshield survey" was performed by City staff to verify the listed sites were appropriately located. These were prioritized and ranked according to three factors; proximity of potential hazard to the WHPA; type of contamination; distance from the groundwater source to the potential hazard (Appendix J). This prioritization allows the WHP implementation process to address each site or land use in a systematic manner.

6.6.4 Protection Strategies and Implementation Tasks

The completion of wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of groundwater sources. With the hazards identified, the WHPP provides 26 specific tasks for the City to undertake to complete the process of implementing this wellhead protection program. Of these, two tasks have been completed, four tasks have been removed as redundant, and 8 tasks are currently being completed. The ongoing and remaining tasks are listed in Table 6.10.

The tasks include a wide range of activities, including placing proper signage throughout the WHPA, education of the public, proper zoning within the WHPA, annual review of environmental databases, implementation of best management practices and the cooperation between the City and appropriate enforcement and emergency response agencies. It is not uncommon that the full list of goals or tasks cannot be immediately adopted because there is insufficient resources available. Therefore, the City should prioritize its WHP tasks in order to meet its overall goal of groundwater protection. Potential prioritization criteria may include: time to complete, staff availability, cost, immediacy or importance, practicality to complete given the City's current resources, or the necessary order of completion (some goals or tasks will logically precede others). It is recommended that the City consider the prioritization of tasks annually, as well as when potential new hazards are identified.

Table 6.15	Protection Strategies and Implementation Tasks Comprehensive Water Plan City of Auburn	
WHPP Task Number	**Task Description**	**Task Status**
1	Include the City's Emergency Management Department (or its equivalent) in the WHP planning process.	Completed
2	Establish formal communication with first responders and educate them about the needs for wellhead protection.	Remaining
3	Notify County health and planning departments.	Ongoing
4	Consider seeking designation of the WHP areas as a special protection area.	Remaining
5	Create awareness of the wellhead protection area by posting metal "WATER SUPPLY PROTECTION AREA" signs along major arterial roads at the borders of the WHP areas.	Remaining
6	Communicate the location of the WHPA, explain basic WHP concepts, and address specific WHP concerns to industrial/commercial site owners and local gravel mine owners.	Completed
7	Increase public awareness through notification letters to customers.	Remaining
8	Coordinate with King and Pierce Counties to require engineering as-builts of new septic system be recorded with property deeds.	Remaining
9 and 24	Review routine leak detection procedures for sewer lines, request the use of "leak-proof" piping for new sewer construction, and replace older lines.	Remaining
10	Document the location and use of petroleum pipelines and develop appropriate emergency procedures.	Completed

Table 6.15 Protection Strategies and Implementation Tasks
Comprehensive Water Plan
City of Auburn

WHPP Task Number	Task Description	Task Status
11	Participate in regional groundwater data development and management program.	Ongoing
12	Encourage King and Pierce Counties to maintain their delegated authority of well-drilling inspection and coordinate with this program to gain advance notice of drilling in or near the WHP areas.	Remaining
13	Ensure SEPA Evaluations include WHP considerations.	Ongoing
14	Document the type and amount of herbicide and pesticide application.	Ongoing
15 and 16	Annually review the Confirmed and Suspected Contaminate Sites (CSCSL), Leaking Underground Storage Tank (LUST), and other environmental database listings within the WHP areas. Monitor Washington Department of Ecology's (Ecology) progress in the cleanup of contaminated sites within the WHPA's and encourage Ecology and county inspection of RCRA hazardous waste generator facilities.	Remaining
17	Promote and coordinate public education programs on WHP concerns.	Ongoing
18	Develop data on the number and size of exempt underground tanks within the half-year and one-year WHP area zones. Also, promote and coordinate public education programs concerning underground tank hazards, leak detection methods, and proper removal and closure procedures.	Remaining

Table 6.15	Protection Strategies and Implementation Tasks Comprehensive Water Plan City of Auburn	
WHPP Task Number	**Task Description**	**Task Status**
19	Seek to have Ecology's prioritize the investigation of contaminated and potentially-contaminated sites within the WHP areas.	Remaining
20	Encourage development and use of best management practices in developments covering groundwater protection.	Ongoing
21	Request County, State, and private landowners to utilize vegetation management to protect water quality.	Completed
22	Encourage thorough analysis of groundwater impacts for siting, operation, and reclamation of gravel quarries and mines	Ongoing
23	Inventory abandoned or unused wells in the six-month, one-year, and five-year WHP area zones. Well owners should be informed about proper well decommissioning procedures.	Remaining
25	Investigate the need and feasibility for re-routing transport of hazardous material through the WHP areas. Also, create a formal Spill Response Plan to describe the City's responsibilities and responses to a major spill event under the State's Incident Command System.	Remaining
26	Work with responsible parties to assess adequacy of stormwater systems	Ongoing

WATER QUALITY

7.1 INTRODUCTION

The purpose of this chapter is to review current and upcoming regulations relevant to the City of Auburn (City). This chapter includes the following:

- Review of current and upcoming regulations.
- Summary of the City's water quality monitoring programs.
- Summary of recent water quality testing results.
- Summary of the Wholesale Interties Blending Evaluation.
- Recommendations.

7.2 WATER QUALITY REGULATIONS

The Safe Drinking Water Act (SDWA) of 1974 established primary drinking water regulations designed to ensure the distribution of safe drinking water. These regulations were the first to be implemented at all public water systems in the U.S., covering both chemical and microbial contaminants. These regulations consisted of standards for 18 parameters, referred to as the National Interim Primary Drinking Water Regulations. They remained in place for over 10 years with minor revisions, including a revised fluoride standard, addition of a total trihalomethanes standard, and interim regulations for radionuclides in potable water.

In 1986, Congress passed widespread amendments to the SDWA, which significantly altered the rate at which the United States Environmental Protection Agency (USEPA) was to set drinking water standards. These amendments resulted in a three-fold increase in the number of contaminants regulated. Also at that time, the National Interim and revised Primary Drinking Water Regulations promulgated prior to 1986 were redefined as National Primary Drinking Water Regulations.

The 1996 amendments to the SDWA greatly enhanced the existing law by recognizing source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. Among others, the 1996 amendments required the USEPA to develop rules to balance risks between microbial pathogens and disinfection by-products (DBP), named the Microbial/Disinfection By-Product (M/DBP) Rules. Several rules emerged from this requirement, including the Stage 1 and Stage 2 Disinfectants and Disinfection By-Products Rules, and the Interim, Long Term 1 and Long Term 2 Enhanced Surface Water Treatment Rules.

The SDWA gives the USEPA authority to delegate primary enforcement responsibilities, or primacy, to individual states. Within the state of Washington, the Washington State Department of Health (DOH) was given authority to enforce drinking water regulations. To maintain authority to enforce drinking water regulations under the SDWA, a state must adopt drinking water regulations at least as stringent as the federal standards. The Washington regulations are contained in Title 246 of the Washington Administrative Code (WAC).

The City's water system is classified as a Group A - Community Water System by the DOH. As a Group A system, the City is responsible for monitoring and complying with all applicable SDWA and WAC regulations pertaining to source water and distribution system water quality. USEPA regulations and accompanying state codes that pertain to the City are described herein. The regulations are divided into three categories: source water quality, distribution system water quality, and water quality programs.

The City also owns and operates the Braunwood satellite system located in southeast Auburn. This system is classified as a Group A - Community Water System by the DOH. The Braunwood development, also known as the Hidden Valley Acres development, is discussed in detail in Chapter 5. The City regularly monitors the system as required and has not had water quality issues. Therefore, it is not discussed further in this chapter.

7.2.1 Source Water Quality

Regulations that address source water quality for groundwater and surface water systems are described herein. Historically, the City has relied on groundwater supplies from wells and springs, which have been determined to not be under the direct influence of surface waters (DOH 2004 for Coal Creek Springs). The City began to use surface water in 2012 through the B-St Wholesale Intertie with Tacoma Public Utilities (TPU). This supply, referred to as the Regional Water Supply, originates from the Green River and the Howard Hansen Dam. Therefore, the City is now required to meet the Surface Water Treatment Rule. However, as a wholesale purchaser the City receives treated water from the Second Supply Project, where Tacoma maintains compliance with the Interim Enhanced Surface Water Rule, Long Term 1 and Long Term 2 Enhanced Surface Water Treatment Rules; and the Filter Backwash Recycling Rule.

7.2.1.1 Primary and Secondary Drinking Water Regulations

National Primary Drinking Water Regulations set legally enforceable maximum contaminant levels (MCLs) and established non-enforceable maximum contaminant level goals (MCLGs) for water contaminants. MCLs base based on treatment technique requirements were not summarized and are being addressed through the City's existing facilities. A constituent's MCL is generally based on its public health goal (PHG), which is the level of a contaminant in drinking water below which there is no known or expected health risk. Monitoring of constituents with primary standards is addressed under WAC 246-290-300, with MCLs defined under WAC 246-290-310 and required follow-up actions for MCL violations addressed under WAC 246-290-320.

The USEPA has also established secondary standards for 15 contaminants to address the aesthetic quality of drinking water. Because the federal standards primarily address taste and odor, rather than health issues, they are often used only as a guideline. Monitoring of constituents with secondary standards is addressed under WAC 246-290-300, with secondary MCLs defined under WAC 246-290-310. For new community water systems, treatment for secondary contaminant MCL exceedances is required under WAC 246-290-320 (3)(d). For other public water systems, the WAC stipulates that the required follow-up action be determined by the DOH based on the degree of consumer acceptance of the water quality and their willingness to bear the costs of meeting the secondary standard.

7.2.1.2 <u>Arsenic Rule (2001)</u>

In January 2001, the USEPA promulgated a new standard that requires public water systems to reduce arsenic levels in drinking water. The final rule became effective in January 2006 and applies to all community water systems and non-transient, non-community water systems, regardless of size. The rule not only establishes an MCL for arsenic (0.010 mg/L), based on a running annual average (RAA) of quarterly results and an MCLG for arsenic (zero), but also lists feasible technologies and affordable technologies for small systems that can be used to comply with the MCL. However, systems are not required to use the listed technologies in order to meet the MCL. The arsenic rule has been adopted by the Washington DOH as a revision to the arsenic MCL under WAC 246-290-310.

7.2.1.3 <u>Radionuclide Rule (2000)</u>

On December 7, 2000, the USEPA announced updated standards for radionuclides. This rule became effective on December 8, 2003. All community water systems are required to meet the MCLs, presented in Table 7.1, and requirements for monitoring and reporting. All systems were required to complete initial monitoring and phase in the monitoring requirements, between December 8, 2003 and December 30, 2007. Initially, utilities were required to undergo four consecutive quarters of monitoring for gross alpha, combined radium-226/-228, and uranium. Only systems considered “vulnerable” were required to monitor for gross beta (quarterly samples), tritium, and strontium-90 (annual samples). The initial monitoring was used to determine if a system would have to perform reduced or increased monitoring. The City conducts reduced monitoring with a standard 6-year sampling period. The Radionuclide Rule has been adopted by the Washington DOH; monitoring is addressed under WAC 246-290-300, the MCLs are defined under WAC 246-290-310 and required follow-up actions for MCL violations are addressed under WAC 246-290-320.

Table 7.1 Radionuclide Regulation Comprehensive Water Plan City of Auburn	
Constituent	**MCL**
Combined Radium-226 and Radium-228	5 pCi/L[(1)]
Gross Alpha Particle Activity (including Radium-226, but excluding radon and uranium)	15 pCi/L
Beta Particle and Photon Emitters	4 millirems per year
Uranium	30 µg/L

Notes:
(1) pCi/L = picocuries per liter.

7.2.1.4 Groundwater Rule (2007)

The USEPA enacted the final Groundwater Rule (GWR) January 8, 2007, for the purpose of providing increased protection against microbial pathogens in public water systems that use untreated groundwater. The GWR applies to public water systems that serve groundwater as well as to any system that mixes surface and groundwater, if the groundwater is added directly to the distribution system and is provided to customers without treatment.

To implement the GWR, the USEPA is taking a risk-based approach to protect drinking water from groundwater sources that have been identified as being at the greatest risk of fecal contamination. This strategy includes four primary components:

1. Periodic sanitary surveys that require the evaluation of eight critical elements of a public water system and the identification of significant deficiencies (such as a well located near a leaking septic system).
2. Triggered source water monitoring when a system does not sufficiently disinfect drinking water to achieve 4-log (99.99 percent) virus removal and identifies a positive sample during its Total Coliform Rule monitoring and assessment monitoring (at state discretion) targeted at high-risk systems.
3. Corrective action required for any system with a significant deficiency or evidence of source water fecal contamination.
4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves 4-log virus inactivation.

The GWR increased the frequency of sanitary surveys from once every five years to once every three years. Initial sanitary surveys must be completed by December 31, 2012. However, for community water systems that have been identified by the state as outstanding performers (generally those that have treatment that provides 4 log virus inactivation or removal at all sources), the initial sanitary survey must be completed by December 31, 2014. If a significant deficiency is found in the sanitary survey, then corrective actions may be required by DOH. DOH completed a Sanitary Survey of the City's facility in September of 2012.

Triggered source water monitoring is required within 24 hours of positive total coliform sample in the distribution system. Source water monitoring is conducted for *Escherichia coli* (*E. coli)*, rather than total coliform. If source water monitoring samples are positive for *E. coli*, then corrective action or additional five samples within the next 24 hours will be required. If a positive *E. coli* result is obtained in the additional samples, then corrective action must be taken. An E. *coli* Response Plan has been developed to aid in the response and related communication with the public.

Corrective actions may be required as a result the sanitary survey or triggered source monitoring. Significant deficiencies are defined as "a defect in the design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the Department of Health determines to be causing, or have the potential for causing, the introduction of contamination into the water delivered to consumers. (DOH 2013 331-447)" Corrective actions can involve one or more of the following:

- Correct all significant deficiencies.
- Provide an alternative source of water.
- Eliminate the source of contamination.
- Provide 4-log treatment.

Systems have 45 days either to complete corrective actions or to comply with a corrective action plan. Annual public notification will be required if a significant deficiency remains uncorrected.

Compliance monitoring is required to prove that chlorine residual concentrations are high enough to achieve 4-log virus inactivation. For the City, continuous monitoring would be required. Failure to monitor, report, or provide adequate treatment will result in a violation that at a minimum would require public notification of customers. For systems providing 4-log virus inactivation, which is not the result of a corrective action, triggered source water monitoring may be conducted instead of compliance monitoring.

7.2.1.5 Unregulated Contaminants

There are two programs that address contaminants for which future regulatory requirements are being considered. The first is the USEPA Unregulated Contaminant Monitoring (UCM) Program, which is used to collect occurrence data for contaminants suspected to be present in drinking water, but that do not have health-based standards. Depending on their size, utilities are required to monitor for a select list of contaminants, which is reviewed every 5 years.

The second is the Contaminant Candidate List (CCL). The USEPA is required to establish a list of contaminants that aid in priority setting for the drinking water program. The USEPA conducts research on health, analytical methods, treatment technologies, effectiveness, costs, and occurrence for drinking water contaminants on the CCL. The second CCL (CCL2) included 51 contaminants; regulatory determination that no action was required for 11 of the contaminants was made in 2008. The third CCL (CCL3) was published in 2009 and monitors 104 chemicals and 12 microbiological contaminants.

7.2.1.6 Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) established filtration and disinfection as a drinking water treatment technique in lieu of MCLs for Giardia lamblia, viruses, HPC bacteria, Legionella, and turbidity. Promulgated on December 31, 1990, the SWTR requires 99 percent (2-log) removal and/or inactivation of Cryptosporidium, 99.9 percent (3 log) removal and/or inactivation of Giardia cysts, and 99.99 percent (4 log) removal and/or inactivation of viruses. As part of the SWTR, surface water systems must disinfect, must filter water unless certain source water-quality and site-specific conditions are met, and must be operated by qualified, certified personnel.

The Regional Water Supply was unfiltered during the period of sampling presented in this Plan; therefore, the City must maintain a disinfectant residual throughout the water distribution system. At entry points to the distribution system, residual disinfectant concentrations cannot be <0.2 mg/L for more than 4 hours. At distribution system sample locations, residual disinfectant concentrations cannot be undetectable in greater than 5% of samples in a month, for any 2 consecutive months. Heterotrophic plate count (HPC) ≤ 500/mL is deemed to have detectable residual disinfectant.

To meet the Long Term 2 Enhanced Surface Water Treatment Rule, the Green River Filtration Facility was constructed to filter the regional supply. With the facility's completion in late 2014, the City's wholesale source will comply with these more stringent requirements.

Groundwater under the influence of surface water (GWUI) is regulated by the SWTR. The intent is to provide the same level of treatment for groundwater sources that are at risk for contamination by pathogens as surface water supplies. As previously stated, the City does not have any sources that are considered to the GWUI.

7.2.2 Distribution System Water Quality

Regulations that address distribution system water quality are described herein.

7.2.2.1 Total Coliform Rule (1989)

The Total Coliform Rule (TCR) was promulgated in 1989, and established an MCLG of zero for total and fecal coliforms. The rule requires that less than 5 percent of distribution system samples collected each month be positive for the presence of total coliform bacteria.

Positive samples must be further analyzed for *E. coli* and fecal coliform. If two consecutive samples in the system are total coliform positive and one is also positive for fecal coliform or *E. coli*, it is considered an acute MCL violation, resulting in notification and further monitoring requirements.

Secondary disinfection is required under the TCR in accordance with the following:

- A minimum disinfectant residual of 0.2 mg/L free chlorine or 0.5 mg/L chloramines measured as total chlorine must be continually present at the entrance of the distribution system, with a detectable chlorine residual maintained throughout the distribution system.
- A sample with HPCs less than 500 cfu/100 mL is assumed to carry the required minimum residual.

The TCR has been adopted by the Washington DOH; monitoring requirements are defined under WAC 246-290-300, acute and non-acute MCL violations are defined under WAC 246-290-310 (2), and required follow-up actions are specified under WAC 246-290-320.

The EPA published the final Revised TCR on February 13, 2013. The final Revised TCR: "Requires public water systems that are vulnerable to microbial contamination to identify and fix problems; and Establishes criteria for public water systems to qualify for and stay on reduced monitoring, which could reduce water system burden and provide incentives for better system operation. (EPA 2012)." Public water systems must comply with the rule by April 1, 2016. DOH's rule making to adopt the Revised TCR is ongoing and is expected to be adopted in spring of 2015.

The Revised TCR removes the MCL and MCLG for total coliform, as well as the non-acute MCL. Rather, the Revised TCR establishes a MCL and MCLG for E. coli, as well as a treatment technique for coliforms. The Revised TRC maintains the same routine monitoring structure as the 1989 rule using Total Coliforms to indicate if a "pathway" for contamination exists in the distributions system. Total Coliform positive samples trigger additional assessment that includes monitoring for *E. Coli*. MCL violations are based on sampling during these assessments. If sanitary defects are found, then the rule requires corrective actions. Public notification is required if an *E. Coli* violation occurs or if the water system fails to conduct the required assessment or corrective actions.

Rule revisions will require existing Coliform Monitoring Plans to be updated. In April 2013, DOH has updated its guidance called "Preparing a coliform monitoring plan (DOH 2013, 331-036)". Additionally, it has prepared a number of checklists and examples of coliform monitoring plans. Updated Coliform Monitoring Plans will provide the necessary plans and procedures to implement the Revised TCR. The City's updated Coliform Monitoring Plan is presented in Appendix L and is based on these new guides.

7.2.2.2 Lead and Copper Rule (1991/2000)

The federal Lead and Copper Rule was finalized in June 1991. In lieu of MCLs, this rule established an action level for lead of 0.015 mg/L and for copper of 1.3 mg/L in more than 10 percent of customer tap samples, and MCLGs of 0 mg/L for lead and 1.3 mg/L for copper. Exceeding the action level is not a violation, but triggers additional action including water quality parameter monitoring, corrosion control treatment, source water monitoring/treatment, public education, and lead service line replacement.

On January 12, 2000, the USEPA promulgated the Lead and Copper Rule Minor Revisions (LCRMR) to streamline requirements, promote consistent national implementation, and in many cases, reduce the burden on water systems. The LCRMR does not change the action levels or the rule's basic requirements to optimize corrosion control. The modified rule addresses seven broad categories:

1. Demonstration of optimal corrosion control.
2. Lead service line replacement requirements.
3. Public education requirements.
4. Monitoring requirements.
5. Analytical methods.
6. Reporting and record-keeping requirements.
7. Special primacy considerations.

State regulations for lead and copper monitoring are outlined in detail in WAC 246-290-300 (5).

7.2.2.3 Stage 1 Disinfectants and Disinfection By-Products (1998)

The Stage 1 Disinfectants and Disinfection By-Products Rule (DBPR) was promulgated in December 1998. The portions of the Stage 1 DBPR relevant to the City are the MCLs for total trihalomethanes (TTHMs) and 5 haloacetic acids (HAA5) of 0.080 and 0.060 mg/L, respectively. Compliance with the TTHM and HAA5 MCLs is based on a system-wide Running Annual Average (RAA) of quarterly samples taken in the distribution system. The Stage 1 DBPR also introduced a maximum residual disinfectant level (MRDLs) of 4 mg/L for free chlorine, based on an RAA of samples collected concurrent with TCR monitoring.

The Stage 1 DBPR requires the development of a monitoring plan, as described in WAC 246-290-300. The MCLs are defined in WAC 246-290-310 and the required follow-up actions in WAC 246-290-320.

7.2.2.4 Stage 2 Disinfectants and Disinfection By-Products Rule (2006)

The Stage 2 DBPR was promulgated by the USEPA on January 4, 2006. The key provisions of the Stage 2 DBPR consist of:

- An Initial Distribution System Evaluation (IDSE) to identify distribution system locations with high DBP concentrations. Further information is provided below.
- Site-specific locational running annual averages (LRAAs) instead of system-wide RAAs to calculate compliance data. LRAAs will strengthen public health protection by eliminating the potential for groups of customers to receive elevated levels of DBPs on a consistent basis.

The MCLs for TTHM and HAA5 remain unchanged from the Stage 1 DBPR at 0.080 and 0.060 mg/L, respectively, although they will now be calculated as LRAAs.

The IDSE is the first step in Stage 2 DBPR compliance. It intends to identify sampling locations for Stage 2 DBPR compliance monitoring that represent distribution system sites with high TTHM and HAA5 levels. For systems serving more than 500 people, three options are available for the IDSE:

- 40/30 Waiver, which allows systems with no samples exceeding TTHM and HAA5 concentrations of 40 and 30 µg/L, respectively, during 8 consecutive quarters to apply to waive the IDSE requirements.
- Standard Monitoring Program (SMP), which involves a 1-year distribution system monitoring effort to determine locations that routinely show high TTHM and HAA5 concentrations.
- System-Specific Study (SSS), based on historical data and a system model.

The Washington DOH has assumed responsibility for the Stage 2 DBPR in January 2010. Auburn was granted a 40/30 Waiver in August of 2013; therefore no IDSE was required. The City conducted Stage 2 sampling in 2012 ahead of this deadline. The City conducts quarterly monitoring at eight sites for TTHM and HAA5.

7.2.3 Water Quality Programs

Required water quality programs are described herein.

7.2.3.1 Consumer Confidence Reports

Under the 1996 amendments to the SDWA, community water systems are required to provide an annual Consumer Confidence Report (CCR). The annual reports must be distributed to customers and include information on the following:

- Drinking water sources.
- Definition of terms.
- Concentrations of any regulated constituents detected in the water, along with their respective maximum contaminant levels and maximum contaminant level goals.

- Information on health effects for any constituents at concentrations that exceed their respective MCLs.
- Concentrations of unregulated constituents, as required by the USEPA.

In addition to the CCR, water quality data is provided to the City's wholesale customers.

7.2.3.2 Public Notification Rule

The Public Notification Rule (PNR) requires that public water systems notify their customers when they violate USEPA or State regulations (including monitoring requirements) or otherwise provide drinking water that may pose a risk to consumer's health. The original public notification requirements were established in the SDWA; the revised PNR was promulgated in 2000 as required by the 1996 SDWA amendments.

The PNR establishes three notification levels:

- Immediate Notice (Tier 1): In a situation where there is the potential for human health to be immediately impacted, notification is required within 24 hours.
- Notice As Soon As Possible (Tier 2): In a situation where an MCL is exceeded or water has not been treated properly, but there is no immediate threat to human health, notification is required as soon as possible and within 30 days.
- Annual Notice (Tier 3): In a situation where a standard is violated that does not directly impact human health, notice must be provided within one year, likely within the system's CCR.

Public notification requirements are addressed as part of the follow-up actions in WAC 246-290-320.

7.3 MONITORING PRACTICES

The City is primarily responsible for monitoring source and distribution system water quality, based on the monitoring programs described herein. This section documents current monitoring practices. All sampling is conducted in accordance with annual Water Quality Monitoring Schedule received from DOH.

National Primary and Secondary Drinking Water Regulations. Compliance with primary and secondary MCLs is determined through the following monitoring programs:

- *Inorganic Chemical and Physical Parameter Monitoring*. This includes monitoring of the following primary constituents: antimony, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, sodium, and thallium. The following constituents and physical parameters with secondary MCLs are also monitored: chloride, color, hardness, iron, manganese, specific conductivity, silver, sulfate, turbidity, total dissolved solids, and zinc. Monitoring of these constituents varies by source between once every 36-month compliance period to once every 9 years.

However, the City typically monitors these constituents every 12 months, during the month of July. Samples are collected at each source, at the entry point following treatment.

- *Asbestos Monitoring*. Asbestos sampling is usually required once every 36-month compliance period. However, the City has a waiver that requires sampling only once every nine years at three distribution system sample sites. No data was collected during the study period.
- *Nitrate and Nitrite Monitoring*. Nitrate (N) and nitrite (as N) are monitored once every 12 months, during the month of July. This reduced monitoring frequency is granted by the State after determining concentrations in the system are reliably and consistently less than the MCL. Samples are collected at all sources, at the entry point following treatment.
- *Volatile Organic Compounds (VOC) Monitoring*. Monitoring of these constituents varies by source between once every 36-month compliance period to once every 6 years. This reduced sampling frequency is granted by the State to sources with no previous detection of any VOC in any collected sample. More frequent, annual sampling is required for Wells 2 and 6, which are both currently represented by the corrosion control treatment (CCT) facility at Fulmer Field Park. Sampling is conducted at all sources, at the entry point following treatment.
- *Synthetic Organic Compounds(SOC) Monitoring*. Sampling for SOCs, such as herbicides, pesticides, and soil fumigants monitoring has been waived for a three to nine year period depending on SOC category. This reduced monitoring frequency is granted to systems that did not detect a contaminant during an initial compliance period. Sampling is conducted at all sources, at the entry point following treatment. There are a number of SOCs that have statewide waivers, including dioxin, endothall, glyphosphate, and ethylene dibromide and other soil fumigants.
- *Radionuclide Monitoring*. Radionuclide monitoring currently consists of Radium-228 monitoring on a standard 6-year compliance period at all entry points following treatment. Additionally, Gross alpha is monitored at the Fulmer Field CCT Facility.

Total Coliform Rule. The City currently conducts monitoring at 60 TCR sites for total and fecal coliform. Sampling is conducted at one quarter of the routine sample locations each week during the first four weeks of a month. The City also monitors weekly for total and fecal coliform at Coal Creek Springs and West Hill Springs at their respective collector vaults as well as after treatment at West Hill Springs, Howard Road and Fulmer Field CCT Facilities, and several additional sites to support operations on a weekly basis.

Residual Disinfectant Concentration Monitoring. Chlorine dosing and concentration levels are sampled daily at the system’s chlorination sites. In addition, free chlorine concentrations are monitored concurrent with TCR monitoring.

Stage 1 DBPR. The City conducted annual monitoring of six distribution system sample sites for TTHM and HAA5. Monitoring was conducted during the month of peak temperature (assumed to be August). Stage 1 DBPR monitoring was superseded in 2012 with Stage 2 DBPR monitoring.

Stage 2 DBPR. Stage 2 DBPR monitoring began in 2012. The City conducts quarterly monitoring of eight distribution system sample sites for TTHM and HAA5. LRAAs are generated for each site.

Lead and Copper Rule. The City collects tap water samples from 30 distribution system sites once during each 36-month compliance period for lead and copper monitoring.

Fluoride. The City conducts monthly sampling within the distribution system to determine concentration of fluoride. This sampling is in addition to the inorganic source monitoring required by DOH. The City does not add fluoride; however, fluoride is added to TPU wholesale supplies. Sampling is conducted, for informational purposes only, to monitor the blending of RWSS water within the distribution system and answer customers questions regarding fluoride in the City's water.

7.4 WATER QUALITY EVALUATION

This section documents the City's past and projected future compliance with the water quality regulations discussed above.

7.4.1 Source Water Quality

Monitoring data for 2008 through 2013 for inorganic constituents, physical parameters, SOCs, and VOCs were reviewed. All constituents are currently below their respective MCLs and future compliance is anticipated. Table 7.2 summarizes the inorganic chemical and physical constituents identified in the City's wells based on data provided by City staff. Since 2007, Wells 2, 6 and 7 are represented by samples collected from the Fulmer Field CCT Facility. Wells 3A, 3B, and 5B were not used during this period and were therefore not sampled. In addition to City sampling, TPU provides water quality data for the provided wholesale supply. With the exception of one secondary contaminant, iron, all regulated primary or secondary contaminants are well below their respective MCLs.

Iron concentrations in Well 1, Well 4, and Well 5A exceeded the Secondary standard of 0.3 mg/L. Secondary standards represent non-public health concerns that are not-enforceable and generally concern the aesthetic qualities of the water. The elevated concentrations of iron occurred in both 2011 and 2013 in Well #1, where no sampling was conducted in 2012. Iron concentrations in the source from 2008 through 2010 were non-detectable. Elevated concentrations of iron in Well 4 and Well 5A occurred in 2013 and 2011, respectively. Iron concentrations in all other years were non-detectable. Historically, sampling of Well 1 has detected similar concentrations of iron periodically. Iron concentrations of 0.67 mg/L were detected in Well 5A during the 2001; however, all other samples since 1998 have been

Table 7.2 Historical Inorganic Chemical Concentrations and Physical Properties
Comprehensive Water Plan
City of Auburn

Constituent	MCL	Units	Maximum Detected Concentration[1]						
			Coal Creek Springs	**West Hill Spring**	**Well 1**	**Well 4**	**Well 5**	**Well 5A**	**Fulmer CCT Facility[2]**
USEPA Regulated (Primary)									
Arsenic	0.05	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	0.001	0.002	0.002
Barium	2	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium	0.005	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Chromium	0.1	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury	0.002	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Selenium	0.05	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Beryllium	0.004	mg/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Nickel	0.1	mg/L	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Antimony	0.006	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Thallium	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cyanide	0.2	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoride	4	mg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrite-N	1	mg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrate-N	10	mg/L	1.1	3.7	2.4	1.1	1.7	0.2	1.5
Total Nitrate/Nitrite	10	mg/L	1.1	3.7	2.4	1.1	1.7	< 0.4	1.5
USEPA Regulated (Secondary)									
Iron	0.3	mg/L	< 0.1	< 0.1	**0.79**	**0.91**	< 0.1	**1.3**	< 0.1
Manganese	0.05	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04
Silver	0.1	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloride	250	mg/L	4	8	4	4	4	3	8
Sulfate	250	mg/L	6	16	13	11	11	6	14
Zinc	5	mg/L	< 0.2	< 0.2	< 0.2	0.25	< 0.2	1.6	< 0.2

Table 7.2 Historical Inorganic Chemical Concentrations and Physical Properties
Comprehensive Water Plan
City of Auburn

Constituent	MCL	Units	Maximum Detected Concentration[1]						
			Coal Creek Springs	West Hill Spring	Well 1	Well 4	Well 5	Well 5A	Fulmer CCT Facility[2]
State Regulated									
Sodium		mg/L	5	9	7	6	9	6	14
Hardness		mg/L	64	169	86	68	112	64	112
Conductivity (micromhos/cm)	700	micromhos/cm	133	263	188	147	241	127	227
Turbidity (NTU)		NTU	0.2	0.3	12.4	18.9	0.7	12.6	1.5
Color (color units)	15	Color Units	< 5	< 5	7.5	< 5	< 5	5	< 5
Total Dissolved Solids[3]	500	mg/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
State Unregulated									
Lead		mg/L	0.002	< 0.002	0.003	0.01	< 0.002	0.005	< 0.002
Copper		mg/L	0.16	0.34	0.04	0.76	< 0.02	< 0.02	< 0.02

Notes:

(1) Based on monitoring conducted between 2008 and 2013. Wells 3A, 3B, and 5B were not in use during this time period and no monitoring was conducted.

(2) The Fulmer CCT Facility was monitored only in 2007 and replaced monitoring of Wells 2, 6, and 7.

(3) N/A - not applicable, no testing conducted; testing for total dissolved solids is only required if the specific conductivity is greater than 700 umhos/cm.

below or near the detection level. Other than 2013, all Well 4 samples since 1998 have been below the detection limit. Given this historical data, these elevated levels appear to be periodic.

Synthetic organic compounds were monitored in all of the City's sources in 2012, except Well No. 1 that was sampled in 2010; all constituents were below the detection limit. The City was granted waivers for reduced monitoring; therefore, no additional samples were taken.

Volatile organic compound (VOC) were monitored in all the City's active sources at least once since 2008. VOCs were found in the 2010 sampling of Coal Creek Springs. Five unregulated VOCs were found in the sample, which are summarized in Table 7.3. Sample concentrations in all other years were below their respective detection limits.

Table 7.3 Detected Volatile and Synthetic Organic Compounds
Comprehensive Water Plan
City of Auburn

Constituent	Source, Year	Concentration (ug/L)	MCL (ug/L)
Chloroform	Coal Creek Spring, 2010	1.2	None(1)
Bromodichloromethane	Coal Creek Spring, 2010	1.7	None(1)
Chlorodibromomethane	Coal Creek Spring, 2010	2.2	None(1)
Bromoform	Coal Creek Spring, 2010	1.0	None(1)
Total Trihalomethanes	Coal Creek Spring, 2010	6.1	None(1)

Notes:
(1) EPA Unregulated VOC.

Trichloroethylene and tetrachloroethylene were detected in sampling of Wells 2 and 6 in 2003 and 2004 has not been detected in the more recent sampling. No VOCs were detected in the other sources.

Radionuclide monitoring of all sources was conducted in 2010; levels in all sources were below their respective detection limits. Sampling for Gross Alpha Particle Activity and Radium-228 was conducted at the Well 1 in 2009; levels in both constituents were again below their respective detection limits.

7.4.1.1.1 *Recommendations*

The City is in compliance with all surface water quality rules. It is recommended that the City continue its monitoring program. Additionally, the City should continue to coordinate with Tacoma to address any issues with the Regional Supply if they arise.

7.4.1.2 Groundwater Rule

Chlorination is added at the majority of the City's wells to maintain safe water supplies. The exceptions are Wells 3A and 3B, which are currently not in service, and Well 5, which serves the Lakeland Hills area. The last Sanitary Survey was completed by DOH in September 2012 and found only minor deficiencies. The City does not anticipate that a significant deficiency will be identified in the next Sanitary Survey. The last positive total coliform sample was asingle positive sample that occurred in 2008. While unlikely, the City is prepared to respond if Total Coliform is found in the distribution system through triggered monitoring.

Triggered monitoring and Sanitary Surveys may result in corrective actions. These corrective actions may require additional CIP projects to improve significant deficiencies in source or distribution system infrastructure or additional disinfection. Impacts of increased disinfection potentially required as a corrective action by the Groundwater Rule may include:

- Potential for increased DBP formation.
- Increased corrosiveness of the water.
- Capital and O&M costs for treatment and disinfection facilities.
- Additional costs for triggered source water monitoring.

To reduce the risk of contamination from *E. coli* the City may be required to use alternative sources. The City's Emergency Response Plan identifies a number of supply sources that may be used in an emergency outage. Additional water supply contingency plans can be found in the City's Water Resource Protection Program.

7.4.1.2.1 *Recommendations*

There are no major concerns with the City's compliance with the Ground Water Rule. It is recommended that the City continue to correct the minor deficiencies identified in the sanitary survey. The City should correct the deficiencies identified in the 2012 Sanitary Survey. Additional actions under the GWR may be required; it is anticipated that such requirements will be communicated to the City by the DOH as they are adopted. The issues identified in the survey and required actions are summarized in Table 7.4 below.

Table 7.4 Summary of Issues Identified in 2012 Sanitary Survey
Comprehensive Water Plan
City of Auburn

	Issues/Recommended Improvements	Required Action (if any)
Sources and Treatment		
West Hill Springs	Add control valve shut-down. Add Tide-flex valve to overflow.	
Howard Road and Fulmer Field CCT Facilities	Verify if the clearwells have overflows that are adequately screened.	Completed
Well 1	Confirm a raw water tap is installed	Completed
Well 2	Confirm a screened vent is installed	Currently no pump in Well 2
Well 4	Seal opening around electrical box penetration	Completed
Well 5	Confirm raw water sample tap is installed and add a screen vent.	Completed
Well 5A	Confirm raw water sample tap and screen vent is installed.	Completed
Well 7	Install fine screen on inside of coarse screen at concrete flow box located at Well 7.	Completed
Storage		
Reservoir 1	Install fine screen or Tide-flex valve on the overflow pipe located at Howard Road CCT Facility.	Completed
	Routinely clean out gutter drain as needed to prevent trapped stormwater from entering tank.	New hatch installed
Reservoir 2	Consider adding fine mesh screen on inside of reservoir vent.	Completed
	Routinely clean out gutter drain as needed to prevent trapped stormwater from entering tank.	New hatch installed
General	Ensure Hatches without gaskets have a tight seal to prevent any potential for contamination entering the reservoir.	New hatches installed
General	Work to modify the overflow pipelines at each reservoir to incorporate an air gap and screen/flapper valve to keep each reservoir safe from potential contamination.	Inform DOH of plan of action to complete improvements.

Table 7.4	Summary of Issues Identified in 2012 Sanitary Survey Comprehensive Water Plan City of Auburn	
	Issues/Recommended Improvements	**Required Action (if any)**
Management and Operations		
Water System Plan (WSP)	Submit plan to avoid losing distribution design exemption and green (in compliance) operating permit status.	Provide written notice to DOH when WSP is submitted.
Water Facilities Inventory	Add 132nd Ave SE intertie to the City's Water Facilities Inventory.	Completed
Total Coliform Rule	Include updated Coliform Monitoring Plan with the WSP. Update sample locations and address how the City plans to comply with the Groundwater Rule.	Provide updated Coliform Monitoring Plan with WSP.

7.4.1.3 <u>Surface Water Treatment Rule</u>

The SWTR and associated compliance activities have been implemented since 2012 in conjunction with receiving wholesale water from the Regional Water Supply System (RWSS). The City monitors chlorine residual levels at the B St and the 132 Ave interties with the RWSS. The chlorine residual in the water obtained from the RWSS range on average from 0.6 to 1.4 mg/L.

7.4.1.3.1 *Recommendations*

There are no major concerns with meeting the Surface Water Treatment Rule. With the filtration of the Regional Supply, the City no longer needs to meet the disinfection requirements of the unfiltered systems. It is recommended that the City add continuous chlorine analyzers at each intertie with SCADA connections to monitor and record residual at the interties.

7.4.2 Distribution System Water Quality

The City has no current or anticipated challenges meeting distribution system water quality requirements, based on data provided by the City and input from City staff. The water quality data relevant to each regulation are summarized herein.

7.4.2.1 <u>Total Coliform Rule</u>

Auburn prepared its original Coliform Monitoring Plan (CMP) in 1991 in accordance with the TCR and makes modifications as needed to continue compliance. The City has updated the CMP as part of this Plan to confirm with new DOH guidance and the Revised TCR.

The monitoring frequency under the TCR for total coliforms is based on the population served by the system. In accordance with the TRC, systems that serve between 50,001 -

60,000 people are required to collect 60 representative samples every month. Samples are taken throughout the system. This represents an increase from the previous Plan.

The City uses two types of disinfectant for treatment, chlorine gas and sodium hypochlorite, which both produce free chlorine residuals in the distribution system. Monthly average chlorine residuals throughout the distribution system ranged from 0.63 to 0.77 mg/L over the period from 2008 to 2013, as summarized in Table 7.5. Although the range of chlorine residuals appears to vary throughout the year, the levels appear relatively consistent from year to year. Ongoing improvements to chlorination facilities at Well 1 and Well 4 are expected to maintain or improve the level of total chlorine residuals in the system.

**Table 7.5 Total Chlorine Residuals
Comprehensive Water Plan
City of Auburn**

	Sample Results (mg/L)	
Year	**Average**	**Range**
2008	0.64	0.01 - 1.9
2009	0.66	0.02 - 1.18
2010	0.63	0 - 1.2
2011	0.67	0.11 - 1.1
2012	0.71	0.05 - 1.44
2013	0.77	0.38 - 1.9

Chlorine residuals at the 60 individual sites were also evaluated to determine if average chlorine residuals were less than 0.5 mg/L, which was considered an indication of areas of lower chlorine residual. Four of the 60 sites had low average chlorine as are presented in Table 7.6. Two of the sites had minimum residuals less than 0.1 mg/L, which was considered very low. The City may wish to evaluate and address the cause of the low chlorine residuals at these sites.

Table 7.6	Sample Sites with Low Chlorine Residuals Comprehensive Water Plan City of Auburn		
Site Number	**Address**	**Average Residual (mg/L)(1)**	**Minimum Residual (mg/L)(1)**
C-46	710 47 St SE	0.49	0.30
C-13	5110 Mill Pond Dr SE	0.49	0.09
C-31	Elizabeth Ave SE	0.46	0.09
B-1	4431 47 St SE	0.44	0.35

Note:

(1) Based on chlorine residual data collected between 2008 and 2013.

The City also monitors chlorine residual at the Braunwood satellite service area. Average chlorine residuals for this area was 0.44 mg/L. A single sample in December 2010 registered no chlorine residual at this site. Since 2012, the City has maintained total chlorine residual above 0.3 mg/L.

7.4.2.2 Stage 1 and 2 Disinfectants/Disinfection By-products Rules

The City conducted both Stage 1 DBPR and Stage 2 DBPR monitoring since the last planning period. TTHM and HAA5 data was collected at six locations under the Stage 1 DBPR from 2008 through 2011, when the City was supplied completely by groundwater. All samples were well below the concentrations that the DOH uses to determine whether a water system qualifies for reduced monitoring (0.040 mg/L TTHMs; 0.030 mg/L HAA5) as shown in Table 7.7. Note, the City's TTHM and HAA5 monitoring has been conducted once per year during the month with the warmest water temperature (i.e. July or August).

The City was required to begin Stage 2 DBPR compliance monitoring starting in April of 2012, because the City's current population served has exceeded 50,000 people. Sampling was conducted at eight Stage 2 sample sites in 2012, as presented in Table 7.8.

Table 7.7 Stage 1 Disinfection By-Product Rule Monitoring Summary
Comprehensive Water Plan
City of Auburn

Sample Site	Total Trihalomethane Concentration (µg/L)		Haloacetic Acid 5 Concentration (µg/L)	
	Average (1)	Max	Average (1)	Max
2001 36th St SE	5.8	10.4	ND	ND
31512 115th Pl SE	3.5	5.8	ND	ND
3615 Orchard St SE	4.5	5.7	ND	ND
3705 West Valley Hwy N	8.3	13.2	1.5	3.0
5208 Nathan Loop	3.9	12.7	1.1	4.4
710 47th St SE	1.6	3.1	ND	ND

Notes:
(1) Average concentrations calculated assuming a concentration of 0 µg/L for all non-detect samples.

Table 7.8 Stage 2 Disinfection By-Product Rule Monitoring Summary
Comprehensive Water Plan
City of Auburn

Sample Site	Total Trihalomethane Concentration (µg/L)	Haloacetic Acid 5 Concentration (µg/L)
	LRAA (1, 2)	LRAA (1, 3)
1212 12th St NE	3.3	ND
2001 36th St SE	8.7	1.4
29309 112th Ave SE	12.9	10.7
31512 115th Pl SE	8.3	4.6
3615 Orchard St SE	8	ND
3705 West Valley Hwy N	10.4	4.7
5208 Nathan Loop SE	3.2	ND
710 47th St SE	3.2	ND

Notes:
(1) LRAA = Locational Running Annual Average.
(2) Total Trihalomethane is MCL is 80 µg/L.
(3) Haloacetic Acid 5 is MCL is 60 µg/L.

7.4.2.3 Lead and Copper Monitoring

Copper levels exceeded the action levels in samples collected in 1993. Based on these results, the City and the DOH entered into a Bilateral Compliance Agreement in 1996 that identified treatment options and schedules for the implementation of corrosion control facilities. New corrosion facilities at the Howard Road/Coal Creek Springs Pump Station and Fulmer Field Park were completed in 2002. The treatment systems use air stripping towers to remove naturally occurring carbon dioxide, increasing the pH. The Howard Road CCT Facility treats water from Coal Creek Springs. Well 1 will also be treated upon completion of ongoing improvements. Fulmer Field CCT Facility treats water from Wells 2, 6, and 7. The pH of the Regional Water Supply is also adjusted for corrosion control before distribution to the City.

The City resumed lead and copper sampling on the regular schedule required under the LCR, starting in 2007. For the City, the LCR requires that at least 30 water samples be collected each 36-month compliance period. Results from the 2012 sampling are presented in Table 7.9. Since the corrosion control facilities were constructed, the copper levels have been well below the action level.

Table 7.9 Lead and Copper Concentrations
Comprehensive Water Plan
City of Auburn

Constituent	2012
Copper Concentrations (mg/L)	
Copper range	<0.07 - 17
Copper 90th percentile	0.17
Lead Concentrations (mg/L)	
Lead range	<0.001
Lead 90th percentile	<0.001

7.4.3 Water Quality Programs

The City's compliance with the water quality programs is as follows:

7.4.3.1 Consumer Confidence Reports

The City's first CCR was distributed in October 1999, as required by DOH. Subsequent annual reports have been distributed in 2000 through 2013, as required. The City's 2013 CCR is provided in Appendix K.

7.4.3.2 Public Notification Rule

The public notification requirements were updated in 2011. The requirements reduce the period of time water suppliers have to inform customers of any situation that may immediately pose a health risk from 72 to 24 hours. For less serious problems, the City can combine notices and make them shorter and easier to understand. Additionally, the new requirements make the standard health effects language more concise, thus making it easier for the City to issue notices. The full public notification requirements can be found in 40 CFR 141.201 - 208, and in WAC 246-290-320. The City should review the new regulations to ensure City procedures are in compliance, if such a review has not yet been completed.

7.5 BLENDING STUDY

The City began using the RWSS as a primary source of supply to augment their existing groundwater well sources. This new supply is surface water from the Green River, which is a departure from the City's historical groundwater supplies. Both the City and RWSS water quality is regulated by the DOH. However, the City has recognized that blending surface water with groundwater may have an impact on water quality as it relates to changes in corrosion potential, compliance with the lead and copper rule, presence of DBPs, volatile organic compounds (VOCs), and changes to historical water quality parameters. Therefore, a blending study was conducted in 2012 to identify possible water quality issues for primary maximum contaminant levels (MCL), secondary MCLs (SMCL), and corrosion parameters.

The study was conducted in accordance with WAC Section 246-290-132. All of the analysis was conducted at the desktop level with modeling and mathematical software using the information and data supplied by the City. No bench-scale studies or testing the actual water quality of blended samples was performed. The results of this analysis were documented in Technical Memorandum No. 1 Blending Study (Carollo 2013). Results were also summarized in the Project Reports for the City's two wholesale interties: B St. NW and 132nd Ave SE.

7.5.1 Blending Scenarios

Four scenarios of blending City water with TPU water are presented in Table 7.10. The study was conducted for the B Street NW intertie; however, results of the study are valid for the 132nd Avenue SE intertie as well. Both locations receive water from the same source, the RWSS. The evaluated scenarios are based on the initial wholesale water agreement of 1,250 gpm, as well as the physical capability of the intertie. These scenarios represent the range of expected blending ratios, which represent the amount of City supply to TPU water. Scenario 2 has proportionally the least amount of water from TPU, 14.7:1, and Scenario 3 has proportionally the most amount of water from TPU, 0.9:1.

The new wholesale water agreement, provides up to an annual daily average of 2,431 gpm (3.5 mgd) annually and 3,556 gpm (5.12 mgd) on the MDD. The resulting blending ratios vary between 3.5:1 and 2.1:1. This level of blending is within the range evaluated; therefore, the results are applicable for new wholesale water agreement

7.5.2 Blending Evaluation

Results of the study demonstrate that the blending of City water with TPU water results in water quality characteristics that meet Primary and Secondary Drinking Water Standards, as shown in Table 7.11 and Table 7.12. The levels of DBPs (both TTHMs and HAA5) from the City sources and RWSS were also evaluated. Under all blending scenarios, the anticipated TTHM and HAA5 values are below the 80 μg/L and 60 μg/L MCL, respectively.

Turbidity and color have been identified as possible aesthetic changes from the City supply water quality but are considered acceptable with respect to water quality standards. However, changes to blended water turbidity and color may or may not be noted by consumers due to the higher turbidity and color of the RWSS. The Green River Filtration Facility will remove TDS and some of the color-forming constituents from the water prior to distribution, which will result in values consistent with the City's current groundwater supply.

Table 7.10 Blended Water: Water Quality Scenarios for Intertie to Tacoma Public Utilities
Comprehensive Water Plan
City of Auburn

Scenario	Blending Ratio (City/TPU Supply)	Auburn Supply, gpm	RWSS, gpm
1	7.8/1	9,750	1,250
2	14.7/1	10,300	700
3	0.9/1.0	2,000	2,200
4	5.1/1	3,500	700

Table 7.11 Blended Water: Primary Drinking Water Standards for Intertie to Tacoma Public Utilities
Comprehensive Water Plan
City of Auburn

Parameter	Units	MCL	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Inorganic Chemicals						
Arsenic	mg/L	0.010	0.004	0.004	0.005	0.004
Asbestos	MFL	7	-(3)	-	-	-
Barium	mg/L	2	0.09	0.09	0.05	0.09
Cadmium	mg/L	0.005	0.002	0.002	0.002	0.002
Chromium	mg/L	0.1	0.01	0.01	0.01	0.01
Mercury	mg/L	0.002	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.05	0.005	0.005	0.005	0.005
Beryllium	mg/L	0.004	0.003	0.003	0.003	0.003
Nickel	mg/L	0.1	0.04	0.04	0.04	0.04
Antimony	mg/L	0.006	0.004	0.004	0.004	0.004

**Table 7.11 Blended Water: Primary Drinking Water Standards for Intertie to Tacoma Public Utilities
Comprehensive Water Plan
City of Auburn**

Parameter	Units	MCL	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Thallium	mg/L	0.002	0.0017	0.0017	0.0018	0.0017
Cyanide	mg/L	0.2	0.05	0.05	0.05	0.05
Fluoride	mg/L	4	0.26	0.23	0.48	0.29
Nitrite-N	mg/L	1	0.23	0.22	0.36	0.25
Nitrate-N	mg/L	10	1.13	1.17	1.15	1.35
Lead and Copper						
Lead	mg/L	0.015 (4)	0.004	0.003	0.008	0.004
Copper	mg/L	1.3	0.41	0.41	0.41	0.41
Radionuclides						
Alpha	pCi/L	15	0.21	0.12	0.96	0.31
Beta	milli-rems/yr	4	ID(1)	ID	ID	ID
Radium	pCi/L	5	0.07	0.04	0.34	0.11
Uranium	μg/L	30	ID	ID	ID	ID
Microorganisms(2)						
Crypto	#/mL	0	-	-	-	-
Coliforms	Presence/ Absence	0	-	-	-	-
Giardia	#/mL	0	-	-	-	-
Legionella	#/mL	0	-	-	-	-
Turbidity	NTU	5	1.2	1.0	2.5	0.9
Viruses	#/mL	0	-	-	-	-

Notes:

(1) ID = insufficient data available to allow for comparison/blending.

(2) MCL values for microorganisms are public health goals. The EPA surface water treatment rules require systems using surface water or groundwater under the direct influence of surface water to disinfect their water and filter their water or meet the criteria to avoid filtration.

(3) "-" indicates data was not available.

(4) Action level, not MCL.

Table 7.12	Blended Water: Secondary Drinking Water Standards for Intertie to Tacoma Public Utilities Comprehensive Water Plan City of Auburn					
Parameter	**Units**	**SMCL**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Aluminum	mg/L	0.05-0.2	ID(1)	ID	ID	ID
Chloride	mg/L	250	5.1	5.3	4.4	5.5
Color	C.U.	15	5.52	5.35	6.75	5.6
Copper	mg/L	1.0	0.41	0.41	0.41	0.41
Fluoride	mg/L	2.0	0.26	0.23	0.48	0.29
Iron	mg/L	0.3	0.09	0.09	0.09	0.08
Manganese	mg/L	0.05	0.017	0.015	0.028	0.016
Odor	TON	3	ID	ID	ID	ID
pH	mg/L	6.5-8.5	7.35	7.37	7.22	7.29
Silver	mg/L	0.10	0.01	0.01	0.01	0.01
Sulfate	mg/L	250	8.7	9.3	4.9	6.4
TDS	mg/L	500	102	107	83	89
Zinc	mg/L	5	0.14	0.15	0.08	0.12

Notes:

(1) ID = insufficient data available to allow for comparison/blending.

7.5.3 Evaluation of Corrosion Potential

Corrosion control, as it relates to the LCR, is a primary health concern, as well as an aesthetic and maintenance concern. The corrosion potential of the blended water was evaluated through four corrosion control indices. The corrosion control indices that were used for this analysis include Langelier (LSI), Aggressive (AI), Calcium Carbonate Precipitation Potential (CCPP), and Larson Ratio (LR).

In general, the individual City sources display a wide range of corrosion indices, with two indices indicating corrosion potential (LSI and CCPP) and two indicating having a small potential for corrosion (AI and LR).

Blending City water with TPU water has a minor impact on corrosion potential based on the corrosion indices investigated, as shown in Table 7.13. Table 7.13 provides the desired range or value of each index and then the results for each blending scenario. The LSI and CCP indices indicated corrosion potential, while the AI and LR indicated non-aggressive or having a small potential for corrosion. However, values within the indices did not vary substantially within the scenarios, except Scenario 3 of the CCPP; indicating minor impacts to corrosion potential from the TPU water.

The City has continued to meet the LCR, since beginning to receive supplies from the B St NW Intertie in 2012. Based on the results on corrosion potential, it is expected to continue to meet the LCR as the supplies from TPU increase.

Table 7.13 City Water (Blended): Corrosion Indices
Groundwater – Surface Water Blending Study
Comprehensive Water Plan
City of Auburn

Index	Desired Range/Value	MDD		ADD	
		Scenario 1 (Maximize Intertie)	Scenario 2 (Baseline Intertie)	Scenario 3 (Max Design Intertie)	Scenario 4 (Baseline Intertie)
LSI	> 0	-1.4	-1.4	-1.7	-1.6
CCPP	4 - 10	-15	-15	-25	-17
AI	> 10 - 12	10.5	10.1	10.2	10.3
LR	< 0.2 - 0.5	0.43	0.43	0.43	0.44

7.5.4 Evaluation of Impact of Treatment Changes on Surface Water Source

The RWSS is expected to finish construction in 2014 on a new filtration facility for the Green River and North Fork Wellfield source waters to meet the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule, referred to as the Green River Filtration Facility. The major change in treatment will be the use of flocculation/sedimentation, granular media filtration, and related facilities.

The changes to treatment from direct supply and ozonation to a filtration facility should have a positive impact on water quality. In general, the water from the RWSS is expected to be more stable (i.e., alkalinity and pH), be improved in quality with respect to turbidity and microbial contaminants, and have a reduced potential for formation of DBPs in the distribution system.

7.5.5 Recommendations

As the City continues to use the intertie with TPU as a non-emergency source of supply, the following future steps are recommended to help the City track water quality parameters resulting from the blending:

- Future Sampling: A small number of water quality parameters were not available for the study or were insufficient for the blending evaluation. Additional sampling for the following water quality parameters should be completed to fill in the gaps in data:
  - Asbestos.
  - Radionuclides.
  - Volatile Organic Compounds (VOCs).
  - Aluminum.

- Odor.
- Natural Organic Matter (NOM).

- Continued Evaluation: Continue to routinely evaluate water quality parameters and potential issues throughout the system to maximize the water supply benefit and minimize potential adverse water quality issues. Results should be revisited if substantial changes in water quality occur to the Regional Water Supply due to the Green River Filtration Facility.

7.6 DEFICIENCIES AND RECOMMENDATIONS

The City is in compliance with all current regulatory requirements, including monitoring requirements. The 2012 Sanitary Survey identified several deficiencies with existing sources. No additional deficiencies are expected due to future growth. The following actions are recommended to maintain future compliance:

1. It is recommended that the City continue its monitoring program. Additionally, the City should continue to coordinate with Tacoma to address any issues with the Regional Supply if they arise.
2. Take actions recommended by the DOH to prepare for the upcoming Groundwater Rule requirements, including:
   a. Correcting deficiencies identified in the 2012 Sanitary Survey.
   b. Updating the City's emergency response plan.
   c. Contacting the designated DOH regional office engineer to determine whether treatment provided at the City's sources is sufficient to provide 4-log virus inactivation or removal, especially the RWSS, West Hill Springs, and Well 1 upon completion of the improvements.
3. It is recommended that the City add continuous chlorine analyzers at each intertie with SCADA connections to monitor and record residual at the interties.
4. Additional sampling for the following water quality parameters should be completed at the interties to fill in the gaps in data:
   - Asbestos.
   - Radionuclides.
   - Volatile Organic Compounds (VOCs).
   - Aluminum.
   - Odor.
   - Natural Organic Matter (NOM).

5. Continue to routinely evaluate water quality parameters and potential issues throughout the system to maximize the water supply benefit and minimize potential adverse water quality issues.

6. Update the City's Water Quality Management Plan, as necessary, to address changes due to forthcoming source improvement projects.

WATER USE EFFICIENCY

As populations continue to climb, demand for limited water supplies is steadily increasing in the Pacific Northwest. Efficient water use is critical for water systems to support growth in their communities and support the environment and recreation. The efficient use of water helps ensure reliable water supplies are available for the City of Auburn (City) well into the future. It is important to the City to not only conserve water, which reduces use, but also promote efficient use, which both conserves water and reduces wasteful uses. The purpose of this chapter is to provide an analysis of the City's historic water conservation program and to evaluate the existing and proposed conservation and water use efficiency measures.

This chapter is formatted into two sections. The first section analyzes the previous conservation programs by examining how it was formed, it's program and goals, and analyzes the savings. The second section of this chapter presents the City's new 2015 Water Use Efficiency (WUE) Program, and includes the new requirements, measures, and demand savings anticipated from the program.

8.1 PRIOR CONSERVATION PROGRAMS

8.1.1 History

The first formal water conservation program was developed by the City in 1995, one year after the Washington Department of Health (DOH) jointly published conservation guidelines, as described below. The City's program included several conservation activities such as school outreach, program promotion, leak detection, meter repair/replacement, and conservation pricing. The City enhanced the program in 2001 and again in 2009. The 2009 program will provide the basis of the historical review in this chapter.

The City's 2015 WUE Program follows DOH's 2011 *Water Use Efficiency Guidebook*. while building off previous plans. Therefore, it is worth noting that in preparing previous plans the City reviewed the 1990 South King County Coordinated Water System Plan (CWSP), and Washington Department of Ecology's 1994 *Conservation Planning Requirements (CPR) - Guidelines and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs,* and the *Water Conservation Bibliography for Public Water Systems* by the US Army Corps of Engineers.

8.1.2 Regulatory Requirements

The Washington Water Utilities Council, DOH, and Department of Ecology jointly developed the CPR. Interim guidelines were first established in 1990, and subsequently finalized and approved in 1994. The DOH published the CPR in 1994, which was the basis of the City's 1995 and 2001 conservation programs.

In 2003, the Washington State Legislature passed Engrossed Second Substitute House Bill 1338, better known as the Municipal Water Law, to address the increasing demand on our state's water resources. The law established that all municipal water suppliers must use water more efficiently in exchange for water rights certainty and flexibility to help water municipal suppliers meet future demand. The Legislature directed the DOH to adopt an enforceable WUE Program, which became effective on January 22, 2007. The WUE Program replaced the CPR. The new WUE requirements emphasize the importance of measuring water usage and evaluating the effectiveness of the water supplier's WUE Program.

8.1.3 Previous Program Goals and Historical Water Usage

The City's 2009–2014 Conservation Program was a continuation of the 2000-2005 Program, with specific enhancements to the program to comply with WUE regulations and create an emphasis on efficient water usage rather than only conserving. The program goals were set per the WAC 246-290-830(4)(a) through a public process and posted to the City's website in July 2009. The goals for the 2009-2014 Program targeted a 1 percent reduction per year in Equivalent Residential Unit (ERU) values. The City also wanted to raise the visibility and performance of the Conservation Program by becoming a community leader in water conservation through example and public education. As part of that leadership, the City supported and participated in applicable regional plans in order to maintain a reliable and adequate supply of water for the region.

In 2007, the planning ERU value was 230 gpd per ERU, based on the 75th percentile of the previous six years of data. The 2013 (current) planning ERU value was 195 gpd per ERU, which was also based on the 75th percentile of the previous six years of data. This equates to a 2.5 percent annual decrease in the planning ERU value, more than double the City's WUE goal.

The annual water use per account from 2008 through 2013 used to calculate the planning ERU value is shown in Table 4.3. The tables shows the City has also experienced ddecreases in water use occurred in all sectors, where Schools and Irrigation had the largest decrease in per account water use. These decreases were likely due to a combination of factors, including: increased metering, WUE education, and economic conditions.

Seasonal water use can have a huge impact on the system's ability to deliver water during peak demands. Figure 4.4 shows the seasonal demand from 2011 to 2013 for each customer class. The winter months show a generally steady monthly usage, while summer months typically show an increase, peak, and decrease in water usage. Historically, single-family residential customer class has produced a large peak in the summer months. This peaking is quantified in the MDD to ADD peaking factor presented in Table 4.5. The 75th percentile of the MDD to ADD peaking factor is 1.82, which is marked decrease from the previous plan of 2.01. The City would like to continue this downward trend in peak use and has included it as a new goal in the 2015-2020 WUE Program.

8.1.4 Historical Distribution System Leakage

Distribution system leakage (DSL) is a significant element of the WUE requirements. It is calculated as the difference between the total amount of water produced and the sum of water sold and authorized unmetered water usage. It may include inaccurate master and service connection meters, unaccounted-for non-revenue water use, pipeline leakage, and unauthorized use. DSL does not include authorized water usage such as water used for fire protection, flushing, construction, and other maintenance and operations practices. However, to be credited, this must be accounted for by metering or by estimating water use with credible means. All water that is not authorized is considered distribution system leakage. The DOH requires the 3-year average DSL to be under 10 percent to minimize water waste. As discussed in Chapter 4, the historical 3-year rolling average DSL was between 6.3 percent and 9.7 percent of the total production since 2007.

8.2 2015-2020 WATER USE EFFICIENCY PROGRAM

The 2015-2020 WUE Program will be a continuation of the City's successful current WUE Program. Program measures have been expanded, reflecting the City's increased service population of over 50,000 people. The program has also been updated to leverage the City's investments in improved SCADA, leak detection, and Advanced Metering Infrastructure (AMI). The 2015 Plan complies with regulations as set forth in WAC 246-290-830 and DOH's 2011 *Water Use Efficiency Guidebook*. This section summarizes the program's goals, demand and supply side measures, reclaimed water, and DSL. The projected demand with the conservation goals, program budget, and cost savings are also presented.

8.2.1 Program Goals

Per the WAC 246-290-830(4)(a), all water purveyors with 1,000 or more connections were required to set efficiency goals through a public process. The City has chosen to focus on implementing voluntary measures to decrease both the average and peak water usage. The 2015 program has established the following goals:

- <u>Water Use per ERU:</u> Decrease the planning ERU value (gpd/ERU) 1 percent annually from the current planning ERU value of 195 gpd/ERU, which is the 75th percentile of 6 years of historical data (2008 – 2013). Revaluate goal when the planning ERU value reaches less than 172 gpd/ERU.
- <u>MDD/ADD Peaking Factor:</u> Decrease the planning peaking factor from the current 1.82, which is equal to the 75th percentile of 6 years of historical data (2008 – 2013), to a planning peaking factor of less than 1.72.

- Distribution System Leakage: Maintain 3-year average DSL under 10 percent to minimize water waste.
- Customer Support: To provide the service and support necessary to those water customers expressing a desire to conserve water as a part of their environmental ethic and as a means of minimizing water bills.
- Regional Support: To support and participate in the *South King County CWSP* and other applicable regional plans in order to maintain a reliable and adequate supply of water for the region.

The WUE Program measures, as summarized below, are designed to help meet these established goals.

8.2.2 Program Requirements

The WUE requirements emphasize the importance of measuring water usage and evaluating the effectiveness of the City's program. There are three fundamental requirements of a WUE Program that the City follows:

- **Planning Requirements** – Municipal water suppliers are required to:
  - Collect data.
  - Forecast demand.
  - Evaluate WUE measures.
  - Calculate DSL.
  - Implement a WUE Program to meet their goals.
- **Distribution Leakage Standard** – Municipal water suppliers are required to meet a distribution system leakage standard to minimize water loss from their distribution system.
- **Goal setting and performance reporting** – Municipal water suppliers are required to set WUE goals through a public process and report annually to their customers and DOH.

8.2.3 Mandatory Measures

The WUE Program includes supply side measures that the City implements to understand and control leakage including new meters, leak detection surveys, and water audits. Per the WUE requirements, the following measures shall be continued for the 2015-2020 WUE program:

- Install production (source) meters.
- Install consumption (service) meters.
- Perform meter calibration.

- Implement a water loss control action plan to control leakage if the 3 year rolling average exceeds 10 percent.
- Educate customers about water use efficiency practices.

Additionally, the following measures that must be evaluated are:

- Rates that encourage water demand efficiency (discussed in Chapter 11);
- Reclamation opportunities (discussed below).

The City in the past has complied with these requirements and will continue to comply with these regulations.

8.2.4 Distribution System Leakage

DSL is a significant element in the City's WUE Program. In the past, distribution leakage was referred to as "unaccounted-for-water". To limit DSL, the City has ongoing leak detection, meter calibration, and an active repair and replacement program for water system infrastructure, as detailed in Chapter 12 – Operations and Maintenance. The City has recently completed a leak detection study of major mains and is determining the best approach to fix several detected leaks. Additionally, the City has recently increased its efforts to reduce non-payment of bills and water theft.

Further, the City has recently updated its SCADA and will implement AMI during the 2015-2020 periods. These investments should significantly increase the City's ability to measure DSL both temporally and geographically. The resulting information may allow the City to better target its WUE activities to reduce DSL.

8.2.4.1 Increasing Effectiveness of the WUE Program with AMI

The City is implementing AMI throughout the system during the 2015-2020 program period. AMI will provide a new tool to improve the effectiveness of the WUE Program measures. AMI can provide detailed water use data for each customer that would allow the City to better understand water use patterns and target WUE Program measures to specific customers. Data may be sent real-time or stored for several weeks or months. Potential AMI capabilities vary depending on the chosen hardware and software; however most systems can aid in the WUE Program. Below is a summary of some of the potential uses of AMI.

- Using advanced algorithms and advanced metering data, the City may be able to identify customer leaks.
- Advanced metering is also expected to provide cost savings in the Leak Detection and Repair and Service Meter Replacements programs.
- Advanced metering may aid in the City's efforts to reduce non-payment of bills and water theft.

- Comparing production and customer water use, DSL can be evaluated in greater temporal and geographic detail. For example, DSL may be calculated by month or for a given service area.
- Advanced metering data can help the City identify groups of customers to target for WUE measures. It can also be used to track the effectiveness of the measures for the same customers.
- Advanced metering data will allow additional reporting options to educate customers, such as their peak water use.

AMI may provide substantial benefits for the WUE Program. It is recommended that the City consider the potential water use and cost savings when implementing AMI in the system.

8.2.5 2015-2020 Demand-Side Program Measures

To encourage WUE and support customers, the City has incorporated program measures that target demand reductions. Under the WUE requirements, a program measure may include water efficient devices, actions, business practices, or policies that promote efficient water use. With 15 measures as part of the 2015 Program, the City exceeds the minimum DOH requirement of 12 measures. WUE measures can target specific customer classes or a combination of customer classes. The City's demand-side program measures are summarized below.

1. <u>School Outreach:</u> School programs will continue to be arranged to educate students on efficient water usage. The Cities of Kent and Auburn, along with partners Lakehaven Utility District and Soos Creek Water and Sewer District, have hosted the annual two day Water Festival for fourth and fifth grade students at Green River Community College. The Water Festival provides hands-on activities to teach water conservation, water supply, groundwater and surface water protection, and the water cycle. The City will conduct alternative or additional outreach if requested by schools.
2. <u>Speakers' Bureau:</u> The City will seek speaking opportunities to discuss water use efficiency with a wide-audience spectrum. Topics could include water efficient fixtures and appliances, curbing seasonal peak demands, lawn watering practices, etc.
3. <u>Program Promotion:</u> The City will seek opportunities for television and/or radio public service announcements for water use efficiency, and submit news articles to local papers and Auburn City Magazine on efficient water usage especially during the spring and summer months.
4. <u>Theme Shows/Fairs:</u> The City hosts an annual Kids Day fair. The fair includes a wide range of activities for all ages of kids. As part of the fair, the City has fun water related activities and provides water efficiency brochures and other materials. The City will conduct outreach at other Theme Shows/Fairs if requested. Water saving device kits are distributed to interested single-family and multiple-family residential customers.

5. Water Audits: The City will conduct a water audit upon the request of a customer, including industrial, commercial, and institutional customers. The audits will review items such as: recirculation of cooling water, reuse of cooling and process water, reuse of treated wastewater, efficient landscape irrigation, low water using fixtures, fixing leaks, and process modifications.

6. Customer Leak Detection: The City identifies potential leaks through investigation of the water meter upon request of customers. After implementing AMI, the City will evaluate the potential for using the advanced meters to help identify leaks.

7. Bills Showing Consumption History: The City will continue to provide customer bills showing the previous year's water usage. After implementing AMI, the City will evaluate additional reporting options to educate customers on their water use.

8. Water Saving Device Kits: The City will participate in distribution of water use efficiency kits through education events such as speakers' bureaus, theme shows, fairs, and through bill insert request forms.

9. WUE Pricing: The City has an inverted block rate structure for single-family residential customers to encourage WUE. The City will consider WUE in future cost of service/rate studies. Studies should determine the most appropriate water structures and rate levels to achieve the City's WUE goals, while generating sufficient revenues for utility operations. It is recommended that the studies consider uniform rates by class, inverted block rates, seasonal rates, and excess use rates.

10. Water Efficient Toilet Rebate Program: The City will continue to provide rebates to customers that replace old toilets with new high-efficiency toilets through their EPA WaterSense Toilet Rebate program.

11. Low-Flow Shower Heads Giveaways: The City gives away free low-flow shower heads at the Utility Billing Counter.

12. School Outdoor Water Use Reduction: The City will target schools in an effort to reduce their outdoor water consumption. Water audits and education on benefits of replacing inefficient irrigation systems or landscaping (including turf) will be conducted.

13. City Water Use Reduction: The City will audit the water use of City accounts in an effort to identify both indoor and outdoor water saving opportunities. The Water Utility staff will help educate City account holders on WUE; however, no water budget has been allocated to implement water saving devices at City facilities.

14. Demonstration Garden: The City maintains a demonstration garden at Well 7. The site includes informational placards on Xeriscaping and the water supply well.

15. Landscape Workshops: The City hosts Natural Yard Care workshops. Workshops are open to homeowners and landscaping professionals.

It is important to note that in addition to the water cost savings for the WUE measures, other benefits result, both to the utility and to its customers, from WUE activities. Such additional benefits could include:

- Significant customer energy savings because water heaters are the second largest energy users in the home. Hot water use can be reduced almost one-third by cost-effective WUE measures, such as water efficient fixtures and appliances. Significant energy savings can also occur for industrial processes requiring water heating and other power uses.
- Efficient landscaping and irrigation techniques save on maintenance costs.
- Reductions in water production decrease energy required by utilities to treat and distribute water and to collect and treat wastewater. Chemical costs are also reduced in water and wastewater operations.
- System measures could provide substantial benefits in addition to water production cost savings including:
  - Identification of non-revenue water could result in recovery of unbilled revenue (inaccurate meters) and reduced unauthorized water usage (theft).
  - Leak detection helps prevent major main breaks, which could result in significant repair costs to the utility.
  - Leak detection reduces a utility's liability due to prevention of potential property damage.
  - Repair and/or replacement of service and source meters allows a utility to recover unbilled water revenues.

8.2.6 Reclaimed Water

According to WAC 246-290-100 and the WUE requirements, water systems with over 1,000 connections must collect and evaluate information on reclaimed water opportunities. The City is committed to wastewater reuse and rainwater reclamation, as stated in its official policies summarized in Chapter 3. The City participates in the King County reclaimed water program; which completed a Reclaimed Water Comprehensive Plan in 2012. Additionally, the City has completed the King County Water Reclamation Evaluation Checklist; provided in Appendix I. Currently, there are no reclaimed water users in the City. The City considers the most likely users of reclaimed water to be the irrigation customer class. Total irrigation use for 2013 was 0.34 million gallons. The City has also identified that it may be possible for four large users to use reclaimed water (Boeing, Emerald Downs, Supermall/Walmart, and Adventist Academy); however, these users have not confirmed an interest in using reclaimed water and there is not currently a reclaimed water source in the area.

The City will implement reclaimed water as a conservation measure and include this savings in the demand projections when specific opportunities arise. The City, in conjunction with King County, may develop projects or consider participation in water reuse projects and programs developed by adjacent jurisdictions and others as appropriate. The efforts may include demonstration or pilot projects developed in accordance with applicable federal, state, and local laws and regulations.

8.2.7 Budget

The City has established a budget for each program measure from 2015-2020, shown in Table 8.2. Program Measure budgets increase by two to three percent over the period, except Program Promotion that increases by up to six percent and large meter test/repair/replace that is expected to increase by four percent. Upkeep of the demonstration garden is part of the regular maintenance of Well 7; therefore, no additional budget was allocated. Natural Yard Care workshops are partially funded through the WUE Program.

Table 8.3 shows the City's budget for required WUE measures through the planning period. Leak detection and repair and service meter replacements are not expected to increase over the program period due to the implementation of AMI.

Table 8.1 2015 to 2020 Budget for Each Program Measure
Comprehensive Water Plan
City of Auburn

Measure	2015	2016	2017	2018	2019	2020
School Outreach(1)	$10,540	$10,750	$10,960	$11,170	$11,380	$11,590
Speakers' Bureau (2)	$1,300	$1,340	$1,380	$1,420	$1,460	$1,500
Program Promotion (3)	$7,060	$7,460	$7,860	$8,260	$8,660	$9,060
Theme Shows/Fairs (4), Demonstration Garden (14) & Landscape Workshops (15)	$1,300	$1,340	$1,380	$1,420	$1,460	$1,500
Water Audits (5), Customer Leak Detection (6), School Outdoor Water Use Reduction (12), & City Water Use Reduction (13)	$19,620	$20,270	$20,920	$21,570	$22,220	$22,870
Bills Showing Consumption History (7)	$2,610	$2,690	$2,770	$2,850	$2,930	$3,010
Water Saving Device Kits (8)	$9,130	$9,410	$9,690	$9,970	$10,250	$10,530
Conservation Pricing (9)	$9,130	$9,410	$9,690	$9,970	$10,250	$10,530
Toilet Rebates (10) & Low-flow Shower (11) Heads	$5,910	$6,030	$6,150	$6,270	$6,390	$6,510
Totals	**$66,600**	**$68,700**	**$70,800**	**$72,900**	**$75,000**	**$77,100**

Table 8.2	2015 to 2020 Budget for System Required WUE Measures Comprehensive Water Plan City of Auburn					
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Leak Detection & Repair	$33,000	$33,000	$33,000	$33,000	$33,000	$33,000
Large Meter Test/Repair/Replace	$67,000	$69,700	$72,500	$75,400	$78,400	$81,500
Service Meter Replacements	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000
Total	**$335,000**	**$337,700**	**$340,500**	**$343,400**	**$346,400**	**$349,500**

8.2.8 Public Participation

The City publishes its Water Use Efficiency Annual Performance Report on the Water Utility webpage and is summarized in the Annual Water Quality Report. The report, also submitted to DOH, provides the City's DSL, date of most recent public forum, WUE goals, description of progress in reaching goals, and additional information on WUE efforts. The City website provides the last three years of Efficiency Reports allowing customers to compare performance between several years. The City's website also prominently displays its Conservation Promotions, including frequently asked questions and rebate forms, that are also available at the Utility Billing counter.

The City has conducted a public process to establish its 2015-2020 WUE Program Effectiveness goals, which are outlined in the next section. A public meeting was held on October 20, 2014 at 3:30 PM. Public comments were incorporated into the WUE goals, and are in Appendix M.

8.2.9 2015-2020 WUE Program Effectiveness

The City's water use, both on average basis and on peak demand days, has declined for over a decade. An aggressive WUE Program is likely a major reason for this decline; however, it is difficult to estimate the actual water savings directly resulting from the City's WUE Program because the measures are not directly quantifiable. Measures such as rebates for high-efficiency toilets and low-flow showerheads, do have a direct water savings per device. The impacts on customer water use as a result of public education, which is the main focus of the City's WUE Program, is challenging to measure, as the response of each participant varies greatly.

8.2.9.1 <u>Future Methods for Measuring Program Effectiveness</u>

The existing program effectiveness was evaluated using system-wide historical water use data. Future program effectiveness may measure the effectiveness of the City's WUE Program based on targeted public education programs to customers in a particular area. This area could be limited to a particular pressure zone, group of neighborhoods, etc., but should be an area for which the City can track water use before and after participation in

WUE activities or events. Winter months would provide an estimate on indoor water use, since outdoor water use, such as irrigation, are kept to a minimum during the winter. Summer months could provide an estimate on total indoor and outdoor water use.

The first step would be to establish a baseline from historical information. The second step is to evaluate the resulting water use after promoting WUE through targeted activities and events to customers in the defined area. AMI may provide additional capabilities to more easily perform these studies. It is recommended that water use be tracked for an additional year to identify seasonal trends. Some consideration would need to be given to variations in weather and economic conditions. Another method would be to perform the same before/after water use analysis for WUE Program participants who volunteer and provide their address. The resulting information would be valuable for the City to correlate its WUE Program efforts with direct water savings for its customers.

8.2.9.2 Cost Savings

The WUE Program primarily provides cost savings in two ways. Reducing demand may reduce or delay capital projects for additional supply and expanded distribution infrastructure. Additionally, reducing DSL can provide additional revenue, as well as increase the efficiency of supplying existing water uses.

The City has completed a cost analysis of their proposed WUE Program using historical data and projected annual water savings. The City has exceeded its WUE Program goal of five percent water use savings from 2008 through 2013; where actual savings were nine percent. However, significant portions of the water use savings may be attributed to the factors other than the WUE Program, such as the economy. To calculate cost savings, it was assumed that the WUE Program only achieved its goal of five percent, rather than the 17 percent reduction; this corresponds to savings of 0.3 mgd of ADD from 2008 to 2013.

The City will budget approximately $401,600.00 for the WUE Program in 2015. This budget includes both the WUE Program measures ($66,600.00), and the required measures ($335,000.00). This annual expenditure is budgeted and expended through the City’s operation and maintenance budget. Based on the projected 2015 budget and the estimated annual water savings of 0.06 mgd, projected unit cost of water from the City’s program for 2015 is estimated to be $0.0181 per gallon on average. It is important to consider the majority of the WUE budget is for service meter replacements, which is a key Utility business practice to maintain accurate billing and payment. Without these costs, the estimated cost for each gallon of water saved by the WUE Program is only $0.0045 per gallon on average. Additionally, WUE plays an important role in reducing the need for new supplies and delaying costly distribution system upgrades.

8.2.10 Projected Water Demand

The projected water savings from the 2015-2020 WUE Program goals are represented in the low demand scenario presented in Chapter 4. The WUE Program is only applicable to retail customers. The projected water demand for the Retail Water Service Area with and without WUE for the ADD and the MDD are presented in Table 8.4. Demands are presented for the 20-year planning period, as well as the Ultimate demand. The planning ERU value of 172 gpd/ERU will be achieved in 2025 based on an annual one percent decrease. No further reductions in demand are projected beyond 2025. Figure 8.1 is a graphical representation of the data in Table 8.4.

As shown in the table, WUE measures are projected to result in an average day reduction in retail demand of 1.08 mgd by 2035, representing a reduction of approximately 12 percent. A reduction of 0.54 mgd (7 percent) is projected by 2020. The MDD to ADD peaking factor was reduced from of 1.82 to 1.73, per the City's goals. As shown in the table, WUE measures are projected to result in a reduction in retail MDD of 1.72 mgd (12 percent) by 2020, and approximately 2.78 mgd (17 percent) by the year 2035. Note, Table 8.4 assumes the reduction in peaking factor occurs in 2015. The last year of historical data is in 2013; therefore, consistent with the current WUE Program, the demand projections assume one percent reduction in 2014.

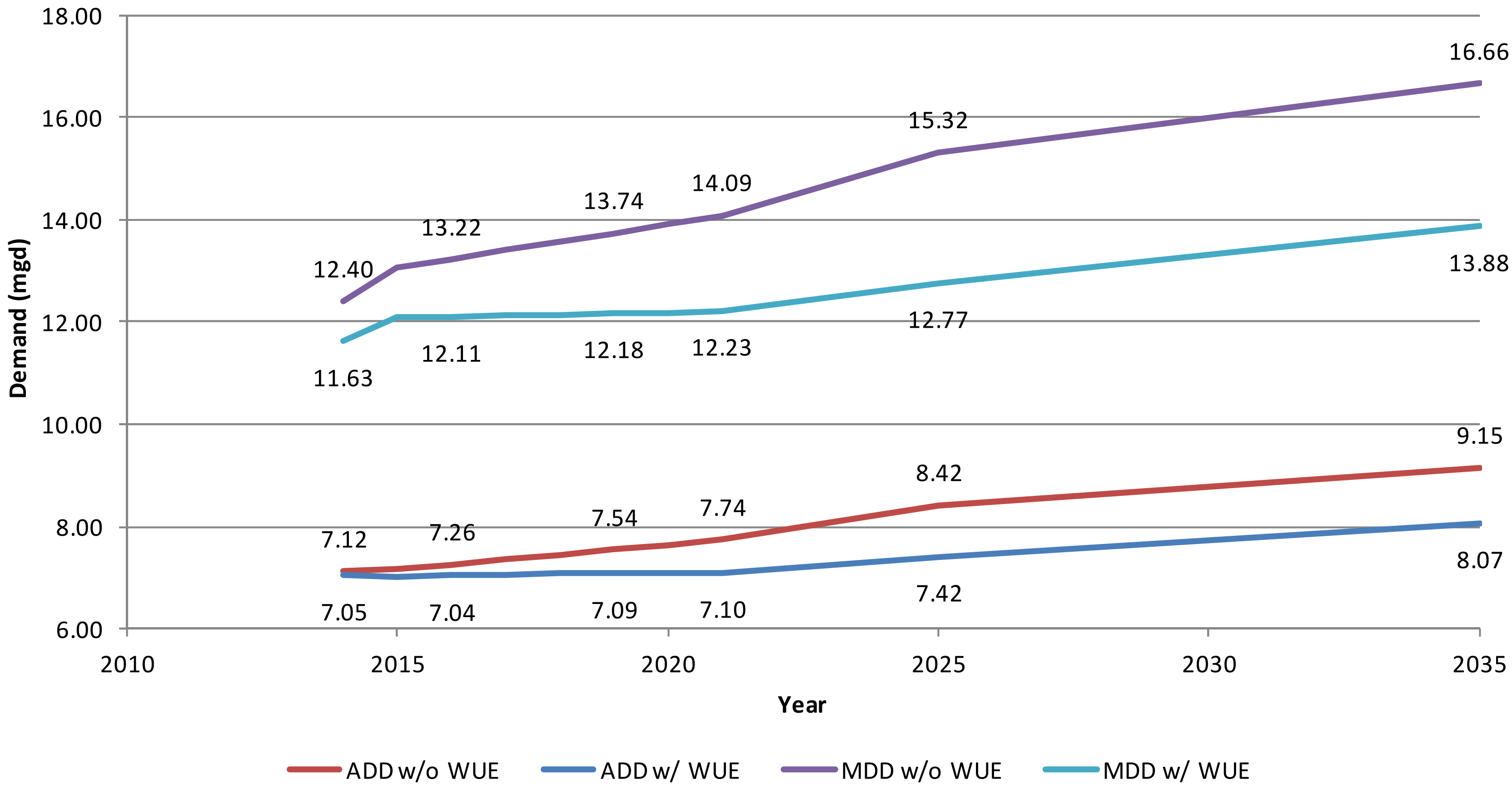
8.2.11 Summary of Water Use Efficiency Program

The City with the WUE Program provides for efficient water use and supports continued growth. This program fulfills all the necessary requirements of DOH. The selected program measures will allow the City to meet its WUE goals, resulting in decreased water demand. Measures are inter related and will help the City achieve its goals to both reduce average water use and peak water use per customer. Public education measures (showing water use in bills, workshops, school outreach, fairs/trade shows, etc.) will continue to be a main focus of the WUE Program to increase customer awareness and knowledge of WUE opportunities. Public education is needed to support the City's other WUE measures and to support reductions in both average and peak water use. Continued appliance rebates and shower head give-away help customers implement what is learned in the public education campaign. With the implementation of AMI, it is expected that the City and customers will be able to identify substantially more water loss reduction opportunities than previously possible. Therefore, customer and City leak detection, water audits, and meter repair and replacement may have a prominent role in the 2015-2020 WUE Program. The increased water loss reduction activities are expected to support reducing average water use. The program will also continue to provide financial disincentives for excessive water use through metering and WUE pricing. This aspect of the program is likely to help reduce peak water usage further. These measures will result in the City being able to achieve its WUE goals, which results in reduced demand.

In conclusion, the City will maintain the target water use efficiency goal of one percent reduction per year in the planning ERU value from 195 gpd per ERU to 172 gpd per ERU by 2025. Additionally, it is the City's goal to reduce the MDD/ADD peaking factor from 1.82 to 1.72. The goals will be reached through implementation of the proposed program measures.

Table 8.3 Retail ADD & MDD with and without WUE
Comprehensive Water Plan
City of Auburn

Demand	2014	2015	2016	2017	2018	2019	2020	2021	2025	2035	Ultimate
ADD w/o WUE	7.12	7.17	7.26	7.36	7.45	7.54	7.63	7.74	8.42	9.15	11.65
ADD w/ WUE	7.05	7.03	7.04	7.06	7.08	7.09	7.09	7.10	7.42	8.07	10.26
Savings	*0.07*	*0.14*	*0.22*	*0.30*	*0.37*	*0.45*	*0.54*	*0.64*	*1.00*	*1.08*	*1.39*
% Savings	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*12%*	*12%*	*12%*
MDD w/o WUE	12.40	13.06	13.22	13.40	13.56	13.74	13.91	14.09	15.32	16.66	21.20
MDD w/ WUE	11.63	12.09	12.11	12.15	12.15	12.18	12.19	12.23	12.77	13.88	17.67
Savings	*0.77*	*0.97*	*1.11*	*1.25*	*1.41*	*1.56*	*1.72*	*1.86*	*2.55*	*2.78*	*3.53*
% Savings	*6%*	*7%*	*8%*	*9%*	*10%*	*11%*	*12%*	*13%*	*17%*	*17%*	*17%*



DEMAND SAVINGS

FIGURE 8.1

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

carollo

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Chapter 9
SYSTEM ANALYSIS

9.1 INTRODUCTION

The City of Auburn (City), Washington operates a multi-source municipal water system (DOH ID 03350V) that includes supply, treatment, storage, and distribution of potable water to retail customers within and adjacent to the City, as well as provides wholesale supplies to neighboring purveyors. Service is provided through four major service areas that are further divided into pressure zones as required by local topography.

An evaluation of the City's water system was conducted to identify deficiencies in system infrastructure and improvement projects. The following sections outline the methodology, identified deficiencies, and potential improvements for: pump stations, storage, and the distribution system. This chapter presents the sizing of improvement projects and the planning horizon they would be required (short-term from 2015-2020, medium-term from 2021-2024, and long-term from 2025-2035). Costs for the improvements were developed as part of the Capital Improvement Program (CIP) in Chapter 10.

9.2 PUMP STATION ANALYSIS

The City's pump stations (PS) and booster pump stations (BPS) are vital infrastructure that play a key role in serving the City's customers. The PSs and BPSs were analyzed to ensure there was sufficient redundancy and reliability capacity to maintain the required level of service. A desktop analysis was conducted to identify PS and BPS deficiencies and improvements. The analysis compared the PS and BPS supply capacity to the required demand and fire flows for each service area and applicable pressure zone. The City's water system PSs and BPSs were evaluated based on open or closed zone criteria, as defined by DOH:

- Open zones are operated from a storage reservoir (i.e., Reservoir 2). PSs and BPSs are required to have capacity to supply the maximum day demand (MDD). Fire Flows are met from the storage reservoir.
- Closed zones do not have storage (i.e., Lea Hill 648 Pressure Zone) and are required to have capacity to supply the peak hour demand (PHD) and fire flow.

The pump station analysis considered each PS and BPS, where open zone and closed zones were evaluated separately.

Additionally, it is the City's policy that PSs and BPSs meet the required flow with the largest pump out-of-service (redundancy criteria) and have emergency backup power (reliability criteria).

9.2.1 Open Zones Booster Pump Station Analysis

Each of the City's service areas contain multiple storage reservoirs, which are typically located in the largest pressure zone of the service area. PS and BPS discharging into these pressure zones were evaluated using the open zone criteria presented in this chapter. The Lea Hill and Lakeland Hills Service Areas have separate sources of supply in addition to the PS and BPS. In these cases, all available supplies were used to meet the required MDD flow. As with the supply analysis, the reliable capacity (emergency power) and redundant capacity (largest pump out of service) were calculated separately, and the lesser value was used as the PS and BPS capacity in the analysis. It is important to clarify that the largest single pump or intertie was removed, such as a fire pump in a PS or intertie. The results of the open zone pump station analysis are presented by service area.

9.2.1.1 Lakeland Hills Service Area

The Lakeland Hills Service Area is supplied from the Upland Well Field (Well 5, Well 5A, and Well 5B) and by the Valley Service Area using the Terrace View BPS. The Terrace View BPS was constructed in 2010 to supply the Lakeland Hills 630 pressure zone from the Valley Service Area, which is then distributed to the entire service area. Lakeland Hills 630 Pressure Zone contains two reservoirs (Reservoirs 5 and 6). Therefore, the Terrace View BPS was evaluated based on the open zone criteria.

Combination of the Terrace View BPS and the Upland Well Field (Wells 5, 5A, and 5B) were evaluated to serve the entire Lakeland Hills Service Area demand. Well 5 was removed from the redundant source capacity as the single largest pump in the service area, as well from the reliable source capacity in the short-term planning horizon. The City is planning to rehabilitate Well 5, including adding emergency backup power, in the medium-term planning horizon that will fulfill CIP Project S-06 from the previous plan. The resulting redundant supply capacity is 1.84 mgd, which is 0.95 mgd greater than the 2035 MDD, as shown in Table 9.1. Therefore, no pumping improvements are recommended.

Table 9.1 Summary of Pump Station Capacity for Open Zones in 2035
Comprehensive Water Plan
City of Auburn

Parameter	Lakeland Hills	Academy	Lea Hill
Projected MDD, mgd	0.89	1.44	2.92
Redundant or Reliable Capacity			
Source Capacity	1.20	0.00	3.32
Firm PS Capacity	1.58	1.52	5.05
Combined Capacity	2.78	1.52	8.38
Excess (Deficit) Pump Capacity, MG	1.89	0.08	2.13

9.2.1.2 Academy Service Area

The Academy Service Area is supplied from the Valley Service area using the Academy PS. The pump station includes two separate facilities, Academy PS 1 and Academy PS 2, which are jointly operated based on levels in Reservoirs 8A and 8B located in the Academy 531 Pressure Zone. Therefore, the Academy PS 1 and 2 facilities were evaluated based on the open zone criteria.

The combined redundant or reliable supply capacity of the Academy PS stations is 1.52 mgd. The pump stations have sufficient capacity to supply the Academy Service Area through 2035 as shown in Table 9.1, however, additional supplies will be needed shortly thereafter.

The City has identified that the Academy PS 1 facility has reached the end of its usable life and needs replacement in the short-term planning horizon; therefore, it was recommended for replacement. The new Academy PS 1 should be upsized to 1.44 mgd (1,000 gpm) to meet future demands. The additional supply will also aid in reducing storage requirements in the service area. It is recommended that the pump station be expandable, so the combined Academy pump stations can serve the ultimate demand of 2.59 mgd. The City may also consider the expansion of the Academy PS 2 facility, rather than replacing the Academy PS 1 facility.

9.2.1.3 Lea Hill Service Area

Historically, the Lea Hill Service Area has been supplied from the Valley Service area using the Lea Hill PS and the Green River PS. In 2014 the City added wholesale water supply from Tacoma through the 132nd Ave SW intertie. The intertie and PSs supply the Lea Hill 563 Pressure Zone, which includes Reservoirs 4A and 4B. Therefore, the Lea Hill and Green River PSs were evaluated based on the open zone criteria.

The 132nd Ave SW Intertie is considered out-of-service in the redundancy scenario, as the single largest source. The Lea Hill PS, constructed in 1965, was the original source of supply for the Lea Hill Service Area. The City is planning to decommission the Lea Hill PS at the end of its usable life, likely around 2025; therefore, it was not considered in the long-term planning horizon. The Green River PS was constructed in 1999 to support the intertie PS in providing wholesale water. In accordance with contract terms, the City does not consider the wholesale water to these customers in the system analysis as the supply is interruptible; therefore, the entire capacity of the Green River PS (5.05 mgd) was used to meet Lea Hill Service Area demands. The City is planning to add emergency power to the Green River PS in 2018, which fulfills CIP project PS-03 from the previous plan; therefore, it was considered reliable in the future planning horizons. The reliable and redundant pump capacity for Lea Hill is more than sufficient to meet the required flows through 2035. No additional improvements are recommended.

9.2.2 Closed Zone Booster Pump Station Analysis

The City operates a closed zone in each of its service areas. The PSs and BPSs serving these pressure zones were evaluated using the closed zone criteria presented above. The results of the closed zone pump station analysis are presented by service area below.

9.2.2.1 Lakeland Hills BPS

The Lakeland Hills BPS, which was completed in 2013, provides the PHD and fire flows to the closed Lakeland Hills 697 Pressure Zone from the Lakeland Hills 630 Pressure Zone. Lakeland Hills Elementary School is located in the pressure zone and requires 4.50 mgd (3,125 gpm) of fire flow, which is the largest in the service area. The Lakeland Hills BPS has 6.1 mgd of redundant and reliable pumping capacity. This pump capacity is more than sufficient to meet the required 5.0 mgd of flow in 2035, as presented in Table 9.2. Therefore, no pumping improvements are recommended.

Table 9.2 Summary of Booster Pump Station Capacity for Closed Zones in 2035
Comprehensive Water Plan
City of Auburn

Parameter	Lakeland Hills 697 Pressure Zone	Academy East 578 Pressure Zone	Lea Hill 648 Pressure Zone
Projected PHD, gpm	0.5	0.3	0.29
Fire Flow, gpm	4.5	3.6	2.16
Total Required Capacity	5.0	3.9	2.45
Total Source Capacity	10.6	5.9	2.88
Reliable Source Capacity	6.1	4.1	1.44
Excess (Deficit) Existing Capacity, MG	1.1	0.2	(1.01)

9.2.2.2 Academy East BPS

The Academy East BPS, constructed in 2014, serves the new and expanded Academy 585 Pressure Zone from the Academy 531 Pressure Zone. The Academy 585 Pressure Zone replaces the previous Academy 565 Pressure Zone that was served by the now decommissioned Janssen’s Addition PS. The BPS serves the pressure zones PHD and the required non-residential fire flow of 3.6 mgd (2,500 gpm). The redundant, reliable supply capacity of 4.1 mgd is sufficient to meet the total required capacity of 3.9 mgd in 2035, as presented in Table 9.2. Therefore, no pumping improvements are recommended.

9.2.2.3 Intertie Booster Pump Station

The Intertie PS consists of two separate pump stations. The larger pump station delivers wholesale supplies to King County Water District #111 (WD#111) and was not evaluated. The Intertie BPS serving the closed Lea Hill 648 Pressure Zone was evaluated. The Intertie

BPS serves the PHD and 2.16 mgd (1,500 gpm) residential fire flow from the Lea Hill 563 Pressure Zone. The BPS does not have redundant fire flow pumps; therefore, the pump station capacity is reduced from a total of 2.88 mgd to 1.44 mgd when the largest pump is out of service. This reduced capacity cannot meet the required flows starting in the short-term planning horizon. It is recommended that the Intertie BPS be expanded to provide a second 1.44 mgd (1,000 gpm) fire flow pump. The resulting increased capacity will be more than sufficient to meet the required flows in 2035.

Additionally, it is recommended that the BPS and related piping be reconfigured to independently isolate and pump down the Lea Hill Reservoirs (4A and 4B). The new configuration will provide operational flexibility and increase the available storage from the reservoirs.

9.2.2.4 Game Farm Park Pump Station

The Game Farm Park PS provides supplies to the Game Farm Wilderness Park from the Coal Creek Springs transmission main. The pump station is adequately sized for the necessary demand, but does not have a redundant fire pump or emergency power. Additionally, the current pump station is in poor condition and difficult to access. It is recommended that the City replace the pump station in the short-term planning horizon, which is consistent with the previous plans (CIP project PS-08). The City is currently investigating replacing the Coal Creek Springs transmission main where it crosses the White River. As part of this project, the City should consider adding a transmission main to serve the Game Farm Park from the Valley 242 Pressure Zone distribution system. If cost effective, the transmission main would eliminate the need for a new pump station.

9.2.3 Summary of Pump Station Improvements

The City’s existing pump stations are generally well-sized to meet future demands. Several pump station improvements were recommended to meet the City’s pump station criteria and address infrastructure that has reached the end of its usable life. The pump station improvements include:

- New 1.44 mgd (1,000 gpm) Academy PS 1 in the short-term planning horizon.
- Add emergency power to Green River PS in the short-term planning horizon.
- Add an additional 1.44 (1,000 gpm) fire pump to the Intertie BPS in the short-term planning horizon.
- Replace the Game Farm Park Pump Station at the end of its usable life.

9.3 STORAGE ANALYSIS

The City of Auburn currently maintains a total of 16.2 million gallons (MG) of water storage in eight water reservoirs located throughout the service area. Redundant storage is provided in each of the City's major service areas. Historically, the City has considered each service area independently. New sources and pump stations now allow for reliable and redundant operation of the system as interconnected whole, rather than separate service areas. The storage analysis reflects the new operational ability by allowing sharing of Emergency Storage between the zones. The existing infrastructure and customer expectations still require that other storage components, such as fire suppression storage, be stored in individual service areas.

The following sections describe the five required categories of storage, summarize the capacity of the system to meet the storage needs of each service area, and present recommendations to address identified storage deficiencies.

9.3.1 Storage Requirements

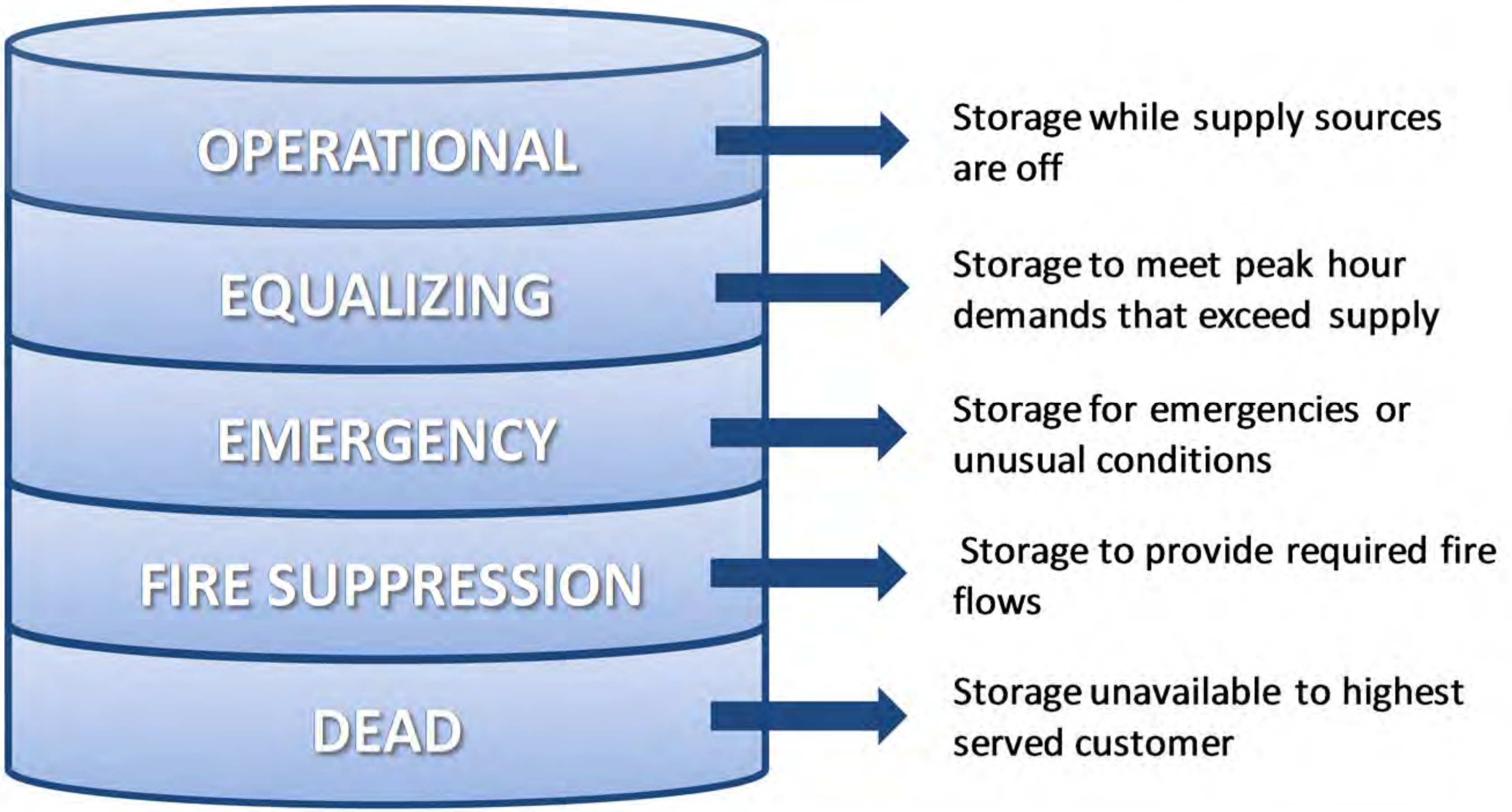
The City's reservoir storage requirements are based on the Washington Administrative Code (WAC) 246-290, Department of Health (DOH) Water System Design standards, and the City's policies presented in Chapter 3. The water storage volumes comprise five categories: Operational Storage, Equalizing Storage, Emergency Storage, Fire Suppression Storage, and Dead Storage. These components of storage are shown schematically in Figure 9.1. The five categories of reservoir storage are defined herein.

9.3.1.1 Operational Storage

Operational Storage is the volume used on a day-to-day basis to supply the water system while the sources of supply are in the "off" position. This volume is dependent on the sensitivity of the water level sensors controlling the pumps and is designed to prevent excessive cycling of the pump motors. Operational Storage volume of at least 1 to 2 feet is typically provided.

9.3.1.2 Equalizing Storage

Equalizing storage volume is the total volume needed to satisfy the PHD that exceeds the capacity of the supply system. The WAC 246-290-253 requires that Equalizing Storage provide for peak demands. DOH recommends that Equalizing Storage for systems with continuous supplies be calculated based on a utility-specific diurnal demand curve for the MDD or similar utility-specific criteria. Equalizing volume requirements are typically greatest on the MDD and are often represented as a percentage of the MDD. The City requires Equalizing Storage of 25 percent of MDD (see criteria in Chapter 3). This criteria has historically been used by the City and is considered conservative as the MDD to PHD peaking factor has declined in recent years.



STORAGE RESERVOIR COMPONENTS

FIGURE 9.1

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

9.3.1.3 Emergency Storage

Emergency Storage volumes, also known as Standby Storage, are required to supply reasonable system demands during a system emergency, such as the disruption of the water supply. Disruptions could be caused by transmission pipeline or equipment failure, power outage, valve failure, or other system interruptions. Emergency Storage volumes are not typically sized for long-term water disruptions. These types of major emergencies should be covered under emergency system operation planning. The City requires Emergency Storage volumes be delivered at a minimum of 20 psi or higher throughout the system.

DOH recommends a minimum of 200 gallons per equivalent residential unit (gal/ERU) of Emergency Storage. Additional storage is recommended by DOH when two times the average day demand (ADD) less system supplies with the largest source out-of-service is greater than 200 gal/ERU. In lieu of applying the DOH recommendations, the City has developed a conservative criteria that accounts for the unique aspects of the City's water system. The City's Emergency Storage criteria is stated in Chapter 3, policy 3.8.18. The criteria can be mathematically represented as the larger of:

$2*MDD - (Q_{\text{Total Supply}} - Q_{\text{Largest Source}})$ Or

$2*MDD - Q_{\text{Reliable Supply}}$

The criteria reflects the City's substantial investment in redundant and reliable supplies and pump stations. The criteria requires twice the MDD of reliable and firm supply and pumping capacity or Emergency Storage is required. The $Q_{\text{Largest Source}}$ represents the largest single source in the system, such as Coal Creek Springs. Previously, the City considered the large source out-of-service in each service area. Emergency Storage is in addition to Fire Suppression storage and is presented in the next section.

9.3.1.4 Fire Suppression Storage

Fire Suppression Storage is the volume of storage required to deliver rate and duration of fire flows prescribed by local fire protection authorities, while maintaining a minimum pressure of 20 psi during MDD conditions (WAC 246-290-230 (6)). Since a fire can occur at any time during the day, the Fire Suppression Storage must be in addition to the Equalizing and Operational Storages.

The City stacks their Fire Suppression and Emergency Storages, where the Emergency and Fire Suppression Storages maintain separate volumes. In the system analysis, the Fire Suppression Storage was placed below Emergency Storage at the bottom of the usable volume of each reservoir.

Fire flows required by existing structures vary within the water service area. The system-wide requirement is 1,500 gpm for two hours for single-family residential units and 2,500 gpm is required for a duration of two hours for all non-residential units except City Parks and open areas. The fire marshal has required fire flows in excess of these general requirements for buildings throughout the system, which is described in detail in Section 9.4.4. The maximum fire flow and fire suppression volume for each major service area is shown in Table 9.3.

Table 9.3 Maximum Fire Flows
Comprehensive Water Plan
City of Auburn

Service Area	Flow gpm	Duration hours	Fire Suppression Volume, MG	Location
Valley	4,000	4	0.96	Various Distribution Facilities
Academy	4,000	4	0.96	Adventist Academy
Lea Hill	4,000	4	0.96	Wesley Homes Sr. Housing (Main Lodge)
Lakeland Hills	3,125	3	0.56	Auburn Elementary School at Lakeland

9.3.1.5 Dead Storage Volume

Dead Storage is the volume of water at the bottom of a storage tank that is unusable. The storage volume is considered dead if it is located below the outlet pipe and cannot be used because of hydraulic limitations, or if it is located below the lowest water surface elevation that meets the minimum design pressure storage (20 psi of pressure during the MDD and a fire flow event) for all customers (WAC 246-290-230(5) and (6)). For planning purposes, a minimum of 1 foot of Dead Storage is used. This minimum volume may account for sediment, water inaccessible due to outlet configuration, and/or air entrainment when supplying fire flows from a partially submerged outlet pipe. A summary of the Dead Storage in existing reservoirs is presented in Table 9.4.

Booster pump stations may allow Dead Storage to be used as long as they do not cause system pressures to fall below the minimum pressure. For the Lakeland Hill Reservoir 5, the pumps for the boosted zone can drain the reservoirs down to the outlet; therefore, 1 foot of Dead Storage was assumed for this reservoir.

9.3.2 Storage Analysis Results

The four service areas were evaluated to ensure each are provided with the required usable Operational, Equalizing, Fire Suppression, and Emergency Storage volumes. Reflecting the interconnectedness of the system, excess storage in higher service areas (e.g., Lea Hill, Lakeland Hills and Academy) can be used in the Valley Service Area and vice versa. The storage analysis compares the required storage, based on the criteria in Section 9.3.1, and the available storage. Storage excess or deficiencies were identified for each service area.

Table 9.4	Reservoir Dead Storage Comprehensive Water Plan City of Auburn					
Reservoir	Nominal Volume per Foot, MG/ft	Outlet Elevation, ft	Maximum Service elevation within zone, ft	Required Tank Elevation[1], ft	Dead Volume, MG	Dead Volume, %
Valley 1	0.20	268.50	235	268.50	0.20	5%
Valley 2	0.12	220.42	168	214.16	0.12	4%
Academy 8A + 8B	0.037	469.0	410	468.0	0.04	2%
Lea Hill 4A + 4B	0.031	499.0	456	517.16	0.59	29%
Lakeland Hills 5	0.017	578.0	547	577.0 [2]	0.02	2%
Lakeland Hills 6	0.025	575	547	593.16	0.29	33%

Notes:

(1) Assumes a minimum static pressure of 20 psi.

(2) The boosted zone of Lakeland Hills can drain the tank down to the suction elevation of the booster pump (577.00 ft), thus providing fire flow service to elevated zones normally served by the reservoir.

9.3.2.1 Valley Service Area

Storage for the Valley Service Area is contained within Reservoir 1 and 2, which have a combined available total storage volume of 8.6 MG, nominal storage volume of 8.55 MG, and available storage volume of 8.23 MG. Nominal storage volume is available storage volume based on the typical operating range of the reservoir. Available storage volume is the nominal storage volume less dead storage. Reservoir 2 is maintained at the Valley 242 Pressure Zone HGL. Reservoir 1 serves the Valley Service Area via pressure reducing valve (PRV) 1, generally operated at the Valley 288 Pressure Zone HGL. The required storage volume for the service area was calculated using the methodology presented in the previous section and presented in Table 9.5. The demand presented in Table 9.5 represents the MDD for the medium scenario presented in Chapter 4. The reliable or redundant supply for each service area are also presented, as Emergency Storage is affected by supplies. As previously discussed, Coal Creek Springs was considered out-of-service when calculating the redundant supply capacity. Detailed results for all planning horizons are provided in Appendix N.

The Valley Service Area does not have sufficient storage volume in Reservoirs 1 and 2 to meet storage volume requirements. The deficiencies are driven by Emergency Storage requirements. Deficiencies are largest in the short-term planning horizon and decrease as additional supplies are brought online.

A combination of storage and supplies are needed to eliminate these deficiencies, as shown in Table 9.6. The City has excess storage in the Lakeland Hills and Academy Service Areas that can be used to reduce Emergency Storage needs in the Valley. Additional PRVs from the Academy and Lakeland Hills Service Areas to the Valley Service Area may be required to facilitate the transfer of storage. There is not sufficient storage in the service areas to meet all Valley storage deficiencies; therefore, new storage and supply improvements are needed.

An additional 2.3 mgd (approximately 1,600 gpm) of supply projects may be moved to the short-term planning horizon to meet storage deficiencies. For example, the Well 7 Treatment Project Phase 1 can be moved from medium-term to the short-term planning horizon (2.5 mgd of supply). In addition to existing storage, 1.0 MG of new storage volume constructed in the medium-term planning horizon will eliminate deficiencies in the medium-term and long-term planning horizon. The new storage is required to provide Emergency Storage, which may be contained in multiple reservoirs and other service areas.

As an alternative to the supply project, the City may consider constructing a new 2.0-MG Valley Reservoir anticipated to be located on existing City-owned property, which was recommended in previous plans. This reservoir may provide the City with improved hydraulic performance, as well as additional flexibility in implementing supply projects.

Algona and MIT demands are supplied from the Valley, but are not considered in the Valley Storage analysis. Algona owns storage in Lakeland Hills Reservoir 6 and is addressed in Section 9.3.2.4 MIT demands are tied directly to Coal Creek Springs flows; therefore, no storage has been reserved.

Table 9.5 Summary of Reservoir Storage Analysis in 2035
Comprehensive Water Plan
City of Auburn

Parameter	Valley	Academy	Lea Hill	Lakeland Hills
Projected MDD	11.41	1.44	2.92	0.89
Reliable or Redundant Source Capacity	16.29	2.52	8.37	2.78
Required Storage, MG				
Operational	0.24	0.07	0.06	0.03
Equalizing	2.85	0.36	0.73	0.22
Emergency	6.53	0.36	0.00	0.00

Table 9.5 Summary of Reservoir Storage Analysis in 2035
Comprehensive Water Plan
City of Auburn

Fire Suppression	0.96	0.96	0.96	0.56
Total Required Storage	10.58	1.75	1.75	0.81
Total Existing Available Storage	8.23	2.62	1.47	1.33
Excess (Deficit) Existing Storage, MG	(2.35)	0.87	(0.28)	0.52

Table 9.6 Summary of Reservoir Storage Analysis in 2035 with Improvements
Comprehensive Water Plan
City of Auburn

Parameter	Valley	Academy	Lea Hill	Lakeland Hills
Projected MDD	11.41	1.44	2.92	0.89
Reliable or Redundant Source Capacity	16.29	2.52	8.37	2.78
Required Storage, MG				
Operational	0.24	0.07	0.06	0.03
Equalizing	2.85	0.36	0.73	0.22
Emergency	6.53	0.36	0.00	0.00
Fire Suppression	0.96	0.96	0.96	0.56
Total Required Storage	10.58	1.75	1.75	0.81
Existing Available Storage	8.23	2.62	1.47	1.33
Shared Available Storage	1.39	-0.87	0.00	-0.52
New Available Storage	1.00	0.00	0.28	0
Total Available Storage	10.62	1.75	1.75	0.81
Excess (Deficit) Existing Storage, MG	0.04	0.00	0.00	0.00

9.3.2.2 Lea Hill Service Area

There is currently total storage of 2.5 MG, nominal storage of 2.06 MG, and available storage volume of 1.47 MG of available storage provided in the Lea Hill Reservoirs 4A and 4B. By 2035 the service area will require 1.75 MG of storage, as shown in Table 9.5. Based on existing infrastructure, the Lea Hill Service Area is deficient in storage throughout the planning periods. In the short-term, the available storage can be increased by configuring the BPS to independently drawdown the Lea Hill Reservoirs. This would allow the City to access 0.24 MG of Dead Storage, assuming Reservoir 4B is drawn down. This work could be included with the fire pump improvements discussed earlier in this chapter. To maintain sufficient fire flows, the tanks should not be simultaneously drawn down.

A small amount (0.04 MG) of additional storage would be required to eliminate the long-term storage deficiency. This storage may come from changes to operational strategies, distribution improvements to reduce dead storage from distribution, or a small increase in pumping from the Valley Service Area.

9.3.2.3 Academy Service Area

There is currently total storage volume of 2.7 MG, nominal storage volume of 2.66 MG, and available storage volume of 2.62 MG provided in the two Academy Reservoirs. The Academy Service Area requires 1.75 MG of storage by 2035, as shown in Table 9.5; therefore, there will be a 0.87 MG surplus storage by 2035. This surplus has been allocated as Valley Emergency Storage. The storage calculations include the replacement of Academy PS 1 in the short-term planning horizon, as discussed in Section 9.2. Without this project, the service area would be deficient in storage in the long-term planning horizon by a maximum of 0.13 MG in 2035.

9.3.2.4 Lakeland Hills Service Area

The Lakeland Hills Reservoir currently has total storage volume of 2.0 MG, nominal storage volume of 1.94 MG, and available storage volume of 1.33 MG. Algona currently owns 0.18 MG of storage in Lakeland Hills Reservoir 6. In 2014, Algona requested an additional 0.12 MG of storage to meet their long-term storage needs. The City has indicated they are willing to sell this storage to Algona and discussions are ongoing. Therefore, a total of 0.3 MG of storage for Algona has been reserved in the Lakeland Hills Service Area. The Lakeland Hills Service Area has sufficient storage throughout the planning period, requiring 0.81 MG of storage by 2035, as shown in Table 9.5; therefore, there will be a 0.52 MG surplus storage by 2035. The excess storage in the Lakeland Hills Service Area has been allocated as Valley Emergency Storage.

9.3.3 Summary of Storage Improvements

Storage deficiencies were identified in the Valley, Lea Hill, and Academy Service Areas. PSs and BPSs are generally well-sized to meet future demands. Several pump station improvements were recommended to meet the City's pump station criteria and address infrastructure that has reached the end of its usable life. The pump station improvements:

- Well 7 Water Quality Phase 1 or other supply project in short-term planning horizon.
- 1.0 MG of additional storage volume for Valley Service Area.
- PRV station from Academy to Valley Service Area.
- PRV station from Lakeland Hills to Valley Service Area.

9.4 HYDRAULIC MODEL

The hydraulic model was the primary tool for evaluating the distribution system. The City's model provides the ability to evaluate current conditions in the system and to evaluate what if scenarios for future growth and infrastructure. The City's current model has undergone an extensive update and calibration since the last Plan. Additionally, the latest demand projects have been incorporated into the model. Details on each of these activities are provided below.

9.4.1 Model Conversion and Update

The City's hydraulic model was converted to Innovyze's InfoWater in 2013 to aid in the development of the City's Unidirectional Flushing (UDF) program. Additionally, the new model platform is fully integrated with ESRI's ArcView to provides a more robust and user-friendly interface. Previously, the City's water hydraulic model was developed using the WaterCAD (Version 8i) hydraulic modeling package, developed by Bentley Systems, Inc. The updated model contains 3,876 nodes and 4,786 pipes. In addition, there were 10 tanks, 13 well and spring sources, and 48 pumps. The conversion and update of the City's former hydraulic model is documented in a Technical Memorandum entitled Hydraulic Model Update and Calibration (Appendix O).

As part of the model conversion work, the model was updated to match the City's GIS based infrastructure and distribution system information. The pipe network was updated to include additional 6-inch diameter mains, which were largely dead-end mains. Most water mains with diameters equal to and less than 4 inches were not included unless they are linked to a hydrant, or needed for connectivity issues. Discrepancies between the hydraulic model and the updated GIS data were identified and resolved using as-built drawings, revised field verified record drawings, and staff's institutional knowledge. The resulting updated InfoWater model was used for the City's UDF program and the Plan.

The model has been continually updated with recent projects and field verified infrastructure. Documentation of key model changes by service area are summarized in Appendix O.

9.4.2 Model Calibration

The purpose of the water system hydraulic model is to estimate, or predict, how the water system will respond under a given set of conditions. Calibration is important to establish confidence that the model has sufficient accuracy to base capital improvement and operational decisions on the model results. To this end, the model was calibrated against field fire flow tests. The calibration process considered both the observed system pressures and how the pumps and reservoirs responded to fire flows. The City's hydraulic model has been calibrated previously; however, an additional calibration was sought to ensure the model's accuracy after the model conversion and update. The new calibration was performed in 2013 as part of the On-Call Modeling Services Contract. The work performed and results are summarized in Appendix O.

Fifteen fire flow tests were conducted across the City's distribution system, which are summarized in Table 9.7. Each test consisted of one flowing hydrant and one pressure hydrant. The tests sites were chosen to provide an adequate representation of system performance throughout the City. Results show there is a good correlation between measured pressures and predicted pressures for all of the hydrant locations. The hydraulic model is considered calibrated if pressures are within 10 psi and 10 percent difference to the field measured data.

The City chose not to conduct fire flow tests in the Lea Hill Service Area in 2013 since there has been relatively little change since the last calibration and due to the possibility of adverse water quality conditions caused by the flushing. Water quality issues have been minimized through the City's UDF program; therefore, it is recommended that the City calibrate Lea Hill during the next model update.

Table 9.7 Fire Test Calibration Summary
Comprehensive Water Plan
City of Auburn

Service Area	Number of Tests Performed	Range of Pressure Difference (psi)	Range of Percentage Difference (%)
Valley	9	-6.2/7.7	-8.3/7.8
Academy	4	-2.4/5.4	-4.0/7.5
Lakeland Hills	2	-2.8/5.1	-5.6/7.9
Lea Hill	-	NA	NA

9.4.3 Demand Allocation

The model was updated with the demand projections presented in Chapter 4, which provide demands by customer class for each service area. The demand allocation spatially distributed these future demands to the model's many nodes. Each node represents the demands from nearby customers that may include multiple customer classes (e.g., commercial and residential). Demand is allocated based on the number and class of customers contributing to the node.

The City's zoning defines the customer classes that can be developed or redeveloped on a given parcel in the future. Therefore, future demands were allocated based on City zoning to vacant and redevelopable lands. Nodes with future demands are shown on Figure 9.2, where existing demand nodes are in white and future demand nodes are in dark blue. Each shown node includes demands from the contributing area that was determined through GIS analyses.

The zoning of the contributing area, in acres, to each node was calculated using GIS. The demand projections were developed based on accounts, not area, therefore the demands were converted to a demand per acre. Using the demand per acre values, the projected demands were calculated for the contributing area in each node. Details on how each aspect of the demand allocation was calculated are provided in the following sections.

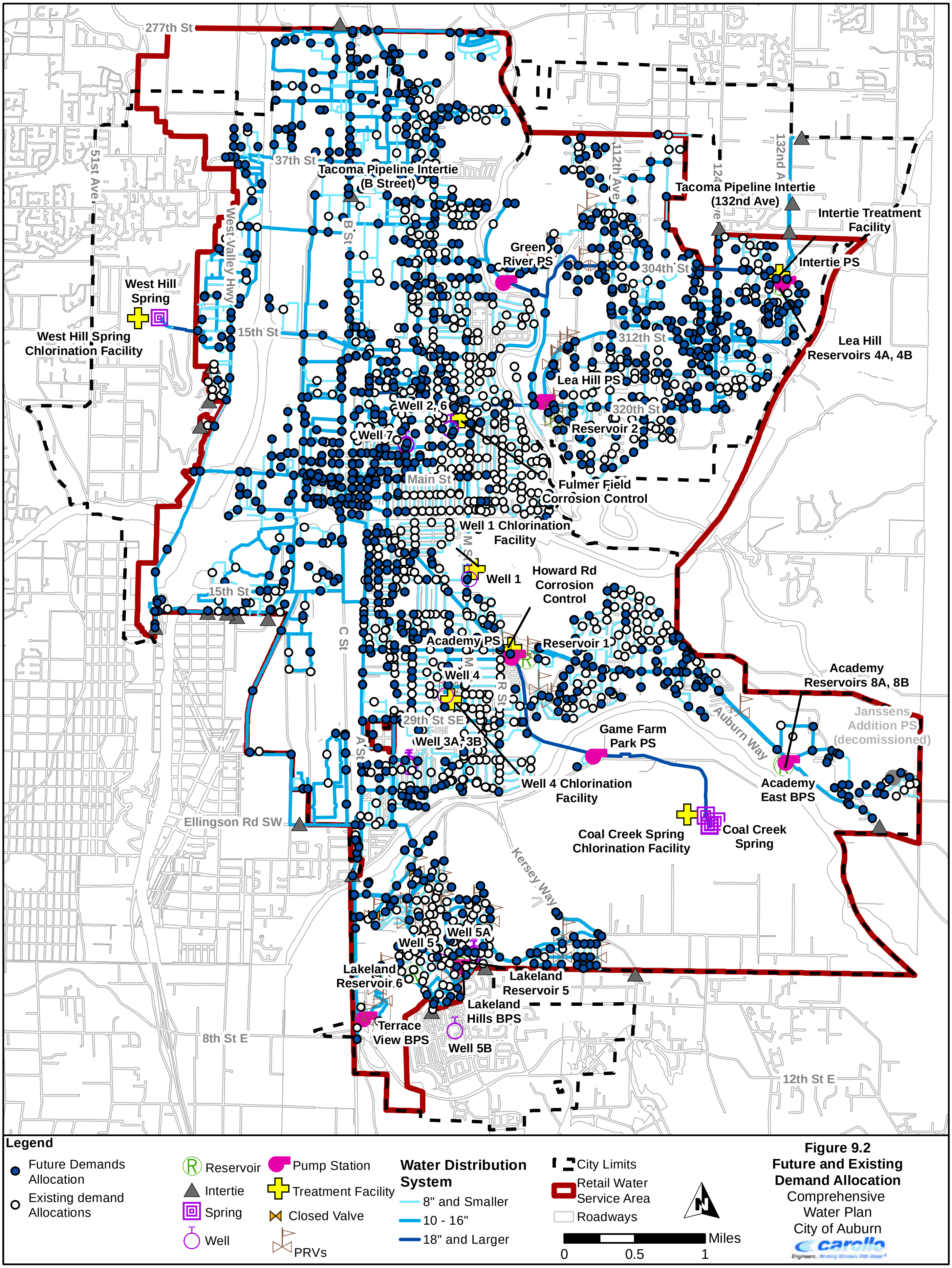


Figure 9.2
Future and Existing Demand Allocation
Comprehensive Water Plan
City of Auburn

9.4.3.1 Demand Allocation

The demand allocation was based on the land use or zoning within these contributing areas. The existing (2015) demands were allocated based on current land use. Future demands were allocated based on zoning, where the contributing area was limited to vacant and redevelopable lands within the City. Using GIS, the area of each category of land use or zoning within the contributing area of each node was calculated. The land use and zoning categories are more detailed than customer classes; therefore, categories were combined that best represent each customer class. The resulting data provided the land use and zoning area for the contributing area of each nodes. This data was combined with the demand per acre to allocate the demands.

Due to limited multifamily zoned areas in Lea Hill, future demands were allocated across all areas, rather than only the redevelopable, and vacant areas.

The contributing area to each node was established by combining nearby property parcels. Automated GIS tools were used initially to assign parcels to each node. The results of the automated analyses were reviewed and selected parcels were reassigned to better represent the source of water for the customers. Commonly, undeveloped or vacant areas were reassigned to the nearest potential system connection to approximate the impact of expansion on the existing system. Additionally, parcels bordering multiple mains were reviewed and reassigned when necessary.

The projected demand per acre was allocated to both existing and future demands. Per acre demands were calculated for 2015, 2021 (short-term planning horizon), 2025 (medium-term planning horizon) and 2035 (long-term planning horizon). These future years are consistent with the City's CIP planning horizons. The 2015 demand projections represent "existing" demands for the demand allocation. Future demands were added to these existing demands. The 2015 demands are not analyzed in the system analysis.

Demands were assigned proportionally based on land use area for each customer class. The demand per acre was calculated for each customer class and service area by dividing the projected 2015 demand by the acres of land use. Therefore, per unit demands were the same for all contributing areas of a given customer class within a service area and the demand per acre value varied between service areas. For example, all commercial areas within the Valley Service Area were assigned the same per acre demand. However, the commercial demand per acre in the Valley Service Area was different from the value in the Lea Hill or Lakeland Service Areas.

Single-family residential, Multi-family residential, Commercial/Manufacturing, Industrial, and City Accounts were assigned based on the land use or zoning. Irrigation demands were allocated proportionally to all non-single family residential areas in the system, except Open Space. Open Space were not allocated demands. Unmetered demands and distribution system losses were allocated uniformly across the system.

Large user demands were assigned to specific locations to accurately capture the hydraulic impacts of these large demands.

Future demands were added incrementally to the existing demands. For example, the incremental 2021 demands are the difference between the 2021 and 2015 demand projections. Therefore, the existing demands were not affected by the future demands. The incremental future demand per acre was calculated by customer class for each service area. Demands were assigned proportionally to the vacant and redevelopable areas for each customer class, as described above, to calculate per unit values in each service area.

The demand allocated to each node was calculated by multiplying the contributing area by the demand per acre values. As previously stated, demand per acre values were based on customer class and service area. Future demands were calculated on an incremental basis for 2021, 2025, and 2035. The resulting demands were imported into the InfoWater Model for use in the system analysis.

The resulting demand allocation does not establish the actual water use for individual customers, rather it represents a typical water use based on large groups of customers. Similarly, the actual site of development or redevelopment is not considered, rather future demands are spread across a large area that the City has established as vacant or having the potential for redevelopment.

Note, the demands presented in this section were developed for planning purposes and should not be used for permitting or design of development-scale projects. .

9.4.4 Fire Flows

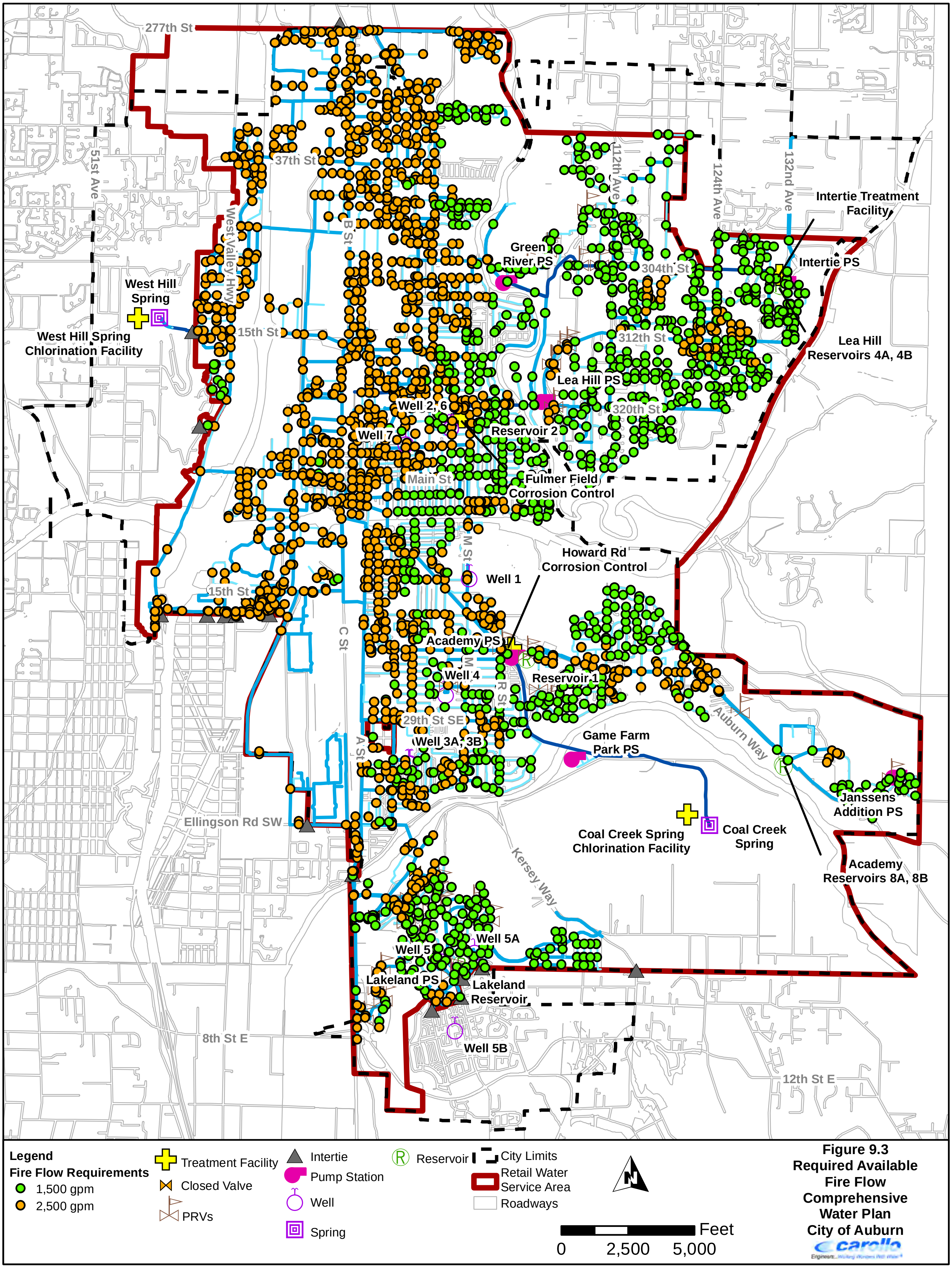
Fire flow demands were verified based on the City's zoning and updated as needed in the hydraulic model. The City's fire flow requirements are 1,500 gallons per minute (gpm) for single-family residential zoning and 2,500 gpm for all multi-family residential and non-residential zoning. City parks without structures and open spaces do not have fire flow requirements. Fire flow demands were only placed in model nodes serving hydrants and are shown in Figure 9.3. The City Fire Marshal requires fire flows up to 4,000 gpm in specific cases, which are shown in Figure 9.4 and tabulated in Table 9.8. These sites include manufacturing sites, retirement communities, a casino, and select schools.

During development review, the City will evaluate the fire flow requirements desired against what is available. If available fire flow is insufficient, the development will be required to either improve the water system or implement structural measures to reduce the fire flow requirement.

Three areas of unincorporated King County are within the City's RWSA, but are not currently served by the City. Fire flow in these areas are designated by King County Code 17.08.

Table 9.8 Buildings in Auburn that have Specific, High Fire Flow Requirements
Comprehensive Water Plan
City of Auburn

Test No.	Location	Address	Service Area	Flow Required (gpm)
1	RPS Distribution Center	3702 "C" St. NE	Valley	4,000
2	Justice Center	340 E Main Street	Valley	2,250
3	New Annex Building	1 E Main Street	Valley	2,500
4	Emerald Downs	2300 Emerald Downs Drive	Valley	3,000
5	Panattoni Warehouse	816 44th ST NW	Valley	4,000
6	Span Alaska	3815 W Valley Highway N	Valley	3,125
7	AMB Valley Distribution Center	2202 Perimeter Road SW	Valley	4,000
8	Super Mall	1101 15th Street SW	Valley	2,000
9	Safeway Distribution Center	3520 Pacific Avenue S	Valley	2,000
10	Auburn Meadows Sr. Housing	945 22nd Street NE	Valley	2,375
11	Grace Community Church	1106 12th Street SE	Valley	3,750
12	Auburn RMC Bed Tower Addition	202 N Division Street	Valley	1,750
13	Riverside High School	501 Oravetz Road SE	Valley	3,000
14	Green River Community College	12401 SE 320th Street	Lea Hill	2,250
15	Wesley Homes Sr. Housing	10805 SE 320th Street	Lea Hill	4,000
16	Auburn Elementary School @ Lakeland	1020 Evergreen Way SE	Lakeland Hills	3,125
17	Academy Campus	5000 Auburn Way South	Academy	4,000
18	MIT Casino Expansion	2402 Auburn Way South	Academy	2,625


277th St
37th St
51st Ave
West Valley Hwy
B St
112th Ave
124th Ave
132nd Ave
Intertie Treatment Facility
Green River PS
304th St
Intertie PS
West Hill Spring
15th St
West Hill Spring Chlorination Facility
312th St
Lea Hill Reservoirs 4A, 4B
Lea Hill PS
Well 2, 6
320th St
Well 7
Reservoir 2
Main St
Fulmer Field Corrosion Control
Howard Rd Corrosion Control
M St
Well 1
15th St
C St
Academy PS
Well 4
Reservoir 1
R St
29th St SE
Auburn Way
Well 3A, 3B
Game Farm Park PS
A St
Janssens Addition PS
Ellingson Rd SW
Coal Creek Spring Chlorination Facility
Coal Creek Spring
Academy Reservoirs 8A, 8B
Kersey Way
Well 5A
Well 5
Lakeland PS
Lakeland Reservoir
8th St E
Well 5B
12th St E
Legend
Fire Flow Requirements
1,500 gpm
2,500 gpm
Treatment Facility
Closed Valve
PRVs
Intertie
Pump Station
Well
Spring
Reservoir
City Limits
Retail Water Service Area
Roadways
Feet
0
2,500
5,000
Figure 9.3
Required Available Fire Flow
Comprehensive Water Plan
City of Auburn
carollo

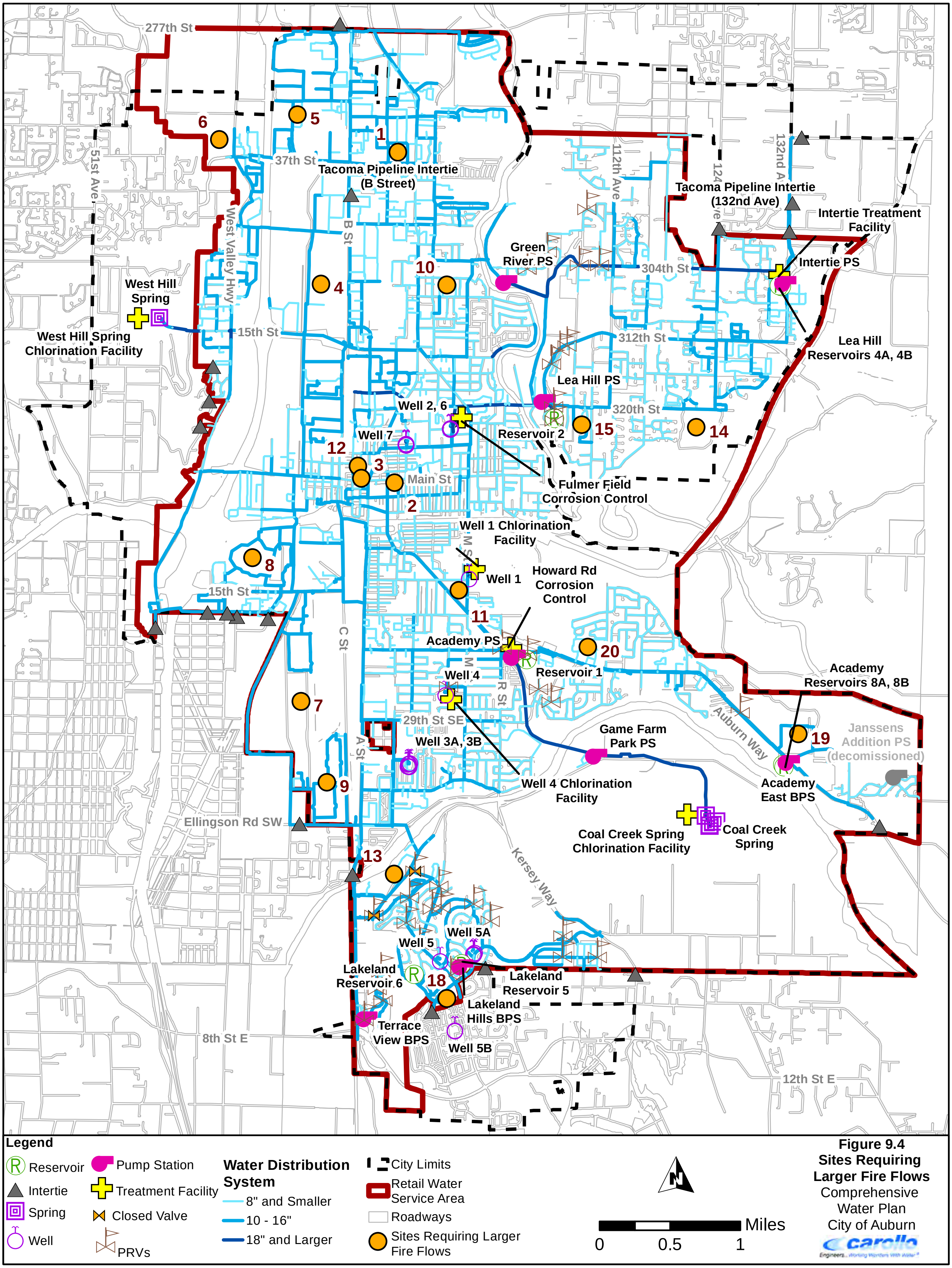


Figure 9.4
Sites Requiring Larger Fire Flows

9.4.5 Diurnal Demand Pattern

Water usage in distribution systems is inherently unsteady due to continuously varying demands. In order for an extended period model simulation to accurately reflect dynamics of the real system, these demand fluctuations must be incorporated into the model. The City previously used the AWWA diurnal curve, however the City recently upgraded their SCADA data system allowing them to develop specific diurnal curves for each of the four service areas of their system. These curves show the hourly demand variation over a several week period. The demand is calculated by a water mass balance of inputs (wells, springs, booster pumps) and outputs (booster pumps) from a given Service Area. SCADA data from August 2013 and May 2013 were used to develop these City specific curves for both ADD and MDD conditions. The diurnal curves and additional information can be found in Appendix O.

9.4.6 Future System Operation and Supply Strategy

The City's supply strategy established in Chapter 6 was used for the model simulations. The supply strategy identified sizing and phasing of improvements, as well as making full use of the Tacoma wholesale interties. The strategy was implemented in the model and source operations were adjusted for each planning year scenario (2015, 2021, 2025, and 2035). Coal Creek Springs, West Hill Springs, the Tacoma Interties, and the Upland Well Field were used in all scenarios. Individual wells in the Valley Well Field were used as available to provide the remainder of the supply.

9.4.7 Model Recommendations

The existing model provides an excellent tool for evaluating the distribution system. The model should be updated periodically to maintain reasonable prediction of water system conditions. An update would include incorporating main replacements and improvements, adding new service areas, incorporating operational changes to the tanks and pumps, adjusting PRV settings, and adjusting demands to match demand projections and zoning. As part of this update, fire flow tests should be conducted to verify the accuracy of the model and aid in monitoring system changes. Additionally, fire flow tests should be conducted to validate model results for new developments in areas with low pressures or high head loss.

9.5 DISTRIBUTION SYSTEM EVALUATION

The updated and calibrated model was used to evaluate future water system conditions in the distribution system. The City's distribution system performance criteria were evaluated for four criteria that evaluate a range of conditions. Areas not meeting the criteria were considered deficient and system improvements were identified to achieve the required level of service. Improvements include piping improvements, valves, and rezoning as presented below.

9.5.1 Evaluation Criteria

The evaluation criteria were set based on the City's policies and criteria presented in Chapter 3. These policies are equal to or greater than that required by DOH Design Manual and WAC 246-290 requirements. The model was evaluated for the following criteria:

1. Maximum recommended pressure of 80 psi during ADD,
2. Minimum pressure of 35 psi during PHD,
3. Maximum velocity of 8 feet per second (ft/s) during PHD, and
4. Minimum pressure of 20 psi during MDD plus Fire Flow.

The results of each criterion are presented below.

9.5.2 Maximum Recommended Pressure during the ADD

Building code requires the installation of individual PRVs when the meter pressure exceeds 80 psi. Therefore, the City has set 80 psi as a recommended maximum pressure for water system design. The model was run in Extended Period Simulation (EPS) during ADD to identify the range of pressures typically experienced in the system. Figure 9.5 shows model nodes with pressures above 80 psi during the ADD during short-term planning horizon. Pressures under long-term scenarios are similar to the conditions in the short-term. No improvements have been identified for this criterion.

The general downward gradient from south to north in the Valley Service Area creates high pressures in the north. As demand increases, most dramatically during fire flows, the maximum pressures will decrease. Therefore, high pressures can be beneficial for maintaining system pressures during large fire flows for the largely commercial and industrial customers in the area. Similarly, high pressures in the Academy Service Area support high fire flows at the MIT Casino.

Additional areas of high pressure are largely due to topography and PRV settings. The City has been able to maintain safe and reliable service in these areas and has no plans to reduce pressures. Additionally, many existing customers are accustomed to these high pressures and view reductions in pressure as a decrease in quality of service. To ensure safe operation, all new customers in high pressure areas will be required to install an individual PRV.

9.5.3 Minimum Low Pressure during the PHD

PHD conditions were simulated to identify areas with operating pressure below 35 psi. Three locations did not meet the low pressure criteria of 35 psi starting in 2015 as shown in Figure 9.6. In the Valley Service Area, the Gains Park area on the west side of the service area, near Lakehaven Utility District (LUD), has pressures below 35 psi. Gains Park extends up the ridge from the Valley Service Area near elevation 66 feet, to a high point of 158 feet, and is located relatively far from the tanks.

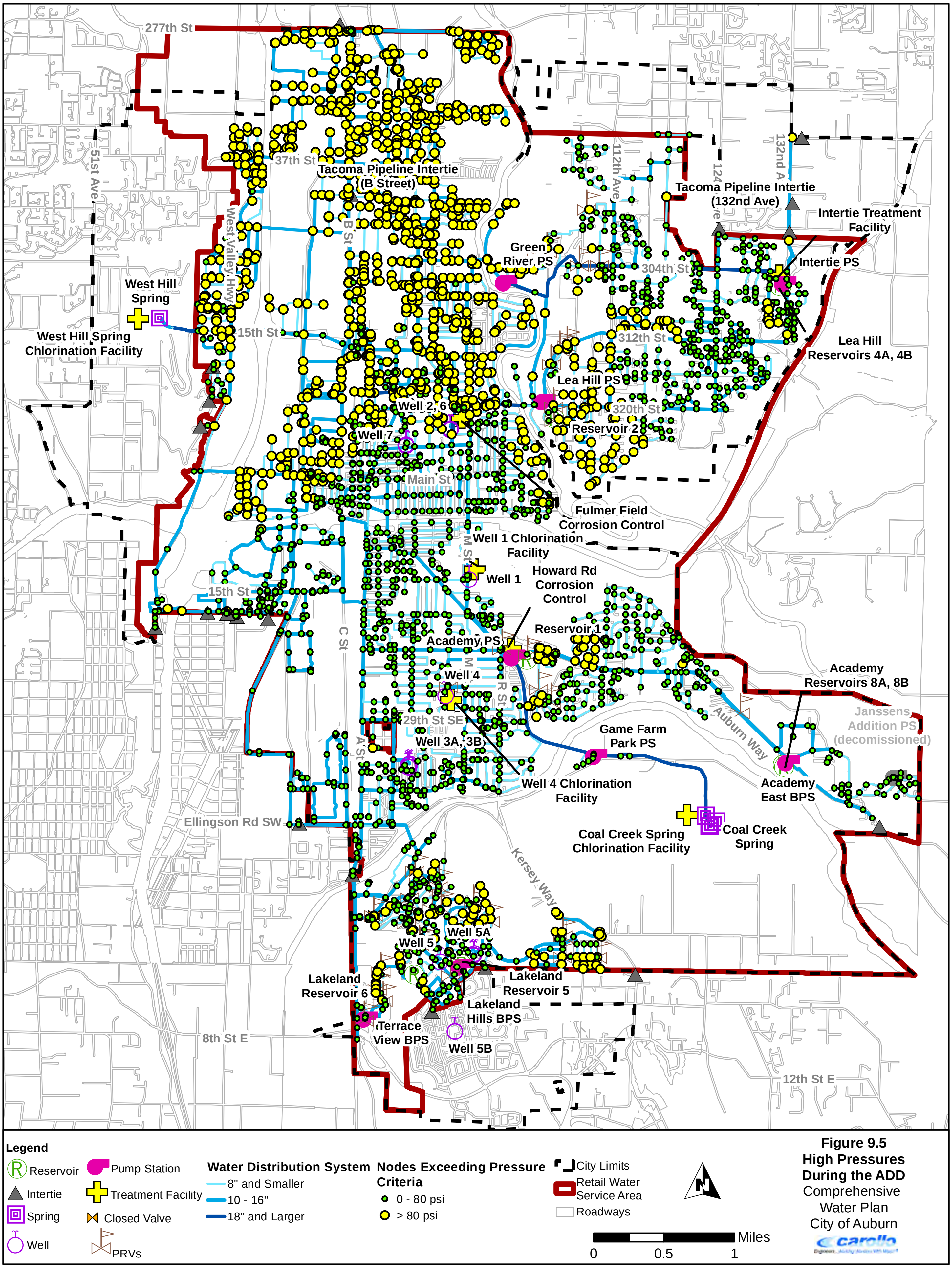


Figure 9.5
High Pressures During the ADD
Comprehensive Water Plan
City of Auburn

The City has an emergency intertie with LUD to provide up to 800 gpm of flow to support fire flows in this area. The combination of system supplied and LUD emergency flows are sufficient to meet the pressure criteria. Either a booster pump station would be required, or the area should be moved to the adjacent Lakehaven Utility District.

The second location of low pressures is located at the boundary of Valley 242 Pressure Zone and Academy 350 Pressure Zone along 28th St SE at the intersection with U Street SE. Switching this customer to the Academy 350 Pressure Zone will improve pressures and fire flows as this is also shown as deficient during the fire run. The proposed rezone is described in greater detail in the Recommended Improvements Section.

The third location was located south of the Lea Hill reservoir along 132nd Ave SE. Nearby locations are currently served by a boosted zone, therefore, it is recommended that the boosted zone be expanded to serve customers in this location. A boosted zone expansion, which encompasses this location, is recommended to meet fire flows and is detailed in the Recommended Improvements Section. No additional improvements to the Intertie BPS beyond those recommended in Section 9.2.2.1 would be required for this expanded boosted zone.

9.5.4 Maximum Velocity during the PHD Scenario

The City would like to maintain velocities less than 8 ft/s in distribution pipes during the PHD. No pipes were found to exceed the velocity criteria in any planning horizon, as shown in Figure 9.6. Therefore, no improvements are recommended.

9.5.5 Minimum Pressure During MDD plus Fire Flow

The City criteria requires minimum system pressures of 20 psi during the MDD plus fire flow. Fire flows are typically the largest flows in the system and often a major factor in pipe sizing and configurations. The InfoWater model was used to systematically simulate a fire at all applicable model nodes. Fire flows were simulated for each of the planning horizons during the MDD and deficient nodes with pressures less than 20 psi are shown in Figure 9.7. During the fire flow analysis, reservoirs are set at the bottom of the fire suppression pool, which is often much lower than typical operating levels. Therefore, locations that may have sufficient pressure during annual hydrant testing may be deficient with these lower reservoir levels.

There are fire flow deficiencies throughout the system, on dead-end mains, in areas of older 4- and 6-inch piping networks, or near high points in a pressure zone. Most deficiencies occur in 2021. Deficiencies in the Valley Service Area are largely associated with high headloss in the older 4-inch and 6-inch pipe network. Lea Hill deficiencies are largely associated with high service elevations. There are relatively few deficiencies in the Academy and Lakeland Hills Service Area.

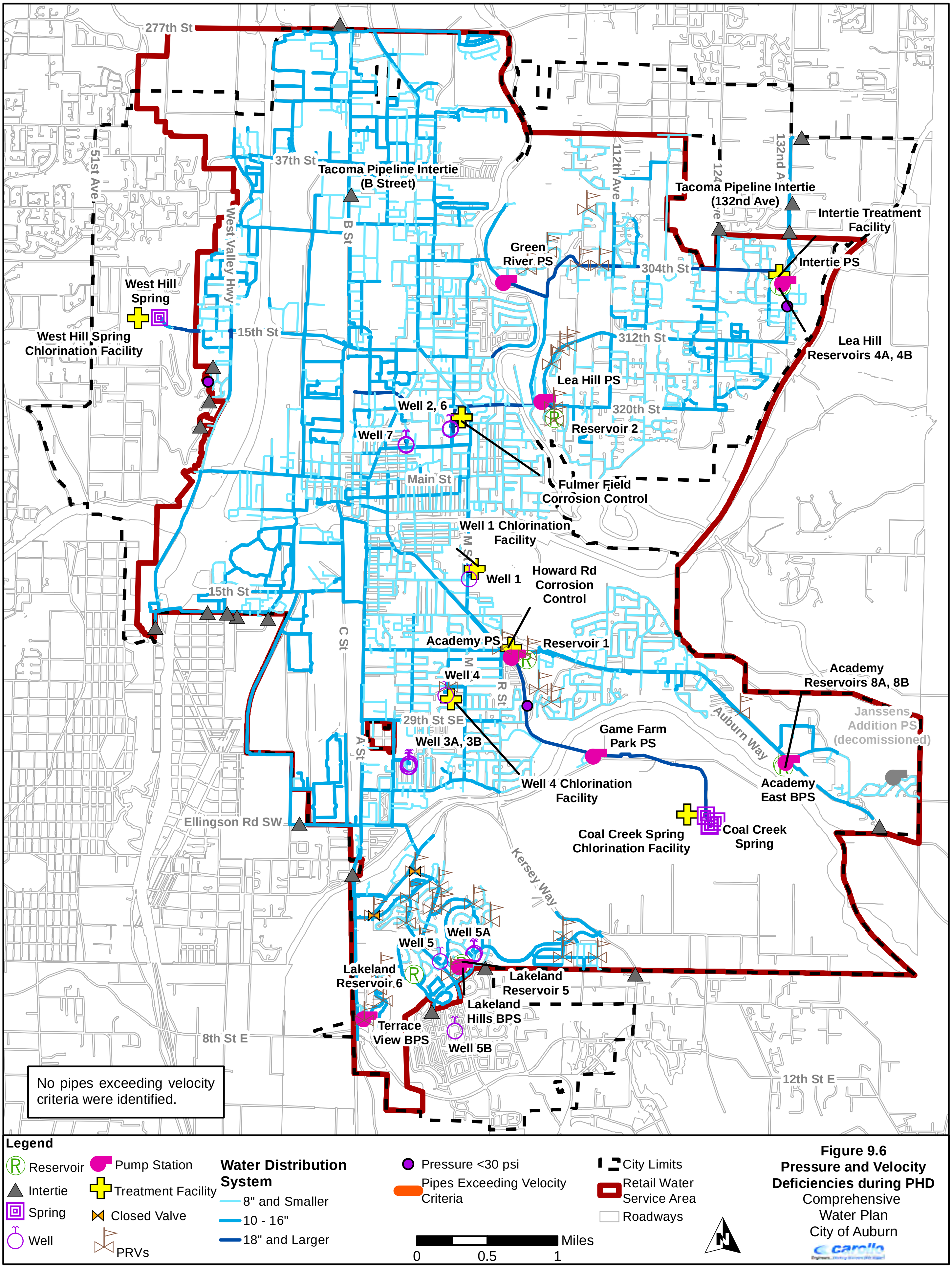


Figure 9.6
Pressure and Velocity Deficiencies during PHD
Comprehensive Water Plan
City of Auburn

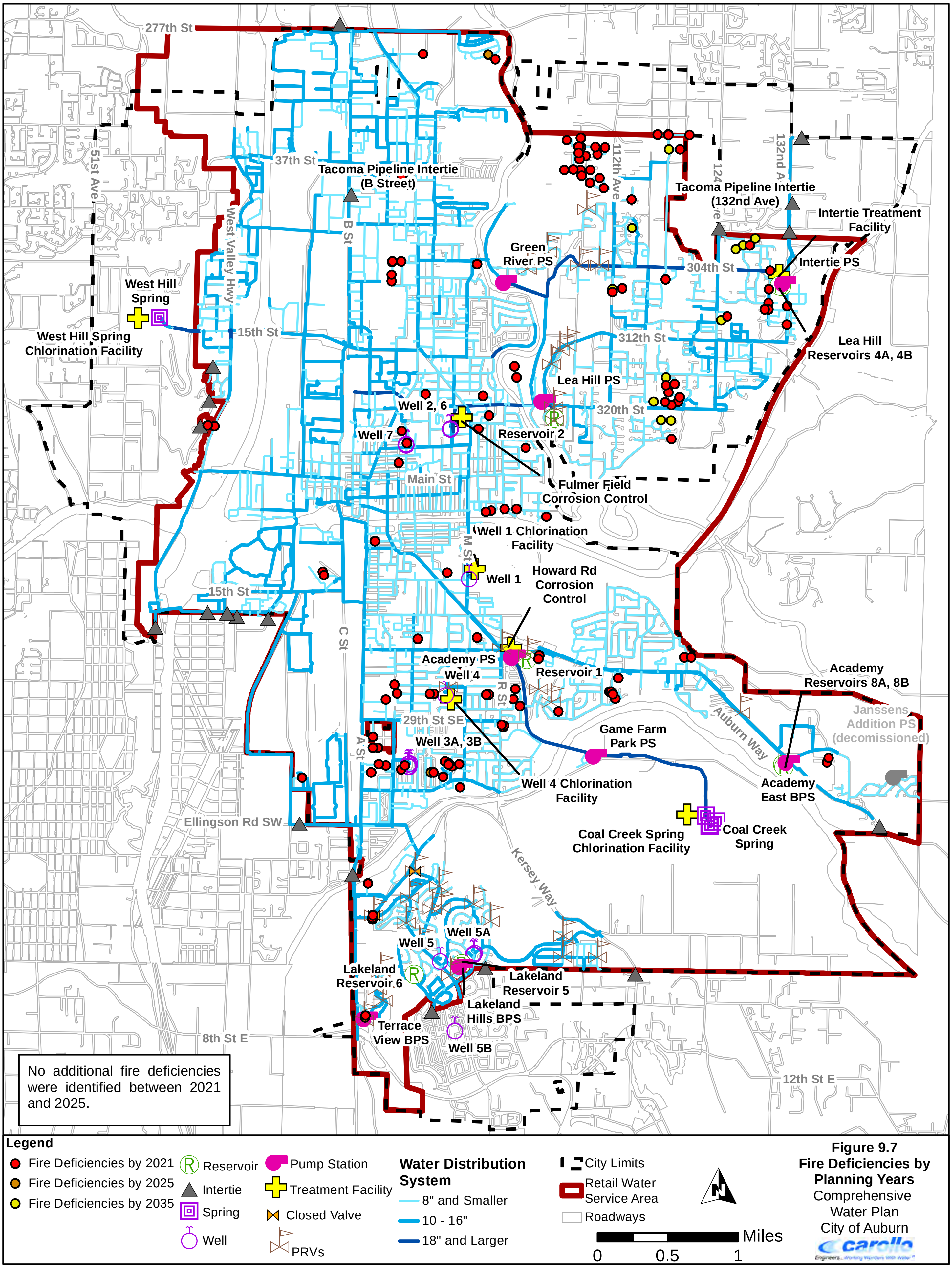


Figure 9.7
Fire Deficiencies by Planning Years
Comprehensive Water Plan
City of Auburn

Note, a combination of public and private hydrants may be required to meet fire flows in the Adventist Academy. Hydrant tests performed in 2014 in the Adventist Academy have shown the school's 8-inch private water system is not looped, as previously believed. Hydraulic modeling of the short-term planning horizon indicates the distribution system is unable to supply 4,000 gpm to a single location within the Adventist Academy without looping. Therefore, the City is working with the Fire Marshal to identify the location and quantity of fire protection needed to protect the Academy's over 15 structures. The City will evaluate the fire flow supply needs once the final fire flows are determined. No deficiencies are shown on Figure 9.7; however, potential improvements are discussed in later sections.

9.5.6 Capacity Improvements

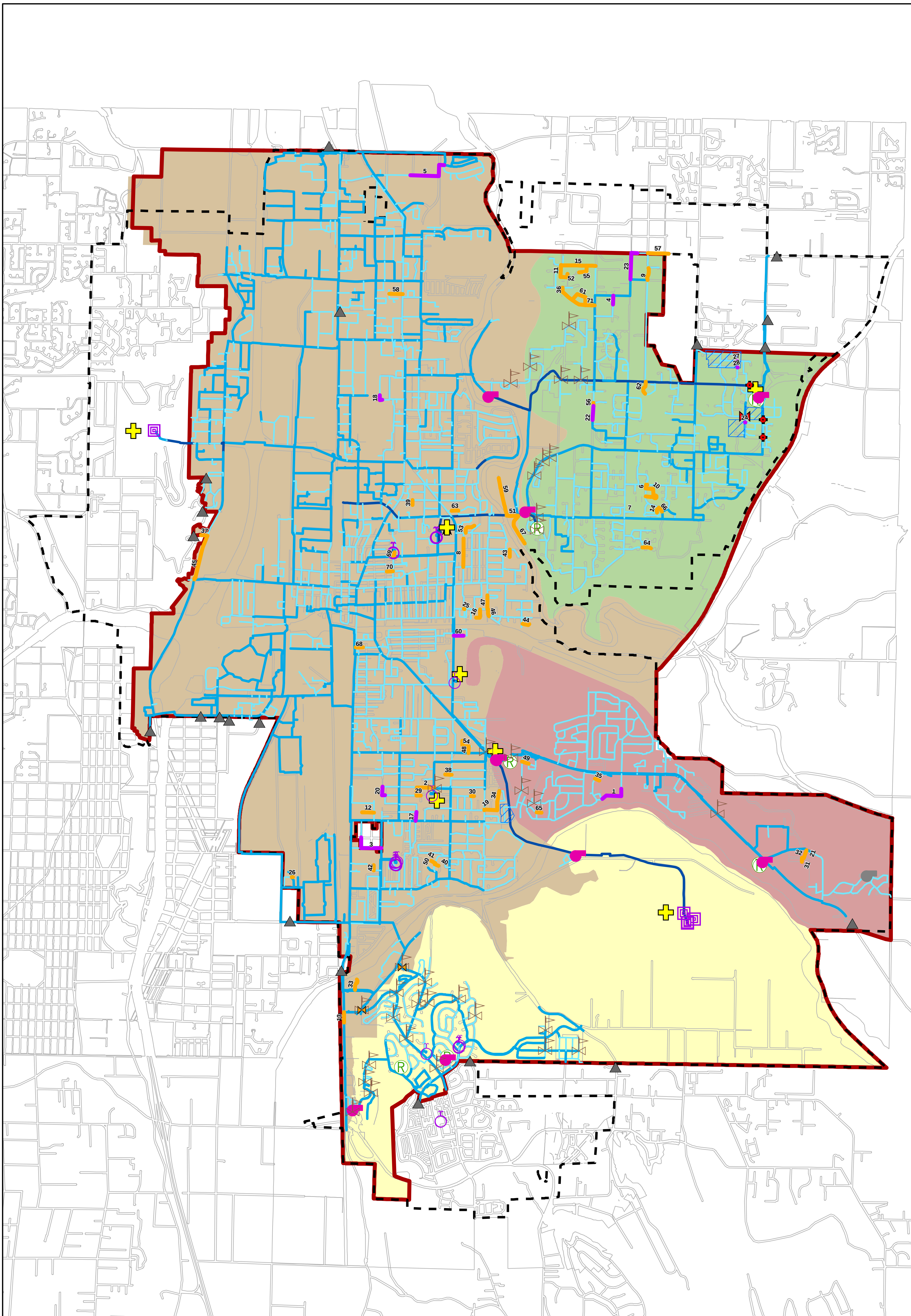
Improvements have been recommended to meet the deficiencies identified in the previous section. Improvements include pipe upsizing, main looping, and pressure rezoning. The recommended improvements are shown in Figure 9.8. Detailed information on each recommended pipe improvement can be found in Appendix P, where Individual projects may be referenced based on the Project ID shown in Figure 9.8. Once implemented, the system will be able to eliminate the identified deficiencies. If all of the recommended improvements are implemented, the model predicts that adequate fire flow is available to all junctions as presented in Figure 9.9 and that all low pressure nodes present adequate pressures as presented in Figure 9.10. The following sections detail recommended improvements for each service area.

9.5.6.1 Valley Service Area

Deficiencies in the Valley Service Area were largely driven by older pipe networks that are undersized to meet modern standards. However, the Valley Service Area is well-networked, so selective pipe upsizing can increase pressures and fire flows to the required levels. Figures 9.11 and 9.12 present the recommended piping improvements in the north and south part of the Valley Service Area, respectively. The majority of these projects are upsizing 6-inch pipe to 8-inch pipe, as shown in Table 9.9. Many of the projects are small lengths of pipe under 500 feet of length. Dead-end mains deficiencies may also be resolved by additional looping. Looping would likely need to occur on private property, so the cost effectiveness will vary. All improvements in the Valley were required to meet short-term deficiencies, as presented in Appendix P. Additionally, pressure rezoning in the Gains Park area is recommended, rather than extensive pipe replacement projects.

9.5.6.2 Lea Hill Service Area

Deficiencies in the Lea Hill Service Area were largely due to the combination of high service elevations and headloss during fire flows. The fire requirements can be met with piping improvements and expansion of the boosted zone, as shown in Figure 9.13 and Figure 9.14, respectively. About half of the pipeline improvements were to upsize existing pipe to 12-inch mains or to create loops to limit headloss, as presented in Table 9.9. Upsizing of existing pipes and new pipe loops will be required to meet fire criteria especially in the north



Legend

- Reservoir
- Intertie
- Spring
- Well
- Pump Station
- Treatment Facility
- Closed Valve
- PRVs

Water Distribution System

- 8" and Smaller
- 10 - 16"
- 18" and Larger
- City Limits
- Retail Water Service Area
- Roadways

Water Service Areas

- Academy
- Lakeland Hills
- Lea Hill
- Valley

- New NC Valve
- Hydrant Improvement

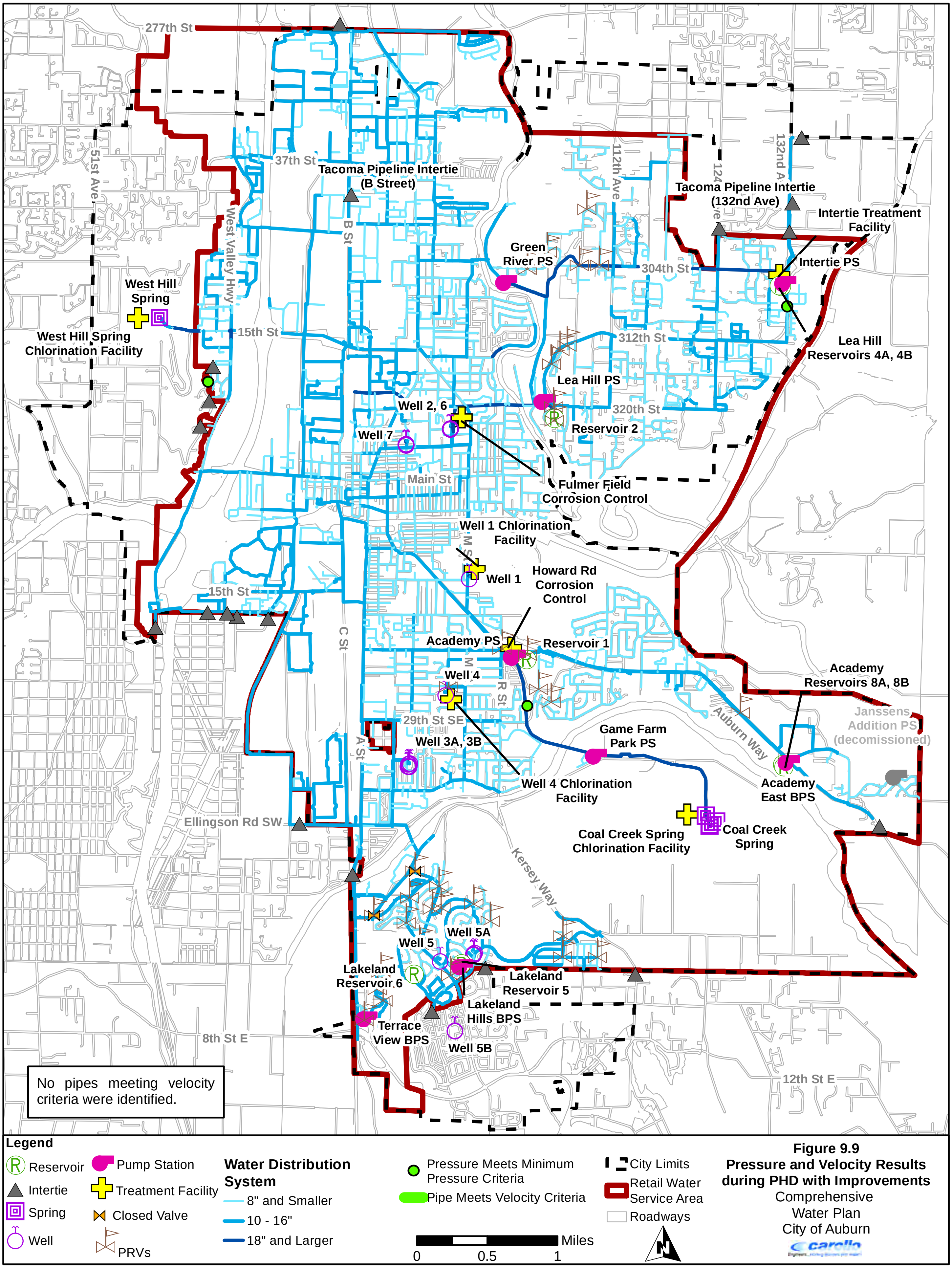
Proposed Improvements

- Replacement
- New Pipe
- 7 Project ID

Miles
0 0.5 1

Figure 9.8
Recommended Water Distribution System Improvements
Comprehensive Water Plan
City of Auburn

carollo
Engineers...Working Wonders With Water™


277th St
37th St
Tacoma Pipeline Intertie
(B Street)
Tacoma Pipeline Intertie
(132nd Ave)
Intertie Treatment
Facility
Intertie PS
Green
River PS
304th St
312th St
320th St
Lea Hill
Reservoirs 4A, 4B
Lea Hill PS
Reservoir 2
West Hill
Spring
West Hill Spring
Chlorination Facility
15th St
51st Ave
West Valley Hwy
B St
112th Ave
124th Ave
132nd Ave
Well 2, 6
Well 7
Main St
Fulmer Field
Corrosion Control
Well 1 Chlorination
Facility
Well 1
Howard Rd
Corrosion
Control
15th St
C St
M St
Academy PS
Reservoir 1
Well 4
R St
29th St SE
A St
Well 3A, 3B
Well 4 Chlorination
Facility
Game Farm
Park PS
Auburn Way
Academy
Reservoirs 8A, 8B
Janssens
Addition PS
(decomissioned)
Academy
East BPS
Coal Creek Spring
Chlorination Facility
Coal Creek
Spring
Ellingson Rd SW
Kersey Way
Well 5A
Well 5
Lakeland
Reservoir 6
Lakeland
Reservoir 5
Lakeland
Hills BPS
Terrace
View BPS
Well 5B
8th St E
12th St E
No pipes meeting velocity criteria were identified.
Legend
Reservoir
Intertie
Spring
Well
Pump Station
Treatment Facility
Closed Valve
PRVs
Water Distribution System
8" and Smaller
10 - 16"
18" and Larger
Pressure Meets Minimum Pressure Criteria
Pipe Meets Velocity Criteria
City Limits
Retail Water Service Area
Roadways
Miles
0
0.5
1
N
Figure 9.9
Pressure and Velocity Results during PHD with Improvements
Comprehensive Water Plan
City of Auburn
carollo

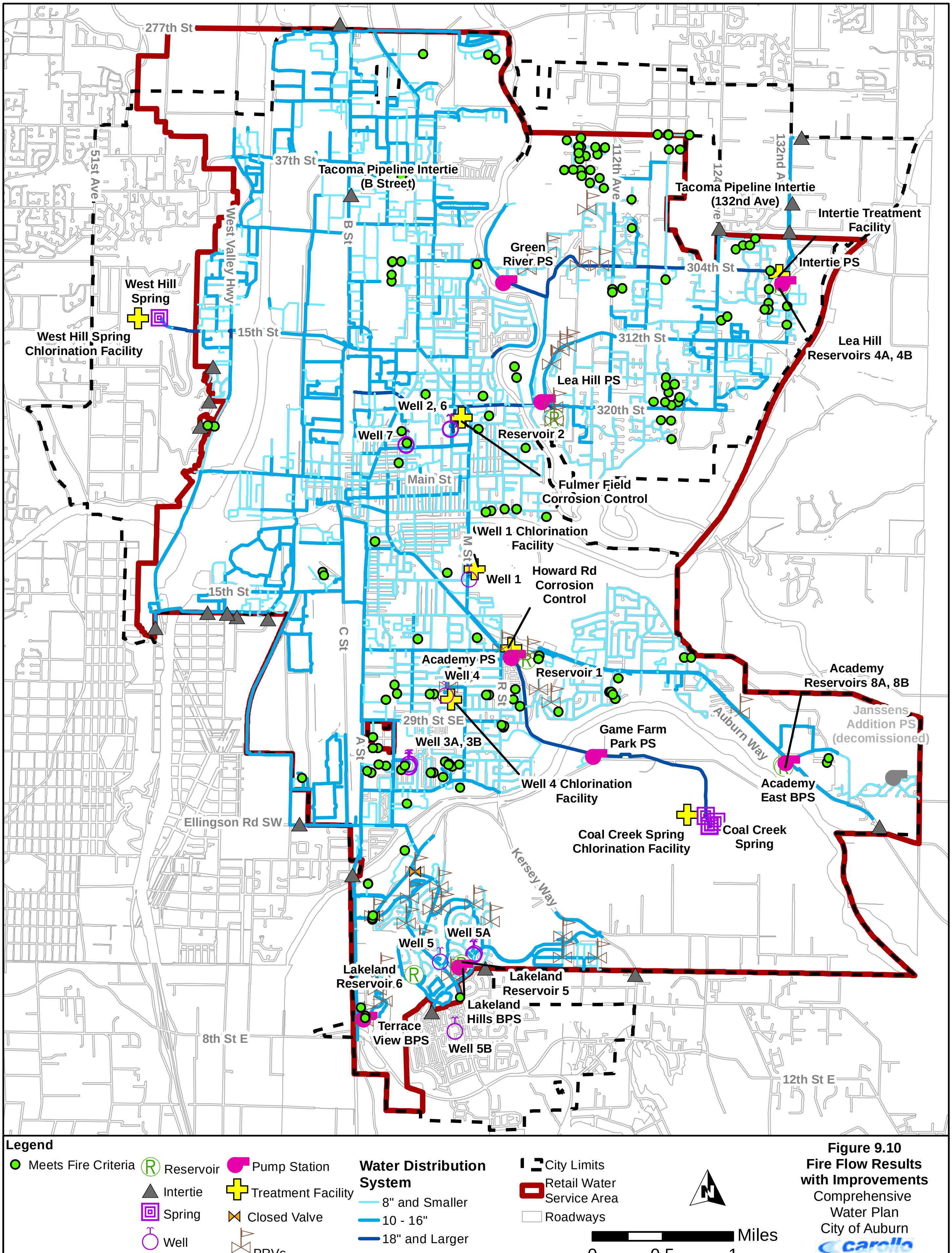


Figure 9.10
Fire Flow Results with Improvements
Comprehensive Water Plan
City of Auburn

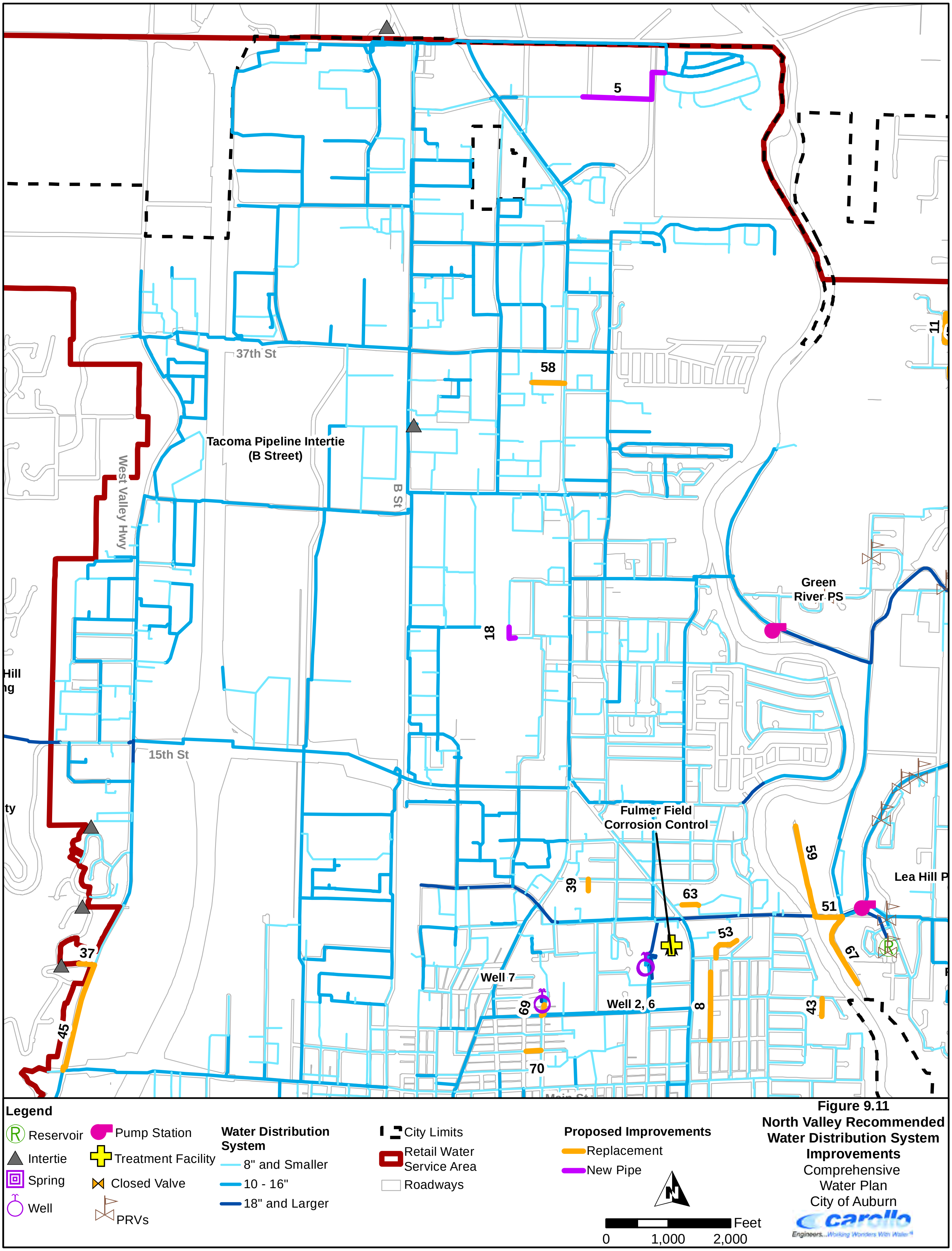


Figure 9.11
North Valley Recommended Water Distribution System Improvements
Comprehensive Water Plan
City of Auburn

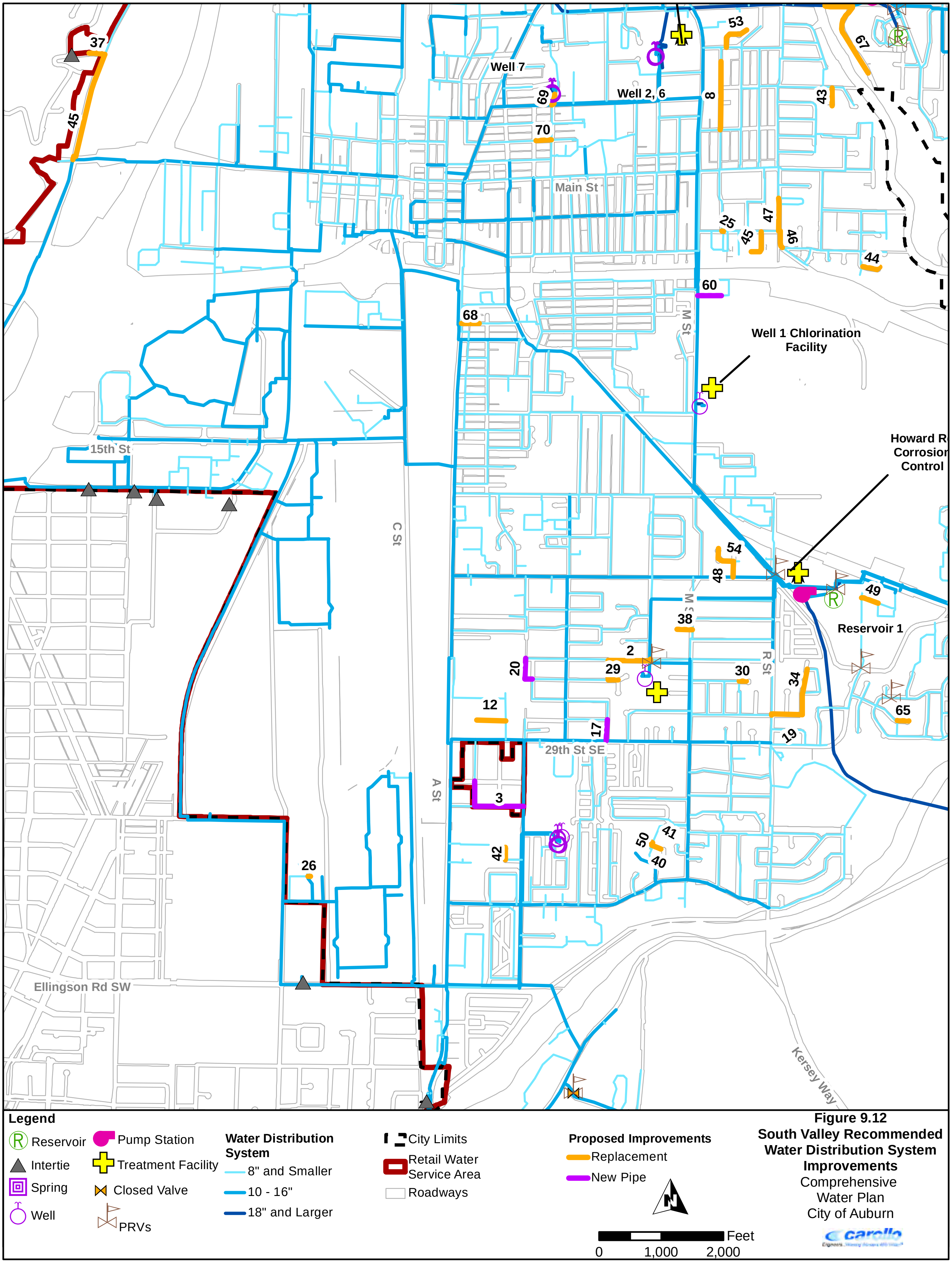
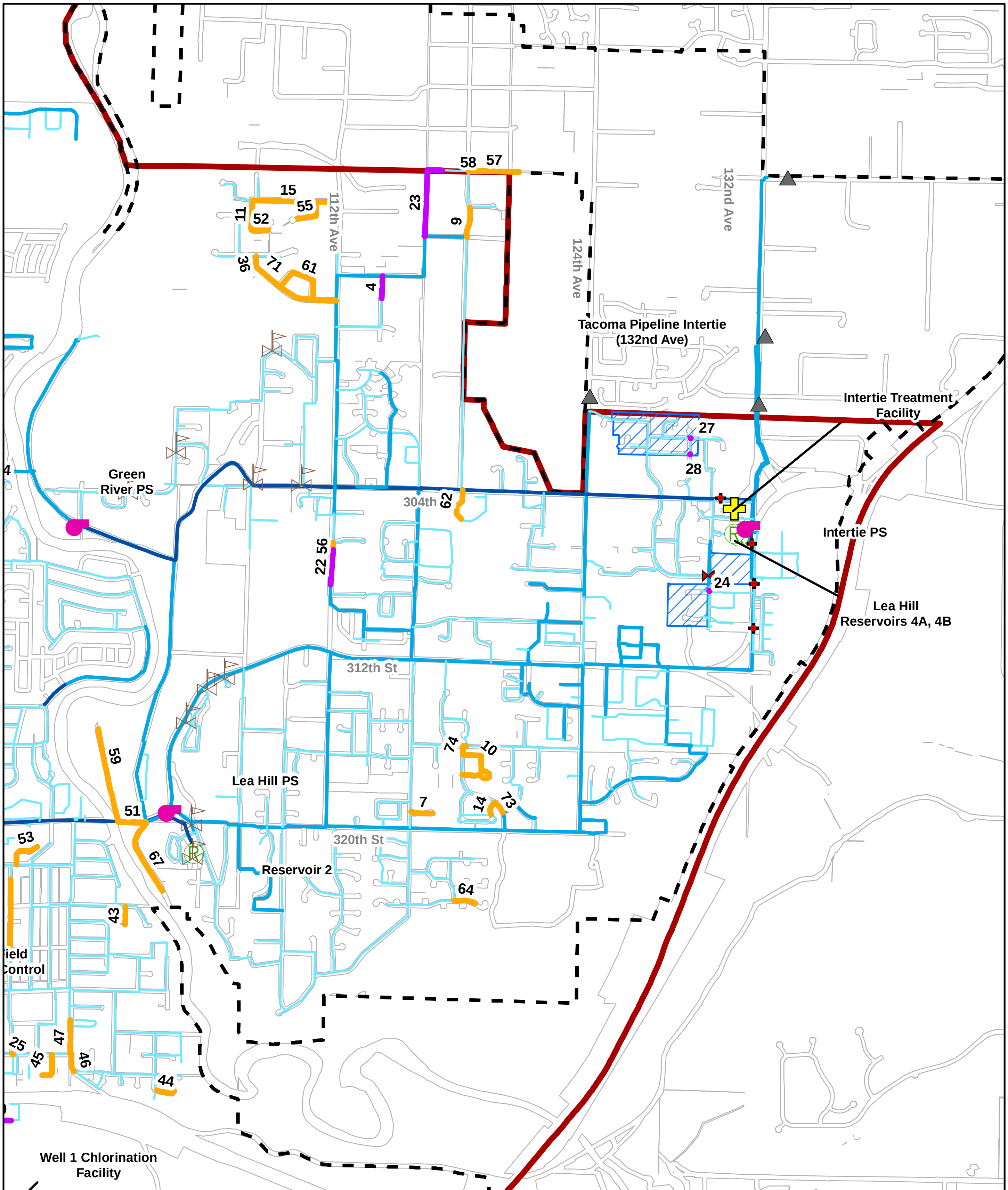


Figure 9.12
South Valley Recommended Water Distribution System Improvements
Comprehensive Water Plan
City of Auburn



Legend

Reservoir
Intertie
Spring
Well
Pump Station
Treatment Facility
Closed Valve
PRVs

Water Distribution System
8" and Smaller
10 - 16"
18" and Larger

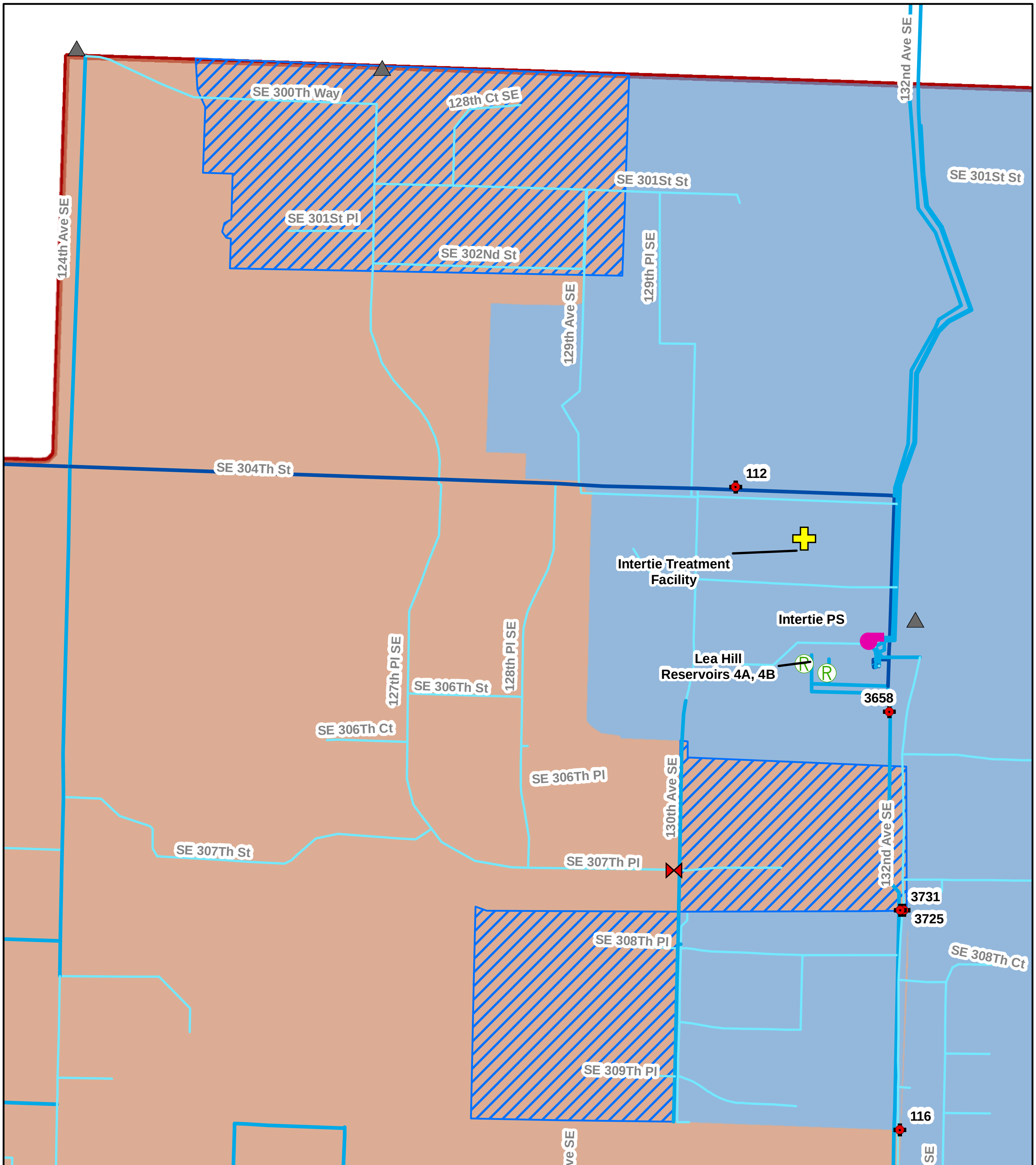
City Limits
Retail Water Service Area
Roadways

Proposed Improvements
Replacement
New Pipe

Feet
0 1,000 2,000

Figure 9.13
Lea Hill Recommended Water Distribution System Improvements
Comprehensive Water Plan
City of Auburn

Carollo



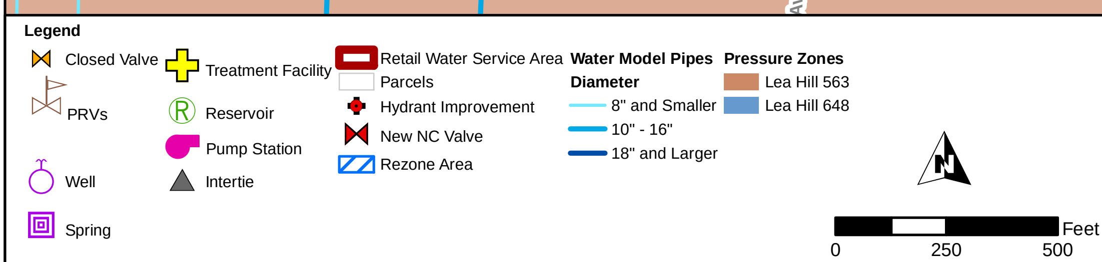


Figure 9.14
Lea Hill Recommended Rezone
Comprehensive
Water Plan
City of Auburn

of the service area, north of SE 296th St where the elevations are some of the greatest in Lea Hill 563. Additional piping and pipe improvements will be required in a high elevation area in the South of the Service Area near SE 318th Place. Projects in these areas address both short-term and long-term deficiencies, as presented in Appendix P.

Table 9.9 Piping Improvements
Comprehensive Water Plan
City of Auburn

Service Area	Improvement Type	Length (ft)	New Size (inch)
Academy	Pipe Replacement	714	12
Academy	Pipe Replacement	492	8
Academy	New Piping	1,071	12
Total Length Academy Piping Improvements		**2,276**	
Lea Hill	New Piping	1,815	12
Lea Hill	New Piping	356	8
Lea Hill	Pipe Replacement	6,081	12
Lea Hill	Pipe Replacement	828	10
Lea Hill	Pipe Replacement	3,466	8
Total Length Lea Hill Piping Improvements		**12,546**	
Valley	New Piping	3,955	8
Valley	New Piping	448	6
Valley	Pipe Replacement	2,359	12
Valley	Pipe Replacement	14,110	8
Total Length Valley Piping Improvements		**20,872**	
Total Length Distribution System Piping Improvements		**35,695**	

9.5.6.3 Academy Service Area

Deficiencies within the Academy Service Area were addressed with piping improvements, as shown in Figure 9.15. A few pipe upsize projects and new pipes that improve looping are necessary to improve residual pressures during fire and meet the pressure criteria of 20 psi. A rezone of part of the Valley 242 to Academy 350 is proposed in order to improve delivery pressures under normal operations and during fire. Figure 9.16 illustrates the proposed rezone location.

As discussed, the Academy was found to be potentially deficient for fire flows. It is recommended that the City work in conjunction with the Academy to implement improvements, as necessary. Improvements may include distribution main improvements along Auburn Way S or 32nd St SE, as well as recommended improvements within the Academy's private system.

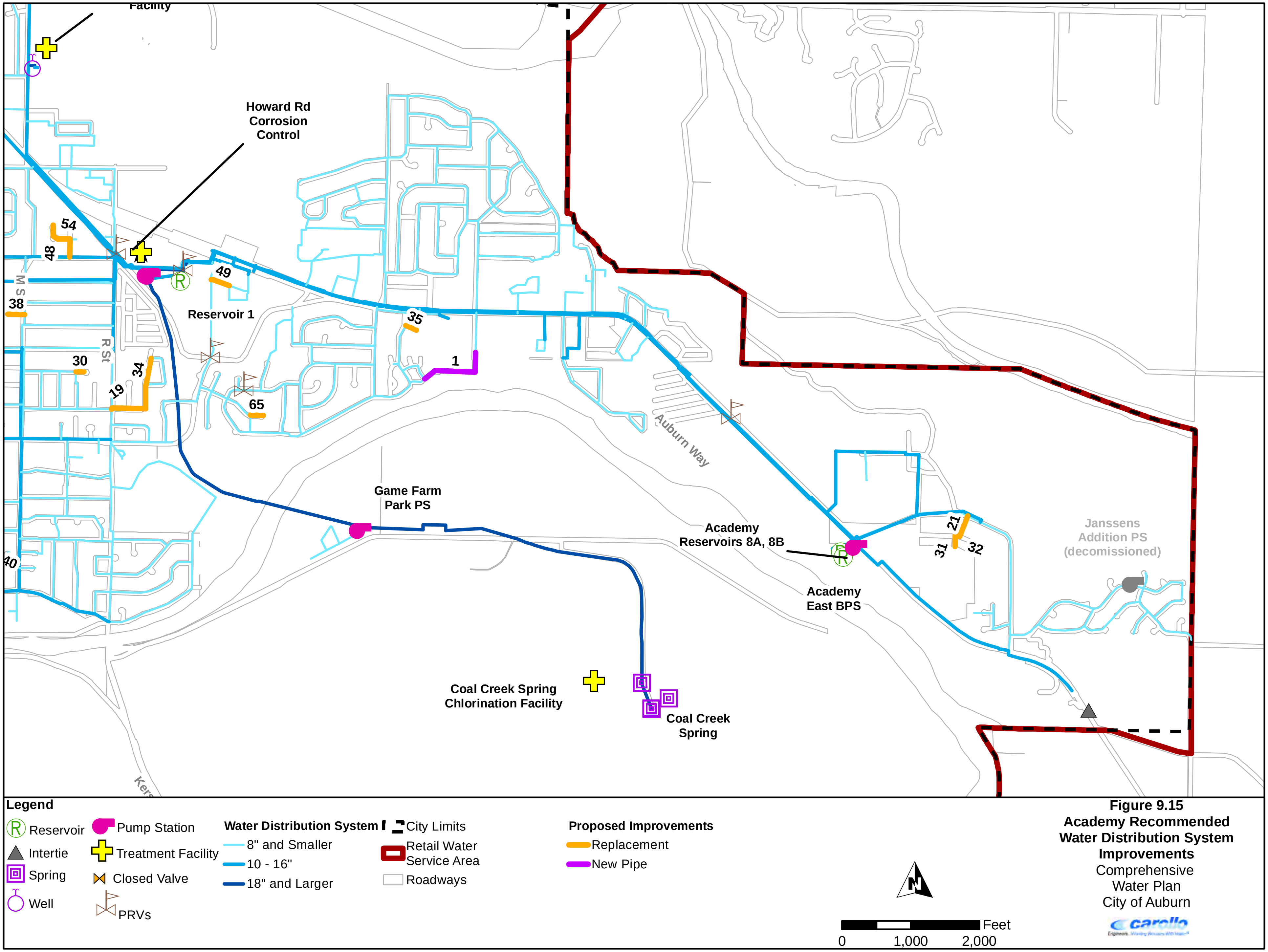


Figure 9.15
Academy Recommended Water Distribution System Improvements
Comprehensive
Water Plan
City of Auburn

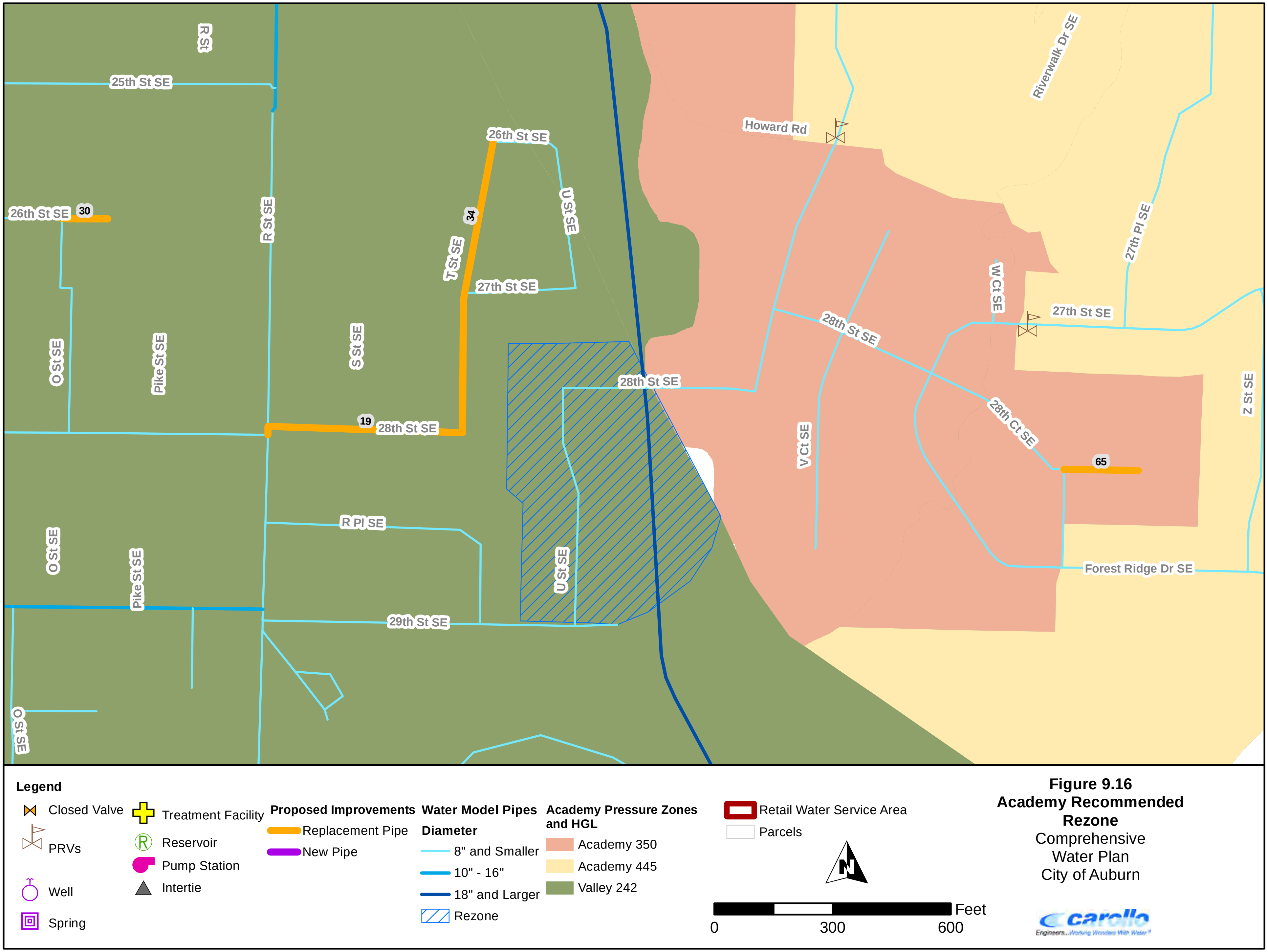


Figure 9.16
Academy Recommended Rezone
Comprehensive Water Plan
City of Auburn

9.5.7 Lakeland Hills Service Area

No deficiencies are found in the Lakeland Hills Service Area for the planning period.

9.5.8 Water Repair and Replacement Program

Previous Plans identified pipelines for the City's water repair and replacement program. The program replaces asbestos-cement (AC), old cast iron pipes, pipes under 6-inches that serve fire hydrants, dead-end mains in non-residential areas, and decommissioned duplicate pipes. The pipes are presented in Figure 9.17 and tabulated in Appendix P.

9.5.8.1 Asbestos-Cement Pipe

The City previously found its AC mains are generally undersized and have relatively high leakage rates. The City has two remaining areas of AC pipe in their system: one in the Valley Service Area that will be replaced in 2015 and the other one in the Lea Hill Service Area that is planned to be replaced at a later date. Upon completion, the City will have eliminated AC mains from the system. The remaining areas are described below.

49th Street SE, 85th Avenue S, Auburn Way S

The six- and eight-inch AC mains serving residential and commercial areas along 49th Street NE, 85th Avenue South, D Street NE and Auburn Way North were acquired from a small water company that dissolved years ago.

West side of 112th Avenue SE

The residential areas west of 112th Avenue SE and north of SE 300th Street are served by AC water mains. The pipes in these areas are aged, undersized, and very fragile. Replacement and upsizing of these pipes will improve fire flows in the area.

9.5.8.2 Aged and Undersized Watermains

The majority of the cast iron piping in the distribution system is 4- to 6-inch diameter with 2-nozzle, 4-1/4-inch fire hydrants. The watermain is typically shallow and the gate valves often leak through the packing gland when operated. It is recommended that the City replace all 4-inch and 6-inch diameter watermains with minimum 8-inch water main, and replace 4-1/4-inch fire hydrants with 5 ¼-inch fire hydrants. Appendix P provides a summary of the locations of these pipes.

Additionally, 2-inch galvanized pipe is still used for domestic service to commercial buildings in some areas. Portions of this pipe have been abandoned over time as new development has occurred. The remaining galvanized pipe should be replaced where possible.

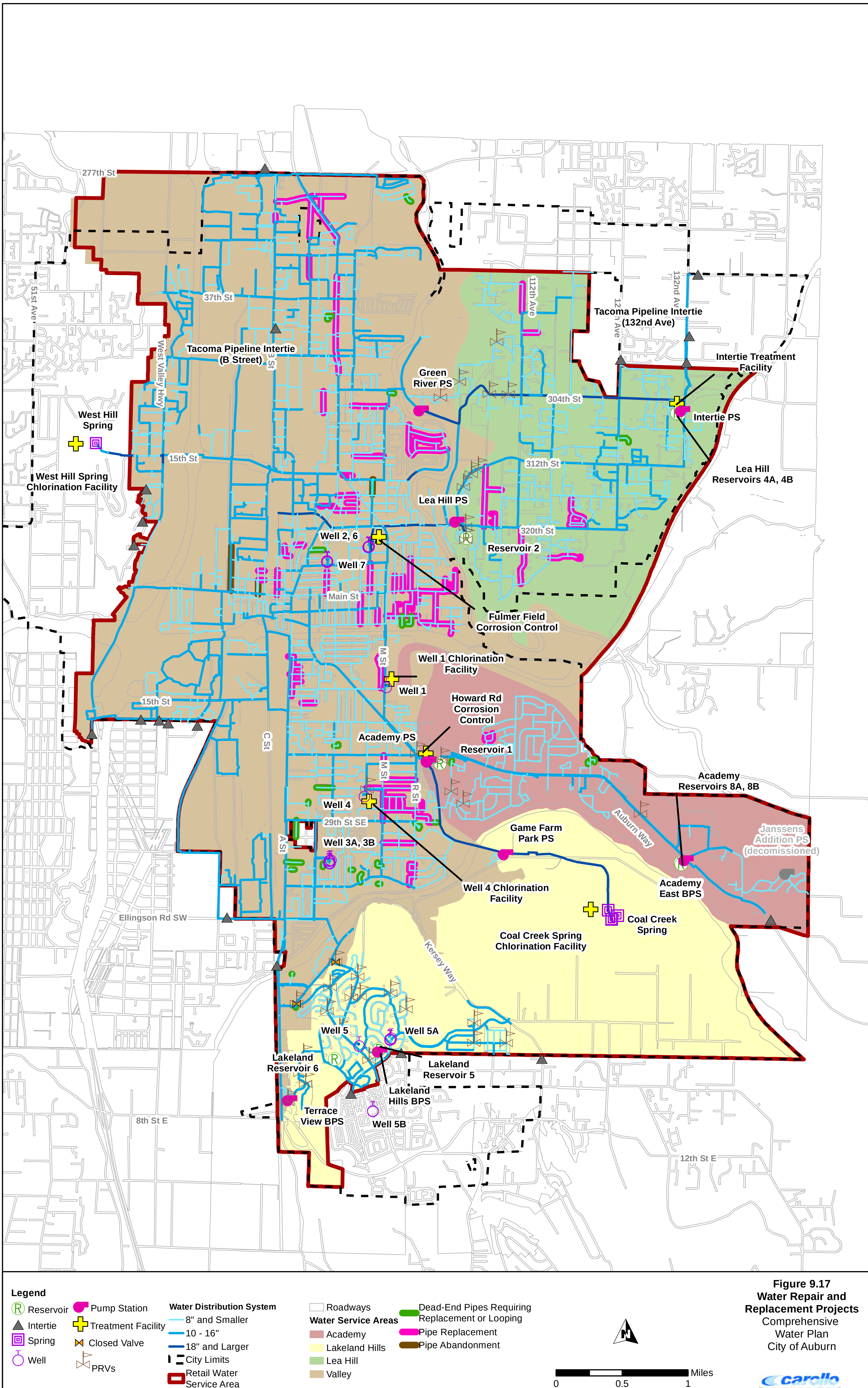


Figure 9.17
Water Repair and Replacement Projects
Comprehensive
Water Plan
City of Auburn

9.5.8.3 Dead-end Pipes in Non Single-Family Areas Requiring Upsize or Looping

The City has multiple older 6-inch or 8-inch diameter dead-end pipes in non-single family areas that do not meet the City's fire flow requirements of 2,500 gpm. Per City design criteria, water mains in multi-family residential and non-residential areas shall be a minimum of 12 inches in diameter. Onsite water main loops, with no possibility of future extension, serving two or less fire hydrants may be reduced to a minimum diameter of 8 inches. Table 9.10 summarizes the dead-end pipes identified through modeling and Figure 9.17 identifies their location. The City considers these water mains to be aged and undersized; therefore, they have been included in the annual replacement program. It is recommended to either upsize these pipes to 12-inch diameter or create a looping when possible.

Table 9.10 Dead-Ends Pipes Requiring Looping
Comprehensive Water Plan
City of Auburn

Service Area	Existing Diameter (inch)	Length (ft)
Valley	4	208
Valley	6	3,289
Valley	8	3,050
Valley	12	79
Academy	6	572
Academy	8	384
Lea Hill	8	523
	Total Length (ft)	**8,105**

9.5.8.4 Abandonment of Duplicate Watermains

The distribution system has a few areas where duplicate watermains have been installed. Most of these are situated parallel to each other and provide independent support to the residential/commercial customers. The following duplicate watermains have been identified.

H Street NW

It is recommended that the City abandon the 8-inch watermain on H Street NW, between West Main Street and 6th Street NW, by transferring the individual water service connections to the parallel 16-inch watermain and connect to each branch watermain. This would improve the fire flow for the area and could be completed with the future replacement of aged and undersized watermains adjacent to H Street NW.

D Street NW

It is recommended that the City abandon the 4-inch watermain on D Street NW and transfer service to the parallel 8-inch watermain.

K Street NE

It is recommended that the City abandon the 8-inch watermain on K Street NE and transfer services to the parallel 12-inch watermain.

9.5.8.5 Recommendation

It is recommended the City continue the Water Repair and Replacement program to replace the watermains as follows:

1. AC watermains.
2. Aged and undersized watermains.
3. Dead-Ends Pipes Requiring upsize or looping.
4. Undersized watermains.
5. Abandonment of duplicate watermains.

The existing annual replacement program pipes should be reviewed and updated through an asset management study. The study will identify the remaining useful life of water mains in the system, prioritize pipe replacements, and develop replacement costs to aid in phasing the replacements. The City has limited pipe age and material data that is required for the remaining useful life analysis. It is recommended that the City collect this data from a combination of as-built drawing, field verification, and staff institutional knowledge before conducting the asset management study.

9.6 SUMMARY

In review of the existing City water system, several current and future deficiencies in the facilities related to system pressure, supply, storage, pumping, and distribution piping have been identified. Specific facilities recommended for upgrades or replacement in the short-term planning horizon has been outlined in the Sections above and are summarized in Table 9.11.

Table 9.11	Recommended Projects from System Analysis Comprehensive Water Plan City of Auburn

Project	Recommended Planning Horizon
Service Areas	
Lea Hill Service Area Rezone	Short-term
Academy Service Area Rezone and Expansion	Short-term
PRVs	
PRV Station from Academy to Valley Service Area	Short-term
PRV Station from Lakeland Hills to Valley Service Area	Short-term
Supply Facilities	
Well 7 Water Quality Treatment Phase 1	Short-term
Pump Stations	
Green River Pump Station Emergency Back-Up Power	2018
New 1.44 mgd Academy Pump Station 1	Short-term
Intertie Booster Pump Station Expansion (Lea Hill 648 Zone)	Short-term
Game Farm Park Pump Station Replacement	Short-term
Storage	
New 1.0 mg Valley Storage Reservoir	Medium-term
Distribution System	
Annual Distribution Improvement Program	Annually
Annual Repair and Replacement Program	Annually

CAPITAL IMPROVEMENTS PLAN

10.1 INTRODUCTION

This chapter presents a summary of all capital projects outlined in the previous chapters and related studies, and creates a cohesive capital improvements plan (CIP) for the City of Auburn (City). The CIP provides a comprehensive accounting of capital projects in the next 20 years needed to continue consistent, efficient water supply to its retail water service area (RWSA) throughout the 20-year planning period. Capacity related projects and repair and replacement projects identified as part of the City's asset management program. As part of the asset management program, the City completed the Facilities Evaluation Study that identified the need for repair or replacement (R&R) of aging above-ground facilities. Projects identified in the study with a cost greater than $10,000 were included as capital projects. Additionally, the CIP includes annual costs for the City's general R&R program, as well as other Maintenance and Operations (M&O) department programs. Programs listed in this chapter consider water supply and storage requirements, improvements to the hydraulic system, and upgrades or replacement of aging facilities and distribution system. All projects are in accordance with the policies and criteria described in Chapter 3 and will conform to the City's design standards provided in Appendix Q.

Projects were allocated to the short-term (2015-2021), medium-term (2022-2025), and long-term (2026-2035) planning horizons. Short-term projects coincide with the City's current Capital Facilities Plan (CFP) and have been placed into specific years. These timeframes are intended to be a framework for future funding decisions that directs when future actions and decisions are intended to occur. However, these timeframes are estimates, and depending on factors involved in the processing of applications and project work, and availability of funding, the timing may change from the included timeframes. The framework does not represent actual commitments by the City, which may depend on funding resources available.

10.2 ESTIMATED COSTS

Planning-level cost estimates were developed for each of the recommended projects for budgeting purposes. These costs are planning level estimates only and should be refined during pre-design of the projects. Cost estimates are presented as total project costs in October 2014 dollars. For future budgeting purposes, the latest engineering news record (ENR) Construction Cost Index (CCI) can be used to project current estimates to the year of implementation. The cost estimates for the Auburn area used the national ENR 20-City CCI of 8,533 (October 2014).

Cost estimates were developed using a Class 5 budget estimate, as established by the American Association of Cost Estimators (AACE). This level of estimate is used for strategic business planning purposes, including long-range capital planning, and represents a zero percent to two percent level of project definition. The expected accuracy range is -30 percent to +50 percent, meaning the actual cost should fall in the range of 30 percent below the estimate to 50 percent above the estimate.

Construction costs assume a 30 percent contingency, 15 percent markup for contractor overhead and profit and a 9.5 percent sales tax on both services and materials to the direct construction costs. Indirect costs are assigned as a percentage of these direct costs, where costs include an additional 30 percent for engineering, legal, administration, and construction management costs. Total project costs are used to develop the CIP to ensure adequate funds are available for engineering, legal, and administration costs in addition to construction costs. The CIP cost estimates should be periodically reevaluated to account for changes in inflation. All costs are in 2014 dollars and have not been inflated.

10.3 CAPITAL PROJECTS

The capital projects identified can be categorized into water supply (S), storage (R), pump stations (PS), distribution (D), and general improvements (G). Specific projects have been assigned an identification number (Project ID) and are described in the sections below. The Project ID was maintained for CIP projects identified in previous plans to aid in continuity. The scope, timing, and costs for these previously identified projects were reviewed and updated as necessary.

10.3.1 Water Supply

Water supply projects were identified in Chapter 6. The City's water supply strategy details both project sizing and timing. A summary of the short-, medium- and long-term capital projects recommended for securing adequate supply to meet the system's future maximum day demands are presented in Table 10.1 and shown in Figure 10.1.

Well 1 Onsite Improvements Project (S-01)

The Well 1 Onsite Improvements project, largely constructed in 2013 and 2014, will be completed in 2015. The project includes a transmission main to the Howard Road Corrosion Control Treatment (CCT) Facility, site improvements, a new well house, new pumping system, on-site emergency power, chlorination, and upgraded electrical and SCADA controls. Per the CFP, the City has budgeted $50,000 in 2015 to complete the project.

Well 4 Emergency Power Improvements Project (S-02)

The Well 4 Emergency Power Improvements Project was designed and bid in 2014 with construction being completed in 2015. The project provides a diesel-fueled generator and new hypochlorite disinfection equipment in a new building at the Well 4 site. Per the CFP, the City has budgeted $50,000 in 2015 to complete the project.

Table 10.1 Water Supply Improvements Projects
Comprehensive Water Plan
City of Auburn

Project Description	Project ID	Project Timing	Added Qi Capacity (mgd)	Estimated Cost	Comment
Short - Term					
Well 1 On-site Improvements Project	S-01	2015		$50,000.00	Transmission to the Howard Road CCT facility, site improvements, a new well house, new pumping system, on-site emergency power, chlorination, and upgraded electrical and SCADA controls.
Well 4 Emergency Power Improvements Project	S-02	2015		$50,000.00	Diesel-fueled generator, hypochlorite disinfection equipment, new building.
Cascade Water Alliance Water Purchase	S-04	2017-2029	3.32	$21,073,743.00	The agreement provides an additional 3.32 mgd of supply during the peak day and 1.5 mgd of average day supply.
Well Inspection and Redevelopment Program	S-07	2015-2033		$1,100,000.00	Annual funding allocation for investigations and redevelopment of supply wells and springs necessary to ensure production at maximum capacity for efficient utilization.
Water Resources Protection Program	S-08	Annual		$660,942.00	Annual funding allocation for the Water Resources Protection Program
Coal Creek Springs Collector Improvements	S-09	2018-2019	4.32	$3,400,000.00	Rehabilitation of the middle collector of Coal Creek Springs, and includes a hydrologic investigation, design, and construction.
Algona Well 1 Decommissioning	S-13	2015		$39,000.00	Requires proper decommission of the well.
West Hill Springs Flow Control Improvements	S-17	2015		$455,000.00	Install a flow control valve for automatic emergency shutdown.
Fulmer Field Improvements Project	S-19	2016-2017		$350,000.00	Replace Well 6 with a new variable frequency drive pump.
Medium - Term					
Well 7 Back-Up Power	S-03	2022		$1,391,000.00	Back-up power provides reliability for this source.
Well 5/5A Upgrades	S-06	2022		$2,142,000.00	New building, back-up generator, chlorination, and perform a hydrologic investigation to evaluate the reasons for the wells observed decreased production.
West Hill Springs Water Quality Improvements	S-12	2025		$430,000.00	Replace West Hill Springs chlorination building and add new liquid chlorination system.
Well 7 Treatment Phase 1	S-15	2022	2.5	$6,769,000.00	Requires manganese treatment facilities
Howard Road CCT Expansion	S-18	2025		$1,015,000.00	Expand the facility to its full capacity (including an additional aeration tower and pumps).
Well 4 Pump Improvements	S-22	2025		$226,000.00	Replace Well 4 pumps at end of useful life.

Table 10.1 Water Supply Improvements Projects
Comprehensive Water Plan
City of Auburn

Project Description	Project ID	Project Timing	Added Qi Capacity (mgd)	Estimated Cost	Comment
Long - Term					
Wells 3A/3B Treatment	S-11	2035	4.03	$9,349,000.00	Without treatment, these wells are not used; manganese treatment is recommended.
Algona Well 1 Redevelopment	S-14	2035	0.72	$1,456,000.00	Well Redevelopment - water right change application, drilling of the well, and pump infrastructure.
Well 7 Treatment Phase 2	S-16	2035	2.5	$5,399,000.00	Requires completion of manganese treatment facilities.
Well 2 Replacement	S-20	2035	3.46	$1,314,000.00	Replace Well 2 to resolve ongoing operational challenges.
Coal Creek Springs Chlorination Building Replacement	S-21	2035		$1,395,000.00	Replace building at Coal Creek Springs Facility, replace gas chlorine with hypochlorite disinfection system.
Subtotal				$58,064,685.00	

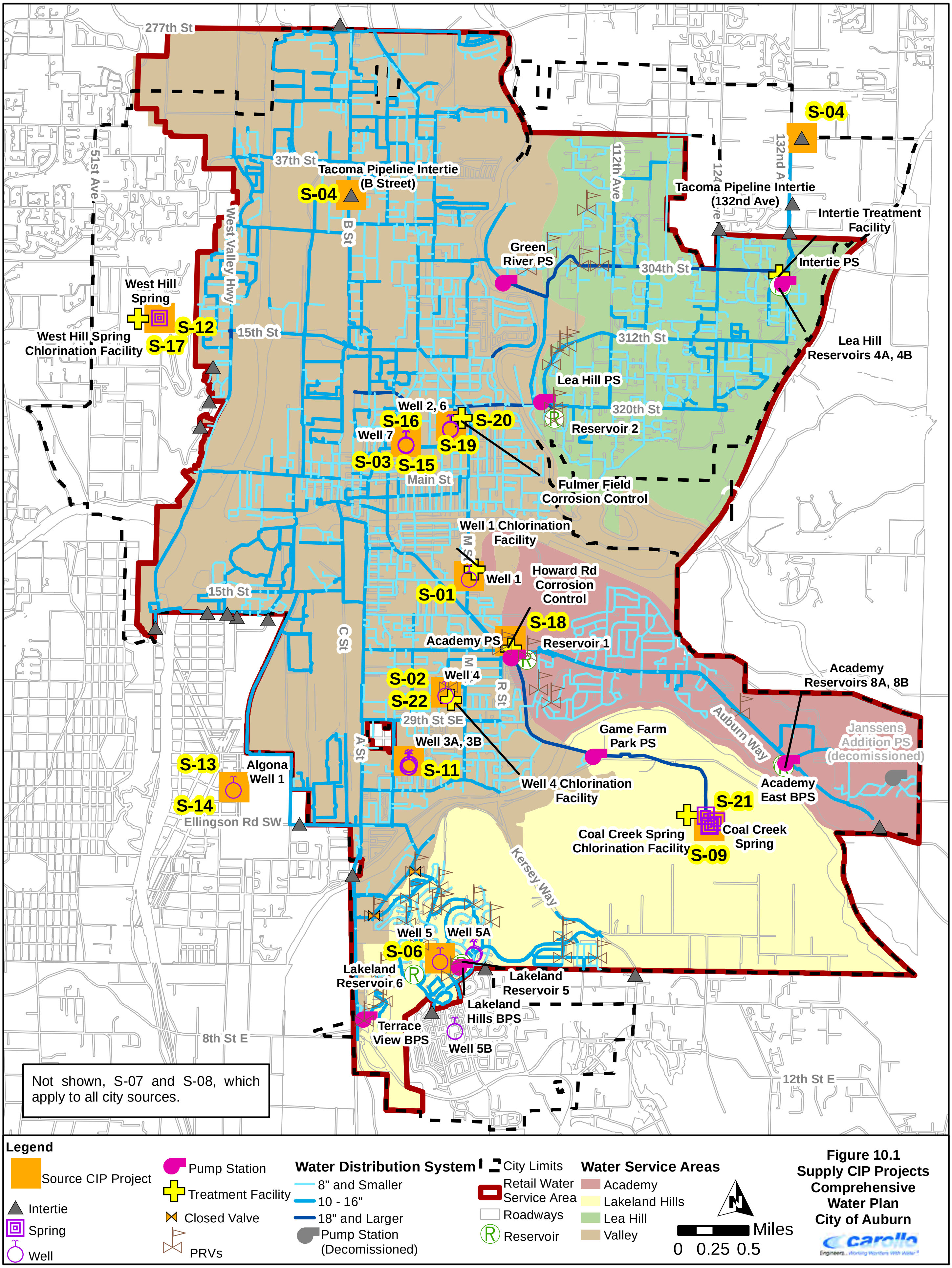


Figure 10.1
Supply CIP Projects
Comprehensive Water Plan
City of Auburn

Well 7 Back-up Power (S-03)

Without back-up power to its pumps, Well 7 cannot be considered a reliable source of supply for the Valley Service Area. The City has limited available land at the Well 7 site, therefore, backup power will be installed at Fulmer Field. The project also includes installing underground electrical transmission capability between Well 7 and Fulmer Field. Costs for a back-up generator are estimated to be $1,391,000 and the improvements are recommended in conjunction with Well 7 Treatment Project Phase 1 in 2022.

Cascade Water Alliance Water Purchase (S-04)

Financing to purchase water from Tacoma Public Utilities (Tacoma) to meet water demands is based on an agreement with Cascade Water Alliance (Cascade), which had purchased water supply from Tacoma. The Council approved the agreement for permanent wholesale supply in September 2013. The agreement provides an additional 3.32 mgd of supply during the peak day and 1.5 mgd of average day supply. Additionally, Cascade and Tacoma have offered additional reserve supplies of 2.736 mgd of average day supply and 3.68 mgd of peak day supplies. The City is currently conducting a study to identify the quantity of reserve supplies to be purchased. The City's permanent and reserve agreement requires System Development Charges (SDC) payments of $21,073,743 between 2017 and 2029. Per the CFP, a total of $3,762,170 of payments are required for the permanent wholesale supplies through 2020. The SDC costs will decrease if less than the full reserve amount is purchased.

Well 5/5A Upgrades (S-06)

Well 5 is in need of a new building, a backup generator, chlorination, and a hydrologic investigation to evaluate the well's observed decreased production. Due to the small size of the existing site, the acquisition of an adjacent parcel may be required. Additionally, the project will address the recommended Capital Improvements identified in the 2014 Facility Evaluation Study (CIP Project G-01), including a new well pump at Well 5 and new pump and motor at Well 5A. Additional upgrades may be identified in the hydrologic investigation; therefore, the cost of this CIP item should be revisited upon completion of the study. The project cost is estimated to be $2,142,000 and is planned for 2022 (medium-term horizon).

Well Inspection and Redevelopment Program (S-07)

The City allocates annual funding for investigations and redevelopment of supply wells and springs necessary to ensure production at maximum capacity for efficient utilization. The CIP is for the production wells and spring collectors, rather than pumps, motors, buildings, etc. Per the CFP, the City has reserved $150,000 on odd years for this work starting in 2021, which amounts to $1,100,000 over the period.

Water Resources Protection Program (S-08)

Starting in 2011, the City allocates annual funding for the Water Resources Protection Program, which is necessary for implementing strategies identified in the Wellhead Protection Program. The City has reserved $24,597 in 2014 for these projects, which is expected to increase annually by 3 percent rate throughout the planning period. Over the 20 year planning period, the annual Water Resource Protection Program cost a total $660,942.

Coal Creek Springs Collector Improvements (S-09)

The middle collector of Coal Creek Springs will be rehabilitated to improve the spring capacity. The project includes a hydrologic investigation, design, and construction. Per the CFP, the project will cost $3.4 million and is planned for 2018-2019.

Wells 3A/3B Treatment (S-11)

Wells 3A and 3B are not commonly operated due to high manganese levels. Manganese treatment is recommended to allow these wells to be used, adding 4.03 mgd of instantaneous flow. The project includes manganese treatment, a new well/treatment building, well pumps, onsite backup-power. Additionally, the existing gaseous chlorination system will be converted to a hypochlorite system. Costs for treatment are estimated to be $9,349,000. This project is recommended for the long-term planning horizon.

West Hill Springs Water Quality Improvements (S-12)

The aging West Hill Springs chlorination building will be replaced and a new liquid chlorination system will be installed. Water quality improvements are estimated to cost $430,000 and are recommended in the year 2025.

Algona Well 1 Decommissioning (S-13)

The Algona Well 1 has been temporarily abandoned and all related facilities removed. This project will have the well properly decommissioned by a State of Washington-licensed well driller. Decommissioning is estimated to cost $39,000 and is planned for 2015.

Algona Well 1 Redevelopment (S-14)

The City will decommission Algona Well 1 in 2015. The City will study possible options to use the water right. The well may be redeveloped on-site or an alternative diversion location may be set for an existing or new well. The project cost of $1,456,000 consists of a water right change application, drilling of the well, and site and well infrastructure. The cost does not include the development of test wells or water quality treatment (Long-term planning horizon).

Well 7 Treatment Project Phase 1 (S-15)

Well 7 is only operated in the summer when necessary due to high manganese levels. Manganese treatment is recommended to allow this well to be used year-round and to ensure better water quality, and to utilize the full water right for this well. Due to space limitations at the Well 7 site, the treatment facilities will be included at the Fulmer CCT Facility. The treatment will be installed in two phases. The first phase will provide 2.5 mgd of capacity in 2022 (medium-term planning horizon). Additionally, the project will address the recommended Capital Improvements to Fulmer Field CCT identified in the Facility Evaluation Study, including a new pump and motor. Costs for Phase 1 treatment are estimated to be $6,769,000.

Well 7 Treatment Phase 2 (S-16)

Well 7 Treatment Phase 2 will complete the manganese treatment facilities at the Fulmer CCT Facility to allow year-round use at the well's full water right. Phase 2 will add 2.5 mgd of treatment for a total capacity of 5.0 mgd. The second phase will be completed in the long-term planning horizon and is estimated to cost $5,399,000.

West Hill Springs Flow Control Improvements (S-17)

The 2012 Sanitary Survey by DOH identified several health and safety concerns at West Hill Springs due to flow control and overflow infrastructure. The West Hill Springs Flow Control Improvements will address these deficiencies, install an electromagnetic meter and flow control valve for automatic shutdown. Per the CFP, the City has budgeted $455,000 in 2015 to complete the improvements.

Howard Road CCT Expansion (S-18)

The inflow to the Howard Road CCT will increase substantially in the short-term planning horizon with the completion of the Well 1 Improvements project and Coal Creek Springs Collector Improvements. The existing facility will be expanded to its full capacity in 2025 to provide additional treatment capacity and provide redundant pump capacity. Additionally, the project will address the recommended Capital Improvements to Howard Road CCT identified in the Facility Evaluation Study, including a new pump and motor. The expansion will include an additional aeration tower and a pump to match existing. The project is estimated to cost $1,015,000.

Fulmer Field Improvements Project (S-19)

The City is completing the Fulmer Well Field Improvements project in 2016-2017, which began in 2013. The project evaluated Wells 2, 6, and 7 and the Fulmer Field CCT Facility to identify improvements to increase the supply and treatment capacity of the existing facilities and infrastructure. In 2014, the Well 6 pump bowls were replaced and the motor serviced. A VFD will be installed for each well. Per the CFP, the City has budgeted $350,000 to complete the project.

Well 2 Replacement (S-20)

The Fulmer Well Field Improvement project found that Well 2 can continue to serve the City, but would need to be replaced to resolve ongoing operational challenges. The City will replace the well in the long-term planning horizon. The cost is estimated to be $1,314,000, which assumes the well will remain on its existing site, or other City-owned property.

Coal Creek Springs Chlorination Building Replacement (S-21)

Coal Creek Springs chlorination building was identified as requiring replacement in the Facility Evaluation Study. Additionally, the project will upgrade the source from chlorine gas to a hypochlorite disinfection system. The new building is estimated to cost $1,395,000 and be completed in the long-term planning horizon (2026 to 2035).

Well 4 Pump Improvements (S-22)

The Facility Evaluation Study identified improvements to Well 4, including an electrical retrofit and replacement of the aging pump check valve. The improvements are expected to cost $226,000 and be completed in the medium-term planning horizon (2022 to 2025).

10.3.2 Storage

The City's reservoirs are generally in good condition; continued maintenance tasks are recommended. Table 10.2 and Figure 10.2 present the location of each of these projects.

Lakeland Hills Reservoir 5 Improvements (R-01)

The Lakeland Hills Reservoir's interior and exterior will be painted as part of its routine maintenance to help preserve the life of the reservoir. Additionally, mixing equipment will be added to improve water quality and a seismic isolation valve and new ladder will be added for safety. Per the CFP, the City has budgeted $735,000 to complete the project in 2015.

Annual Reservoir Repair & Replacement (R&R) Program (R-03)

The City has allocated an annual capital expenditure of $50,000 ($1,050,000 in total) for general reservoir maintenance and minor improvements, beginning in 2015. Projects are identified by the City on an as-needed basis.

Valley Service Area New Reservoir (R-04)

To meet future storage requirements in the Valley Service Area, it is recommended that a new, 1-MG storage facility be provided. A siting study should be conducted to identify the preferred reservoir location and other details. Costs for the reservoir are estimated to be $3,380,000 and the project is needed by the year 2025. The project costs does not include property acquisition.

Table 10.2 Storage Improvements Projects
Comprehensive Water Plan
City of Auburn

Project	Project ID	Project Timing	Added Storage (mg)	Estimated Cost	Comments
Short-Term					
Lakeland Hills Reservoir 5 Improvements	R-01	2015		$735,000.00	Required for maintenance and reservoir longevity, addition of mixing equipment to improve water quality, seismic isolation valve, a new ladder.
Annual Reservoir R&R Program	R-03	Annual		$1,050,000.00	
Reservoir Painting	R-05	2020 & 2022		$2,500,000.00	Required for maintenance and reservoir longevity in both Academy and Lea Hill service areas.
Reservoir Seismic Rehabilitation	R-06	2018-2019		$715,000.00	Installation of seismic control valves on outlet piping of the Valley Service Area Reservoirs (1&2), Lea Hill Reservoirs (4A&4B), and Academy Reservoirs (8A&8B).
Medium-Term					
Valley Service Area New Reservoir	R-04	2025	1.0	$3,380,000.00	Required to meet future storage requirements in the Valley service area.
Reservoir Capital Improvements	R-07	2025		$690,000.00	Improvements to Reservoir 1, Reservoir 4A&4B, Reservoir 8A&8B and Braunwood reservoir based on the condition and remaining useful life.
Subtotal				**$9,070,000.00**	

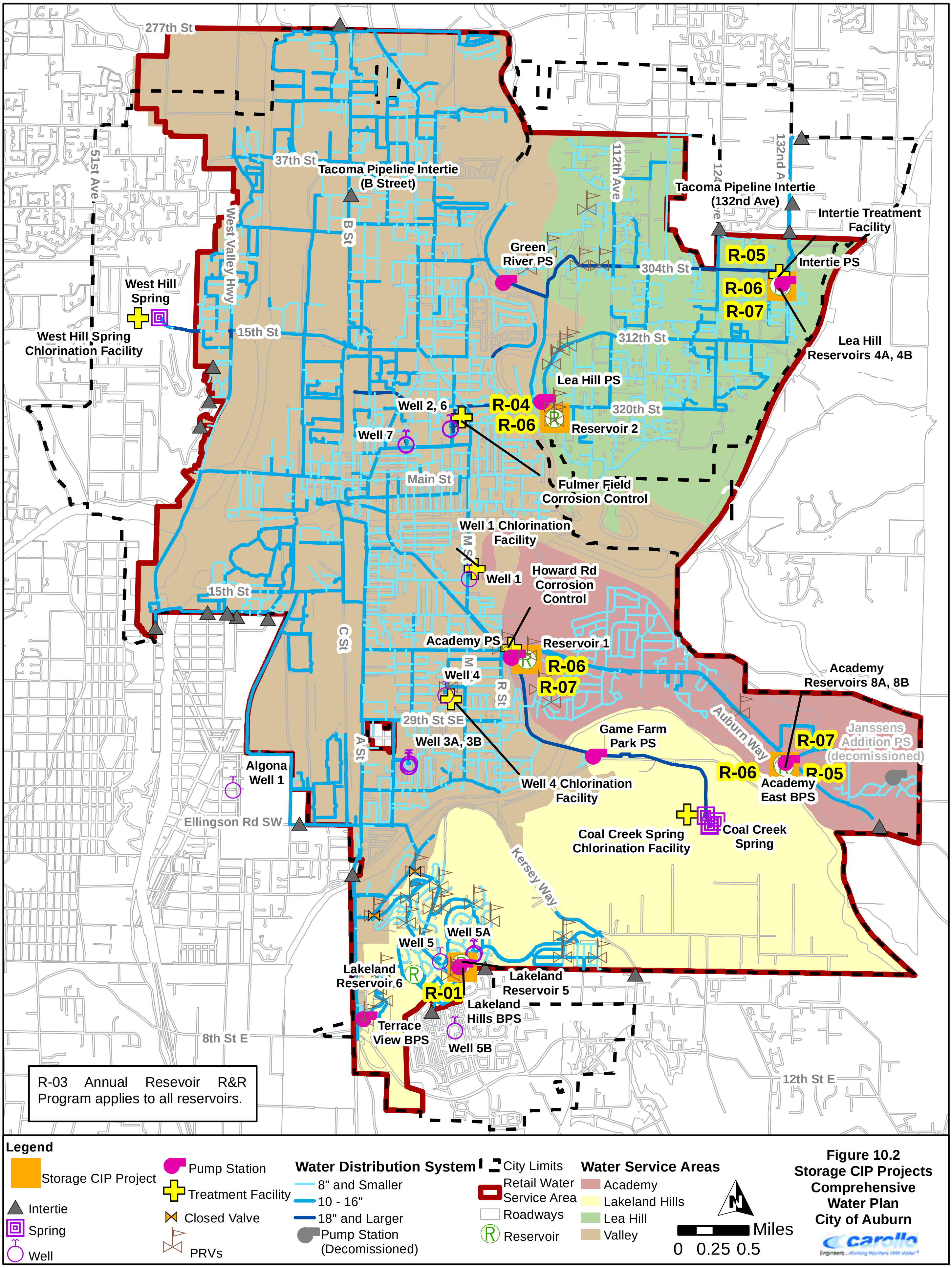


Figure 10.2
Storage CIP Projects
Comprehensive Water Plan
City of Auburn

Reservoir Painting (R-05)

The City plans to paint both the Academy and Lea Hill Service Area reservoirs to ensure longevity of the tanks. The City has budgeted $1,250,000 per service area (two tanks in each) with a total project cost of $2,500,000. The first service area will be completed in 2020 and the second service area will be completed in the medium-term planning horizon.

Reservoir Seismic Rehabilitation (R-06)

The City plans to install seismic control valve on outlet piping of the Valley Service Area Reservoirs (1 & 2), Lea Hill Reservoirs (4A & 4B), and Academy Reservoirs (8A & 8B). Seismic control valve isolates the reservoir to prevent catastrophic flows from the reservoir during a seismic pipe failure. The project is planned for 2018-2019 at a cost of $715,000.

Reservoir Capital Improvements (R-07)

The Facility Evaluation Study identified improvements to reservoir treatment facilities based on the condition and remaining useful life of the assets within the facilities. Improvements were identified at Reservoir 1, Reservoir 4A & 4B, and Reservoir 8A. The combined improvements are expected to cost $690,000 and be completed between in the mid-term planning horizon (2022 to 2025).

10.3.3 Pump Stations

Several pump station improvements are recommended to provide adequate flows and maintain system pressure in the service areas. The recommended improvements are generally focused on increasing capacity and providing redundancy. These projects and their associated costs are presented in Table 10.3 and Figure 10.3 shows the location of each of these projects.

Green River Pump Station Emergency Power (PS-03)

Without an emergency power supply, the Green River Pump Station cannot be considered a reliable source for meeting peak demands in the Lea Hill Service Area due to the possibility of a power outage. Providing a back-up generator and associated electrical improvements are estimated to cost $690,000 and are recommended for the year 2017-2018.

Intertie Booster Pump Station (PS-04)

The Intertie Booster Pump Station fire flow pumps need to be expanded by the addition of one 1,000-gpm pump. It was assumed that the additional pump will fit within the intertie facility and that the station’s electrical facilities are adequate for the addition of one more fire flow pump. Additionally, six fire hydrants within the Lea Hill service area will need to be moved to the boosted zone to insure adequate fire flow. This expansion and rezone is estimated to cost $1,303,000 and is recommended by the year 2021.

Academy Pump Station No. 1 Improvements (PS-07)

The Academy Service Area is served by Academy Pump Station No. 1 (PS1) and No. 2 (PS2). Academy PS1, including the generator, is reaching the end of its useful life and will be replaced and expanded. The new pump station is recommended to have a 1.44 mgd capacity, with the ability to be expanded in the future. Per the CFP, the pump replacement is estimated to cost $2,125,000 and is recommended by the year 2017-2018.

Game Farm Pump Station Capital Improvement Project (PS-09)

The Game Farm Wilderness Park Pump Station is reaching the end of its useful life. The Facility Evaluation Study identified $149,000 of building improvements to allow continued use of the station, which the City plans to implement in the medium-term. The City plans to connect the Game Farm to the distribution system in the long-term and decommission the pump station.

Decommission Lea Hill PS (PS-10)

Previously, the City planned to replace and expand the Lea Hill Pump Station by 2028. With increased supplies from the 132nd Ave RWSS intertie, the pump station is no longer required. Therefore, the City has chosen to decommission the Lea Hill PS at the end of its usable life, approximately 2025. The project will also replace the existing PRV at the site. Decommissioning the PS is expected to cost approximately $83,000; however, this cost may vary depending disposal costs of materials.

Table 10.3 Pump Station Improvements Projects
Comprehensive Water Plan
City of Auburn

Project	Project ID	Project Timing	Added Firm/Reliable Capacity (gpm)	Estimated Cost	Comments
Short-Term					
Green River PS Back-Up Power	PS-03	2017-2018		$690,000.00	Back-up power provides reliability to this pump station.
Academy PS No. 1 Improvements	PS-07	2017-2018		$2,125,000.00	Install larger pumps to meet future demands, and electrical modifications.
Intertie Booster Pump Station	PS-04	2021		$1,303,000.00	Expand the fire flow capacity of the pump station.
Medium-Term					
Game Farm Pump Station Capital Improvement Project	PS-09	2025		$149,000.00	Rehabilitate Game Farm Pump Station to allow continued use until connection with regular distribution system.
Decommission Lea Hill Pump Station	PS-10	2025		$83,000.00	Decommission the pump station at the end of its usable life.
Subtotal				**$4,350,000.00**	

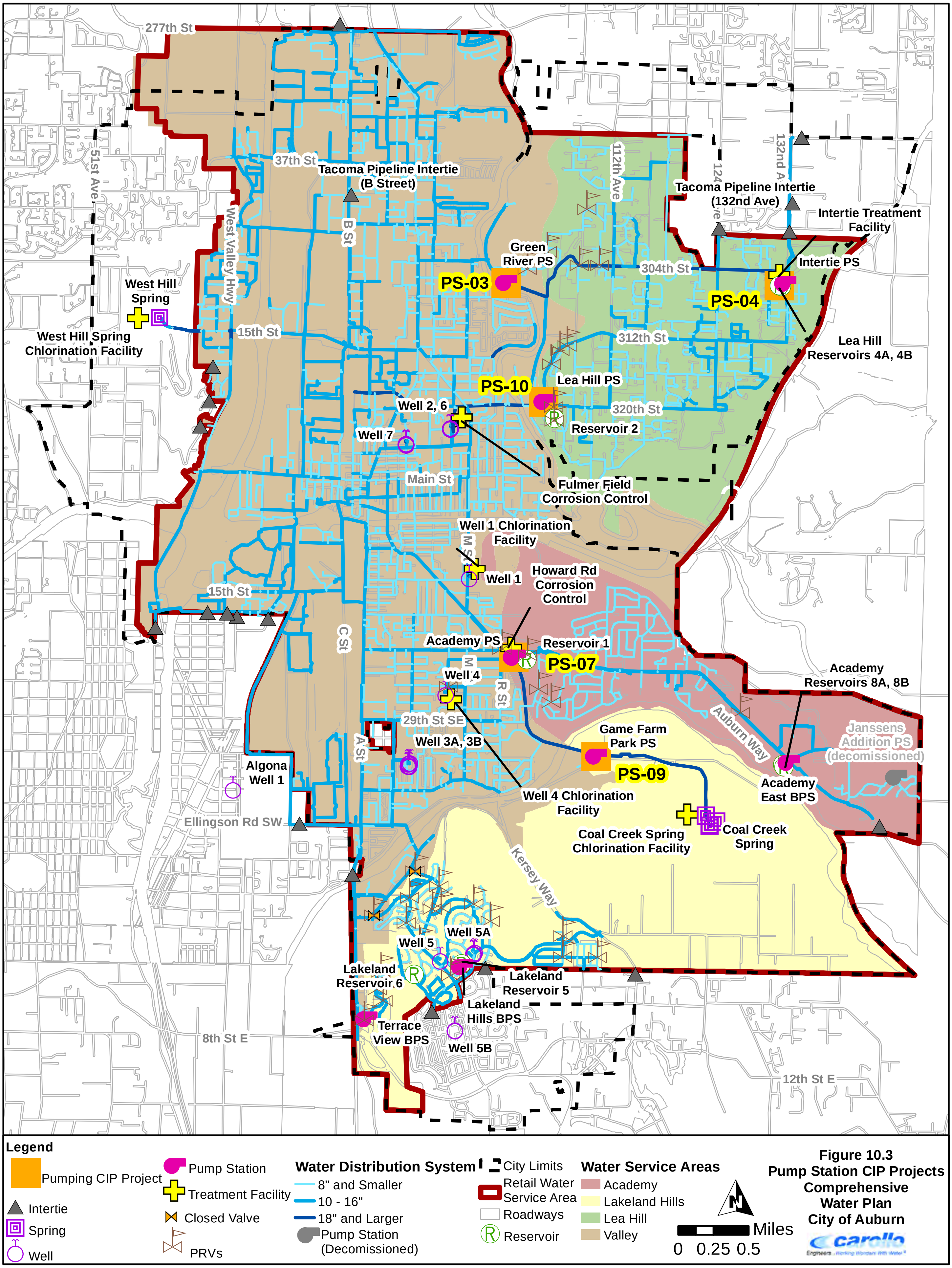


Figure 10.3
Pump Station CIP Projects
Comprehensive
Water Plan
City of Auburn

10.3.4 Distribution System

The City's water distribution system will require many improvements to adequately provide water to its customers. Several pipes have been identified as undersized, aging, having excessively high velocities, or made of asbestos cement. As system demands grow, the City will need to upsize distribution piping to ensure safe delivery of the required flows. To save costs during design and construction, the City is coordinating pipe replacement projects with other street and utility projects. The identified distribution programs for the system are described below and presented in Table 10.4.

<u>Annual Distribution System Improvements Program (D-02)</u>

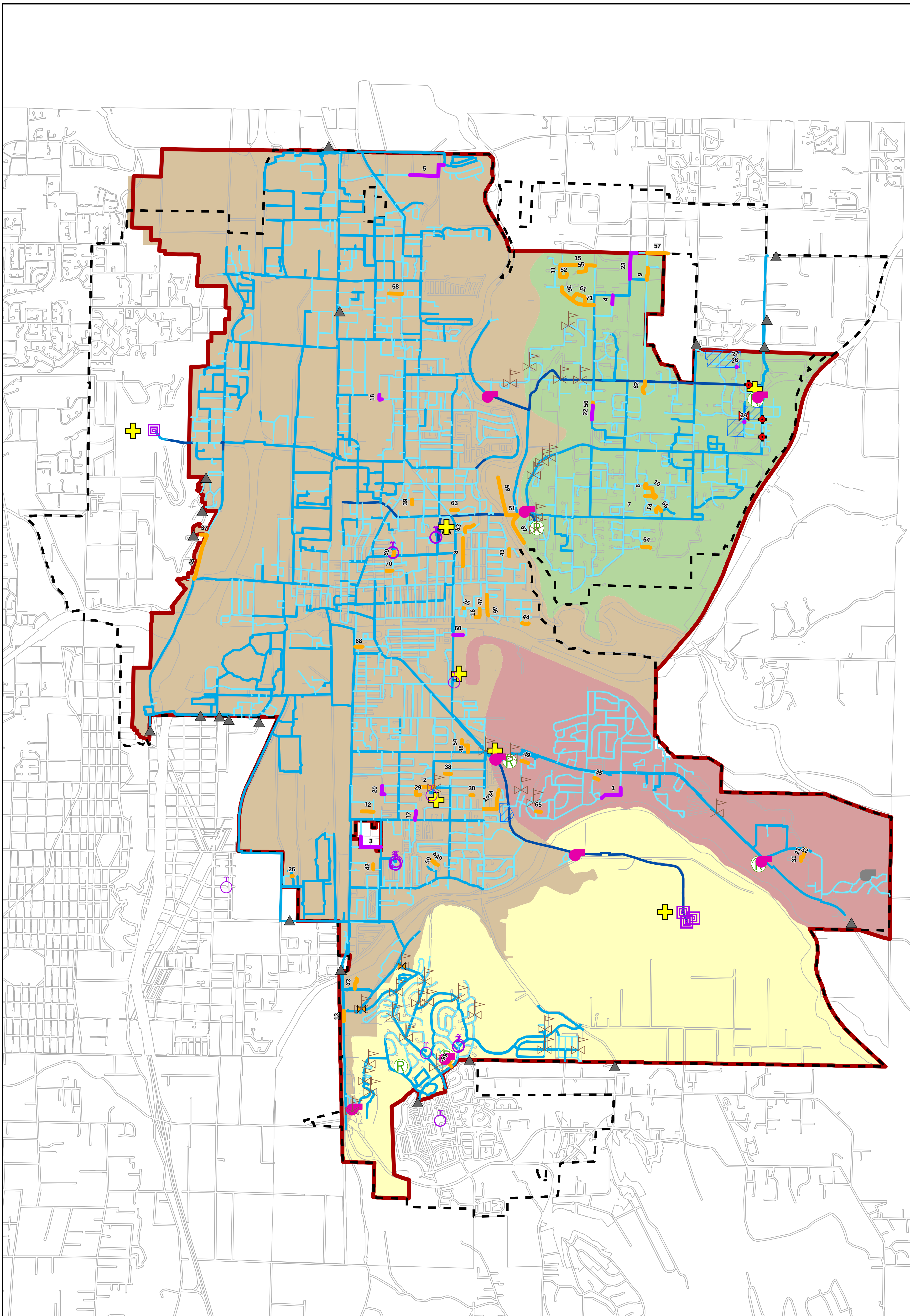
Capacity-related improvements to the City's water distribution system have been identified through the hydraulic analysis. These improvements address low pressures during the PHD and fire flows as shown in Figure 10.4.

<u>SCADA Upgrades (D-03)</u>

The Supervisory Control and Data Acquisition (SCADA) system, also known as the Telemetry system, has been upgraded to improve control of the water utility facilities and to replace obsolete components. Per the CFP, the City has budgeted $10,000 in 2015 to complete the project.

Table 10.4 Distribution System Improvements Projects
Comprehensive Water Plan
City of Auburn

Project	Project ID	Project Timing	Estimated Cost	Comments
Short-Term				
Annual Distribution Improvements Program	D-02	2017-2031	$9,698,000.00	Pipe improvement projects required to meet current and short-term demands.
SCADA Upgrades	D-03	2015	$10,000.00	Complete replacement and upgrade of SCADA system.
Street Utility Improvements	D-06	Annual	$11,519,895.00	Water main improvements concurrent with Save Our Streets and general arterial street improvements.
Water Repair and Replacement	D-09	2015-2031	$9,063,673.00	Pipe improvement projects needed for identified pipe conditions issues.
Pipe Asset Management Study	D-10	2018	$50,000.00	Perform a pipeline asset management study to identify remaining useful life of water mains.
Lea Hill PRV Station Improvements	D-13	2015-2016	$450,000.00	Replace five PRVs in the Lea Hill service area due to aging.
Valley AC Main Replacement	D-14	2015	$50,000.00	Replace the remaining AC pipes in the system.
Medium-Term				
Coal Creek Springs Transmission Main Repair	D-11	2025	$1,300,000.00	Investigate suspected leak on Coal Creek Spring's 24-inch main to assess the degree and magnitude of the leak.
Academy Transmission Replacement	D-12	2025	$2,865,000.00	Replace transmission main in poor condition.
Long-Term				
Braunwood Transmission	D-15	2035	$2,264,600.00	Transmission main from Lakeland Hills Service Area to Braunwood Satellite System.
Game Farm Park Transmission	D-16	2035	$2,212,210.00	Transmission main from Valley Service Area to Game Farm Park.
Subtotal			**$39,483,378.00**	



Legend

Reservoir
Intertie
Spring
Well
Pump Station
Treatment Facility
Closed Valve
PRVs

Water Distribution System
8" and Smaller
10 - 16"
18" and Larger
City Limits
Retail Water Service Area
Roadways

Water Service Areas
Academy
Lakeland Hills
Lea Hill
Valley

New NC Valve
Hydrant Improvement

Proposed Improvements
Replacement
New Pipe

N

0 0.5 1 Miles

Figure 10.4
Distribution System CIP Projects
Comprehensive
Water Plan
City of Auburn

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Street Utility Improvements (D-06)

The City Street Utility program budgets $500,000 a year to perform water main improvements in coordination with the Save our Streets (SOS) program and general arterial street improvements. By replacing water infrastructure concurrent with other utility or street replacement programs, the City is able to reduce overall project costs. Identified projects are anticipated to occur annually throughout the planning period.

In addition to the annual program, the City has identified five individual street improvement projects associated with Auburn Way South improvements and the BNSF Utility crossing to be completed in 2015. Per the CFP, the combined projects' cost for FY 2015, including the annual program, is expected to be $1,519,895.

Water Repair and Replacement (D-09)

Distribution system repair and replacement projects required for meeting peak demands and reducing system losses. The City's pipeline water repair and replacement program presented in Chapter 9 will be accomplished through the combination of the Street Utility Improvements (D-06) and this program. Ideally, Water Repair and Replacement and Street Utility projects will be constructed on alternating years to maintain consistent levels of capital expenditures, beginning in 2017.

Pipeline Asset Management Study (D-10)

A pipeline asset management study is recommended to identify the remaining useful life of water mains in the system, prioritization of pipe replacements, and develop replacement costs to aid in phasing the replacements. It is recommended that the City collect pipe material and age data before conducting the asset management study. The study will be conducted in 2018 and is expected to cost $50,000.

Coal Creek Springs Transmission Main Repair (D-11)

The Facilities Evaluation Study found a suspected leak on Coal Creek Spring's 24-inch steel transmission main crossing the White River. The approximate location of the leak was identified, but further investigation of the leak is required to assess the degree and magnitude of the leak. The City has budgeted $1,300,000 in 2025 to replace the river crossing.

Academy Transmission Main Replacement (D-12)

The Facilities Evaluation Study identified that the 14-inch Academy Transmission Main may be in poor condition, based on its age and assumed material type (Class 52 ductile iron). The report recommended the replacement of approximately 11,300 linear feet of pipe due to decreased wall thickness. Additional testing is required to confirm the study's findings, specifically whether the apparent decrease in wall thickness is due to a thinner original pipe class (e.g., Class 50) or due to corrosion (which would indicate possible need for replacement). The transmission main replacement is expected to cost $2,865,000 and be completed in 2025.

Lea Hill PRV Station Improvements (D-13)

The City plans to replace five aging PRVs in the Lea Hill Service Area that do not meet modern operation and maintenance standards. Per the CFP, the City has budgeted $450,000 to complete the project by 2016.

Valley AC Main Replacement (D-14)

The City previously found its asbestos-cement (AC) mains are generally undersized and have relatively high leakage rates. Replacement of the remaining two areas of AC mains within the system, as described in Section 9.5.8.1, will be completed in 2015. Per the CFP, the City has budgeted $50,000 to complete the project.

Braunwood Transmission (D-15)

An approximately 8,000 linear foot transmission main will be constructed to connect the Braunwood satellite system to the distribution system in the long-term planning horizon. The transmission main will allow for service to additional customers along the pipeline route (53rd St SE). The existing supply, booster pump, and storage facilities at the satellite system may be decommissioned as part of the project. The project is expected to cost $2,264,600.

Game Farm Park Transmission (D-16)

An approximately 7,700 linear foot transmission main will be constructed to connect Game Farm Park to the distribution system in the long-term planning horizon. The transmission main will allow for service to new areas. The existing booster pump station will be decommissioned as part of the project. The project is expected to cost $2,212,210.

10.3.5 General Utility Projects

The City has several general water system projects such as a Facilities Evaluation Study and continued Comprehensive Plan updates. These projects and estimated expenditures are shown in Table 10.5.

Utilities Field Operations Center (G-05)

This project consists of the construction of buildings for utilities field staff use and storage of field equipment. Per the CFP, this project is partially funded by Sewer and Storm; the Water share of the project cost is $300,000.

Muckleshoot Indian Tribe (MIT) Master Meters (G-06)

This project will install master meters to MIT properties to facilitate both City and MIT account administration. Per the CFP, the project is anticipated to cost $400,000 and is scheduled for the year 2015.

Comprehensive Water Plan Updates (G-04, G-08)

The Department of Health requires that the Comprehensive Water Master Plan be updated every six years. This interval is expected to increase to 10 years starting in 2015. Per the CFP, the City has allocated $50,000 to complete the Comprehensive Water Plan in 2015. An additional $425,000 has been budgeted for updates in 2024 and 2034.

Water Meter & Billing System Improvements (G-09)

The City will install advanced metering infrastructure (AMI) to all customers between 2015 and 2019. The AMI will allow for more accurate meter reads, daily information for quicker detection of leaks, and improved efficiency of billing operations. Per the CFP, the City has budgeted $6,500,000 to implement the metering infrastructure.

10.4 CIP SUMMARY

Table 10.6 summarizes the short, medium and long-term CIP elements. All costs shown in Table 10.6 are 2014 dollars. The total supply project costs are estimated at $58.1 million, the total storage project costs are estimated at $9.1 million, the total pump station project costs are estimated at $4.4 million, the total distribution project costs are estimated at $39.5 million and the total general water system project costs are estimated at $8.1 million.

The projects anticipated for the next six years are summarized in Table 10.7. The project costs shown in Table 10.7 are divided into three categories: 1) upgrade; 2) expansion; and 3) repair & replacement. The City uses this information to develop rates and SDC charges. Projects may include elements of multiple categories. In the short-term horizon, approximately 60% of CIP spending will address repair and replacement and approximately 40% of CIP spending will address system upgrades and expansion.

Table 10.5 General Utility Capital Projects
Comprehensive Water Plan
City of Auburn

Project	Project ID	Project Timing	Cost	Comments
Short-Term				
Comprehensive Water Plan Update - 2014	G-04	2015	$50,000.00	Mandated by Washington Department of Health.
Utilities Field Operations Center	G-05	2015	$300,000.00	Construct building for utilities field staff use and storage of field equipment.
MIT Master Meters	G-06	2015	$400,000.00	Implement master meters to MIT properties to ease account administration.
Water Meter & Billing System Improvements	G-09	2015-2019	$6,500,000.00	Install advanced metering infrastructure (AMI) to allow for more accurate meter readers, daily information for quicker detection of leaks, and improved efficiency of billing operations.
Medium-Term				
Comprehensive Water Plan Update - 2025 & 2035	G-08	2024 & 2034	$850,000.00	Mandated by Washington Department of Health.
Subtotal			**$8,100,000.00**	

Table 10.6 Capital Improvements Projects (2014 Costs)
Comprehensive Water Plan
City of Auburn

Project		Total Project Cost (2014 dollars)	Annual Cost	Short-Term 2015-2021	Medium-Term 2022-2025	Long-Term 2026-2035
Supply Projects						
S-01	Well 1 On-site Improvements Project	$50,000.00		$50,000.00	$0.00	$0.00
S-02	Well 4 Emergency Power Improvements Project	$50,000.00		$50,000.00	$0.00	$0.00
S-03	Well 7 Back-Up Power	$1,391,000.00		$0.00	$1,391,000.00	$0.00
S-04	Cascade Water Alliance Water Purchase	$21,073,743.00		$5,926,665.00	$8,657,964.00	$6,489,114.00
S-06	Well 5/5A Upgrades	$2,142,000.00		$0.00	$2,142,000.00	$0.00
S-07	Well Inspection and Redevelopment Program	$1,100,000.00		$50,000.00	$300,000.00	$750,000.00
S-08	Water Resources Protection Program	$660,942.00	$24,597.00	$188,477.00	$126,562.00	$345,903.00
S-09	Coal Creek Springs Collector Improvements	$3,400,000.00		$3,400,000.00	$0.00	$0.00
S-11	Wells 3A/3B Treatment	$9,349,000.00		$0.00	$0.00	$9,349,000.00
S-12	West Hill Springs Water Quality Improvements	$430,000.00		$0.00	$430,000.00	$0.00
S-13	Algona Well 1 Decommissioning	$39,000.00		$39,000.00	$0.00	$0.00
S-14	Algona Well 1 Redevelopment	$1,456,000.00		$0.00	$0.00	$1,456,000.00
S-15	Well 7 Treatment Phase 1	$6,769,000.00		$0.00	$6,769,000.00	$0.00
S-16	Well 7 Treatment Phase 2	$5,399,000.00		$0.00	$0.00	$5,399,000.00
S-17	West Hill Springs Flow Control Improvements	$455,000.00		$455,000.00	$0.00	$0.00
S-18	Howard Road CCT Expansion	$1,015,000.00		$0.00	$1,015,000.00	$0.00
S-19	Fulmer Field Improvements Project	$350,000.00		$350,000.00	$0.00	$0.00
S-20	Well 2 Replacement	$1,314,000.00		$0.00	$0.00	$1,314,000.00
S-21	Coal Creek Springs Chlorination Building Replacement	$1,395,000.00		$0.00	$1,395,000.00	$0.00
S-22	Well 4 Pump Improvements	$226,000.00		$0.00	$226,000.00	$0.00
	Subtotal	**$58,064,685.00**		**$10,509,142.00**	**$21,057,526.00**	**$26,498,017.00**
Storage Projects						
R-01	Lakeland Hills Reservoir 5 Improvements	$735,000.00		$735,000.00	$0.00	$0.00
R-03	Annual Reservoir R&R Program	$1,050,000.00	$50,000.00	$350,000.00	$200,000.00	$500,000.00
R-04	Valley Service Area new Reservoir	$3,380,000.00		$0.00	$3,380,000.00	$0.00
R-05	Reservoir Painting	$2,500,000.00		$1,250,000.00	$1,250,000.00	$0.00
R-06	Reservoir Seismic Rehabilitation	$715,000.00		$715,000.00	$0.00	$0.00
R-07	Reservoir Capital Improvements	$690,000.00		$0.00	$690,000.00	$0.00
	Subtotal	**$9,070,000.00**		**$3,050,000.00**	**$5,520,000.00**	**$500,000.00**
Pump Station Projects						
PS-03	Green River PS Back-Up Power	$690,000.00		$690,000.00	$0.00	$0.00
PS-04	Intertie Booster Pump Station	$1,303,000.00		$1,303,000.00	$0.00	$0.00
PS-07	Academy PS No. 1 Improvements	$2,125,000.00		$2,125,000.00	$0.00	$0.00
PS-09	Game Farm Pump Station Capital Improvement	$149,000.00		$0.00	$149,000.00	$0.00
PS-10	Decommission Lea Hill Pump Station	$83,000.00		$0.00	$83,000.00	$0.00
	Subtotal	**$4,350,000.00**		**$4,118,000.00**	**$232,000.00**	**$0.00**

Table 10.6 Capital Improvements Projects (2014 Costs)
Comprehensive Water Plan
City of Auburn

Project		Total Project Cost (2014 dollars)	Annual Cost	Short-Term 2015-2021	Medium-Term 2022-2025	Long-Term 2026-2035
Distribution System Projects						
D-02	Annual Distribution Improvements Program	$9,698,000.00		$2,900,000.00	$2,600,000.00	$4,198,000.00
D-03	SCADA Upgrades	$10,000.00		$10,000.00	$0.00	$0.00
D-06	Street Utility Improvements	$11,519,895.00	$500,000	$4,519,895.00	$2,000,000.00	$5,000,000.00
D-09	Water Repair and Replacements	$9,063,673.00		$2,600,000.00	$2,600,000.00	$3,863,000.00
D-10	Pipe Asset Management Study	$50,000.00		$50,000.00	$0.00	$0.00
D-11	Coal Creek Springs Transmission Repair	$1,300,000.00		$0.00	$1,300,000.00	$0.00
D-12	Academy Transmission Main Replacement	$2,865,000.00		$0.00	$2,865,000.00	$0.00
D-13	Lea Hill PRV Station Improvements	$450,000.00		$450,000.00	$0.00	$0.00
D-14	Valley AC Main Replacement	$50,000.00		$50,000.00	$0.00	$0.00
D-15	Braunwood Transmission	$2,264,600.00		$0.00	$0.00	$2,264,600.00
D-16	Game Farm Park Transmission	$2,212,210.00		$0.00	$0.00	$2,212,210.00
	Subtotal	**$39,483,378.00**		**$10,579,895.00**	**$11,365,000.00**	**$17,537,810.00**
General Water System Projects						
G-04	Comprehensive Water Plan Update - 2014	$50,000.00		$50,000.00	$0.00	$0.00
G-05	Utilities Field Operations Center	$300,000.00		$300,000.00	$0.00	$0.00
G-06	MIT Master Meters	$400,000.00		$400,000.00	$0.00	$0.00
G-08	Comprehensive Water Plan Update - 2025 & 2035	$850,000.00		$0.00	$425,000.00	$425,000.00
G-09	Water Meter & Billing System Improvements	$6,500,000.00		$6,500,000.00	$0.00	$0.00
	Subtotal	**$8,100,000.00**		**$7,250,000.00**	**$425,000.00**	**$425,000.00**
	TOTAL	**$119,068,063.00**		**$35,507,037.00**	**$38,599,526.00**	**$44,960,827.00**

Table 10.7 Capital Improvements Program Costs and Phasing
Comprehensive Water Plan
City of Auburn

CIP ID	NAME	Year	Upgrade	Expansion	Repair & Replacement	SHORT-TERM							
						FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2015 - 2021 Total
Supply													
S-01	Well 1 On-site Improvements Project	2015	50%	0%	50%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-02	Well 4 Emergency Power Improvements Project	2015	100%	0%	0%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-04	Cascade Water Alliance Water Purchase	2017-2029	0%	100%	0%	$0.00	$0.00	$532,561.00	$532,561.00	$532,561.00	$2,164,491.00	$2,164,491.00	$5,926,665.00
S-07	Well Inspection and Redevelopment Program	2017-2033	20%	0%	80%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
S-08	Water Resources Protection Program	Annual	20%	0%	80%	$24,597.00	$25,335.00	$26,095.00	$26,878.00	$27,685.00	$28,515.00	$29,371.00	$188,477.00
S-09	Coal Creek Springs Collector Improvements	2018-2019	20%	0%	80%	$0.00	$0.00	$0.00	$800,000.00	$2,600,000.00	$0.00	$0.00	$3,400,000.00
S-13	Algona Well 1 Decommissioning	2015	0%	0%	100%	$39,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$39,000.00
S-17	West Hill Springs Flow Control Improvements	2015	50%	0%	50%	$455,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$455,000.00
S-19	Fulmer Field Improvements Project	2016-2017	100%	0%	0%	$0.00	$350,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$350,000.00
	Subtotal					**$668,597.00**	**$375,335.00**	**$558,656.00**	**$1,359,439.00**	**$3,160,246.00**	**$2,193,006.00**	**$2,193,862.00**	**$10,509,142.00**
Storage													
R-01	Lakeland Hills Reservoir 5 Improvements	2015	50%	0%	50%	$735,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$735,000.00
R-03	Annual Reservoir R&R Program	Annual	50%	0%	50%	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$350,000.00
R-05	Reservoir Painting	2020 & 2022	0%	0%	100%	$0.00	$0.00	$0.00	$0.00	$0.00	$1,250,000.00	$0.00	$1,250,000.00
R-06	Reservoir Seismic Rehabilitation	2018-2019	80%	0%	20%	$0.00	$0.00	$0.00	$357,500.00	$357,500.00	$0.00	$0.00	$715,000.00
	Subtotal					**$785,000.00**	**$50,000.00**	**$50,000.00**	**$407,500.00**	**$407,500.00**	**$1,300,000.00**	**$50,000.00**	**$3,050,000.00**
Pump Stations													
PS-03	Green River PS Back-Up Power	2017-2018	50%	0%	50%	$0.00	$0.00	$90,000.00	$600,000.00	$0.00	$0.00	$0.00	$690,000.00
PS-04	Intertie Booster Pump Station Improvements	2021	25%	25%	50%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,303,000.00	$ 1,303,000.00
PS-07	Academy PS No. 1 Improvements	2017-2018	50%	0%	50%	$0.00	$0.00	$925,000.00	$1,200,000.00	$0.00	$0.00	$0.00	$2,125,000.00
	Subtotal					**$0.00**	**$0.00**	**$1,015,000.00**	**$1,800,000.00**	**$0.00**	**$0.00**	**$1,303,000.00**	**$4,118,000.00**

Table 10.7 Capital Improvements Program Costs and Phasing
Comprehensive Water Plan
City of Auburn

CIP ID	NAME	Year	Upgrade	Expansion	Repair & Replacement	SHORT-TERM							
						FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2015 - 2021 Total
Distribution System													
D-02	Annual Distribution Improvements Program	2017-2031	20%	0%	80%	$0.00	$0.00	$300,000.00	$1,000,000.00	$300,000.00	$1,000,000.00	$300,000.00	$2,900,000.00
D-03	SCADA Upgrades	2015	50%	0%	50%	$10,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$10,000.00
D-06	Street Utility Improvements	Annual	20%	0%	80%	$1,519,895.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$500,000.00	$4,519,895.00
D-09	Water Repair and Replacements	2015-2031	20%	0%	80%	$0.00	$0.00	$0.00	$300,000.00	$1,000,000.00	$300,000.00	$1,000,000.00	$2,600,000.00
D-10	Pipe Asset Management Study	2018	50%	0%	50%	$0.00	$0.00	$0.00	$50,000.00	$0.00	$0.00	$0.00	$50,000.00
D-13	Lea Hill PRV Station Improvements	2015-2016	50%	0%	50%	$50,000.00	$400,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$450,000.00
D-14	Valley AC Main Replacement	2015	20%	0%	80%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
	Subtotal					**$1,629,895.00**	**$900,000.00**	**$800,000.00**	**$1,850,000.00**	**$1,800,000.00**	**$1,800,000.00**	**$1,800,000.00**	**$10,579,895.00**
General													
G-04	Comprehensive Water Plan Update - 2014	2015	50%	0%	50%	$50,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$50,000.00
G-05	Utilities Field Operations Center	2015	100%	0%	0%	$300,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$300,000.00
G-06	MIT Master Meters	2015	20%	0%	80%	$400,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$400,000.00
G-09	Water Meter & Billing System Improvements	2015-2019	20%	0%	80%	$1,000,000.00	$1,000,000.00	$1,500,000.00	$1,500,000.00	$1,500,000.00	$0.00	$0.00	$6,500,000.00
	Subtotal					**$1,750,000.00**	**$1,000,000.00**	**$1,500,000.00**	**$1,500,000.00**	**$1,500,000.00**	**$0.00**	**$0.00**	**$7,250,000.00**
	TOTAL		**22%**	**22%**	**56%**	**$4,833,492.00**	**$2,010,335.00**	**$3,923,656.00**	**$6,916,940.00**	**$6,867,746.00**	**$5,293,006.00**	**$4,043,862.00**	**$35,507,037.00**

Chapter 11

FINANCIAL

11.1 INTRODUCTION

The objective of the financial plan is to identify the total cost of providing water service and to provide a financial program that allows the water utility to remain financially viable during execution of the identified Capital Improvement Program (CIP). This viability analysis considers the historical financial condition of the utility, the sufficiency of utility revenues to meet current and future financial and policy obligations and the financial impact of executing the CIP. Furthermore, the plan provides a review of the utility's rate structure with respect to rate adequacy, promotion of water conservation, and customer affordability.

11.2 PAST FINANCIAL PERFORMANCE

This section includes a historical (2008 to 2013) summary of financial performance as reported by the City of Auburn (City) on the Statement of Revenues, Expenses, and Changes in Net Position and the Statement of Net Position, specific to the water utility.

11.2.1 Statement of Revenues, Expenses and Changes in New Position

Table 11.1 shows a consolidated Statement of Revenues, Expenses, and Changes in Net Position for the period 2008 to 2013.

Findings and Trends

Operating Income (including depreciation expense) has been positive since 2011. Operating income grew from an operating loss of $761,001 in 2008 to an operating income of $956,758 in 2012. Furthermore, from 2008 to 2013 operating revenues grew 53%, outpacing operating expenses by 20%. In spite of this trend, operating income in 2013 declined 47% compared to 2012. This is largely attributed to the nearly $1.1 million growth in Operations and Maintenance (O&M) expense in 2013. Depreciation is a non-cash expenditure, so even though operating income has been negative in some years, cash flow was positive for each of the six years in the table.

A few key financial ratios are discussed below. Unless otherwise noted, the stated benchmarks are based on industry standards.

- <u>The O&M Coverage Ratio:</u> (operating revenues divided by operating expenses)
  - Benchmark: A ratio of 1.0 or higher is a desirable result, indicative of sufficient revenues to meet cash operating expenses as well as to cover depreciation expense.
  - Results: Increased from 0.91 in 2008 to 1.05 in 2013 which is a positive trend.

- The Operating Ratio: (total operating expenses excluding depreciation divided by total operating revenues)
  - Benchmark: A ratio greater than 90% indicates there is little room for new debt service and capital replacement without additional rate increases. A ratio greater than 100% indicates that cash operating expenses exceed operating revenues and is indicative of an unsustainable financial condition.
  - Results*:* Decreased from 83% in 2008 to 76% in 2013 which is a positive trend.
- The Debt Service Coverage Ratio: (operating & interest revenues less O&M expenses excluding depreciation, divided by annual debt service)
  - Benchmark: There are two forms of debt service coverage: one applies to debt service from revenue bonds only, while the other applies to debt service on total debt, including state loans. Revenue bonds typically have a legal minimum coverage requirement of 1.25. State loans usually do not carry a minimum coverage requirement; however, based on industry standards, it is recommended that debt service coverage on total debt be at least 1.0. To be conservative, this review of financial statements looks at coverage on total debt.
  - Results: The City's debt service coverage on total debt decreased from 1.7 in 2008 to 1.4 in 2013 but still remains well above industry and City benchmarks.

Table 11.1 **Statement of Revenues, Expenses and Changes in Fund Net Position**
Comprehensive Water Plan
City of Auburn

	2008	2009	2010	2011	2012	2013
OPERATING REVENUES:						
Charges for services	$ 7,664,443	$ 8,825,924	$ 9,100,699	$ 9,008,830	$ 10,335,641	$ 11,695,351
Other Operating Revenue	-	-	-	-	-	-
Total Operating Revenues	7,664,443	8,825,924	9,100,699	9,008,830	10,335,641	11,695,351
OPERATING EXPENSES:						
Operations and Maintenance	3,266,201	3,262,764	3,560,195	3,017,606	3,500,564	4,572,464
Administration	2,192,538	2,484,844	2,557,897	2,328,180	2,503,885	2,951,254
Depreciation/Amortization	2,098,916	2,104,554	2,116,352	2,080,667	2,171,770	2,289,288
Other Operating Expenses	867,789	1,003,065	1,055,120	1,111,008	1,202,664	1,371,582
Total Operating Expenses	8,425,444	8,855,227	9,289,564	8,537,461	9,378,883	11,184,588
OPERATING INCOME (LOSS)	(761,001)	(29,303)	(188,865)	471,369	956,758	510,763
NON OPERATING REVENUE (EXPENSES)						
Interest Revenue	383,491	88,079	58,353	56,417	27,209	23,019
Other Non-Operating Revenue	55,348	93,286	775,827	841,545	725,905	214,324
Interest Expense	(137,855)	(114,306)	(753,316)	(421,883)	(274,449)	(635,239)
Other Non-Operating Expenses	(1,932)	(682)	-	(2,392)	(2,392)	(73,267)
Total Non-Operating Revenue (expenses)	299,052	66,377	80,864	473,687	476,273	(471,163)
INCOME(LOSS) BEFORE CONTRIBUTIONS AND TRANSFERS	(461,949)	37,074	(108,001)	945,056	1,433,031	39,600
CAPITAL CONTRIBUTIONS	2,653,883	649,742	1,257,840	2,458,649	3,307,307	1,005,667
TRANSFERS IN	-	-	-	-	-	-
TRANSFERS OUT	(50,000)	(166,100)	(55,790)	(50,000)	(50,000)	(50,000)
Changes in Net Position	2,141,934	520,716	1,094,049	3,353,705	4,690,338	995,267
Net Position, January 1, as Previously Reported	55,918,291	58,060,225	58,580,941	59,674,990	63,028,695	67,719,033
Change in Accounting Principle						(58,325)
Net Position, January 1, as Restated						67,660,708
Net Position, December 31	$ 58,060,225	$ 58,580,941	$ 59,674,990	$ 63,028,695	$ 67,719,033	$ 68,655,975

11.2.2 Statement of Net Position

Table 11.2 shows the consolidated Statement of Net Position for the period 2008 to 2013.

Findings and Trends

This statement shows that the City's net water assets, which measures the cost of assets (net of depreciation) remaining after liabilities are paid, increased from $58.1 million to $68.7 million over the 2008 to 2013 time period; this represents an 18% increase over the five-year period. This includes an overall increase in current assets of 41%, from $12.4 million in 2008 to $17.4 million in 2013. Cash and investments remained relatively level through 2012 but declined in 2013.

Non-current assets, which represent assets required for use or consumption beyond one year, have seen a 43% increase over the five-year period, from $54.4 million in 2008 to $77.7 million in 2013. A more detailed look at the change in capital assets over this period reveals that Improvements Other Than Buildings has increased 24%, Construction in Progress has increased by about $10 million, and the City paid an System Development Charge (SDC) for wholesale water supply from Tacoma Public Utilities valued at $5.2 million.

The following financial performance indicators of the utility reflect the trends and discussion above. Unless otherwise noted, the stated benchmarks are based on industry standards.

Liquidity:

- <u>The Current Ratio:</u> (unrestricted current assets divided by current liabilities)
    - Benchmark: A ratio of 2.0 or higher is considered good in terms of healthy liquidity. The current ratio is a measure of short-term financial strength and answers the question: Are current assets able to cover expected current liabilities in the coming year?
    - Results: From 2008 through 2012, the current ratio has ranged from 3.3 to 6.9, each year well above the recommended benchmark. However, in 2013 the current ratio declined to 1.9, which is approximately at the suggested benchmark of 2.0. The main reason for the decline is that unrestricted cash and investments dropped by $2.2 million, from $9.1 million to $6.9 million. While a current ratio of 1.9 by itself is not cause for concern, it would be worth the City's attention to explore the reason for the decrease in the level of unrestricted cash and investments between 2012 and 2013.

Efficiency:

- <u>Accounts Receivable Collection Period:</u> (customer receivables on balance sheet x 365 days then divided by annual sales)
    - Benchmark: Generally, less than 30 days is considered very good.
    - Results: Decreased from 37 days in 2008 to 31 days in 2013. This is trending towards the "very good" benchmark.

Capital Structure:

- Debt to Net Capital Assets Ratio: (total outstanding debt divided by capital assets net of accumulated depreciation)
  - Benchmark: For utilities, having a capital structure of at least 40% equity and less than 60% debt is considered a healthy capital structure, with adequate future borrowing capacity and a manageable debt service burden. The City's capital structure policy is even more conservative: 50% debt and 50% equity.
  - Results: Increased from 14% debt in 2008 to 31% debt in 2013. This is still well within both industry and City benchmarks for maximum outstanding debt.

Table 11.2	Statement of Net Position Comprehensive Water Plan City of Auburn					
	2008	2009	2010	2011	2012	2013
Assets						
Current Assets						
Cash and Cash Equivalents	$ 6,695,075	$ 7,112,183	$ 7,988,302	$ 9,105,059	$ 9,097,192	$ 6,933,381
Investments	3,112,826	2,004,773	1,731,607	2,004,940	-	-
Restricted Cash						
Bond Payments	1,009,122	272,508	948,415	974,099	1,282,185	1,773,039
Customer Deposits	33,745	35,606	31,629	20,633	14,746	16,337
Other	468,199	357,499	11,123,922	6,280,141	1,225,687	7,546,533
Customer Accounts	768,978	840,101	888,146	895,871	921,837	999,061
Other Receivables	51,179	8,103	715,867	6,716	-	-
Inventories	242,852	175,328	226,378	187,286	147,520	141,028
Total Current Assets	12,381,976	10,806,101	23,654,266	19,474,745	12,689,167	17,409,379
Non Current Assets						
Long Term Contracts and Notes				-	-	-
Capital Assets						
Land	897,971	897,971	897,971	897,971	897,971	897,971
Water Rights		-	-	-	5,196,600	5,196,600
Buildings and Equipment	3,113,583	2,344,538	2,344,538	2,436,120	2,463,741	2,463,741
Improvements Other Than Buildings	81,599,892	82,968,802	86,437,929	90,393,469	96,250,763	101,191,935
Construction in Progress	920,761	3,134,552	2,400,937	7,331,713	9,189,882	10,812,019
Less: Accumulated Depreciation	(32,146,881)	(34,251,435)	(36,367,787)	(38,448,453)	(40,620,223)	(42,909,512)
Total Capital Assets (Net of A/D)	54,385,326	55,094,428	55,713,588	62,610,820	73,378,734	77,652,754
Total Non-Current Assets	54,385,326	55,094,428	55,713,588	62,610,820	73,378,734	77,652,754
Total Assets	**66,767,302**	**65,900,529**	**79,367,854**	**82,085,565**	**86,067,901**	**95,062,133**
LIABILITIES						
Current Liabilities						
Current Payables	477,679	393,169	802,944	852,393	839,004	1,078,499
Current Deposits	33,745	35,606	31,629	-		-
Loans Payable-Current	-	435,568	435,568	435,568	435,568	515,855
Employee Leave Benefits-Current	123,306	153,208	152,012	146,344	158,980	180,068
Revenue Bonds Payable-Current	896,500	203,500	214,600	225,700	545,133	839,969
General Obligation Bonds Payable-Current		-				-
Accrued Interest	138,825	100,848	752,503	762,807	749,850	959,978
Deposits	-	-	-	20,633	14,746	16,337
Total Current Liabilities	1,670,055	1,321,899	2,389,256	2,443,445	2,743,281	3,590,706
Non Current Liabilities						
Unearned Revenue	42,200	42,200	42,200	42,200	42,200	42,200
Employee Leave Benefits	15,208	50,635	79,476	66,429	55,158	53,695
Loans Payable	5,323,768	4,452,631	4,017,063	3,581,494	3,145,925	4,155,517
Revenue Bonds Payable	1,655,846	1,452,223	13,164,869	12,923,302	12,362,304	18,564,040
General Obligation Bonds Payable	-	-	-	-	-	-
Total Non Current Liabilities	7,037,022	5,997,689	17,303,608	16,613,425	15,605,587	22,815,452
Total Liabilities	**8,707,077**	**7,319,588**	**19,692,864**	**19,056,870**	**18,348,868**	**26,406,158**
NET POSITION						
Invested In Capital Assets, Net of Related Debt	46,509,213	48,550,506	47,778,846	50,498,331	56,889,804	53,577,373
Restricted for:						
Debt Service	468,199	630,007	2,174,980	2,200,664	2,507,872	3,403,353
Capital Projects						5,916,219
Unrestricted	11,082,813	9,400,428	9,721,164	10,329,700	8,321,357	5,759,030
Total Net Position	**$ 58,060,225**	**$ 58,580,941**	**$ 59,674,990**	**$ 63,028,695**	**$ 67,719,033**	**$ 68,655,975**

11.2.3 Outstanding Debt Principal

Table 11.3 outlines the City's outstanding debt principal as of the end of 2013.

The City of Auburn has three outstanding revenue bonds and four outstanding Public Works Trust Fund loans. The total outstanding principal on these loans is $23 million.

Table 11.3	Outstanding Debt Principal Comprehensive Water Plan City of Auburn		
Debt Description		**Principal Outstanding**	**Maturity Year**
2005 Revenue Bond	$	754,800	2016
2010 CIP Revenue Bond	$	11,377,352	2030
2013 CIP Revenue Bond	$	6,426,400	2032
PW-01-691-006	$	1,816,685	2021
PW-02-691-002	$	235,030	2022
PW-13-961-012	$	1,592,885	2032
PW-99-791-003	$	1,094,211	2019
Total	**$**	**23,297,363**	

11.3 FINANCIAL PLAN

11.3.1 Overview

The water utility is an enterprise fund that is responsible for funding all of its related costs. It is not dependent upon general tax revenues or General Fund resources. The primary source of funding for the utility is collections from water service charges. The City controls the level of service charges by ordinance, and subject to statutory authority, can adjust user charges as needed to meet financial objectives.

The financial plan can only provide a qualified assurance of financial feasibility if it considers the "total system" costs of providing water service – both operating and capital. To meet these objectives, the following elements are completed:

- **Capital Funding Plan** – This plan identifies the total CIP obligations for the planning period 2015-2035. As defined previously in this document, the planning period is separated into three individual time horizons: "Short Term" 2015 to 2021, "Medium Term" 2022 to 2025 and "Long Term" 2026 to 2035. The plan defines a strategy for funding the CIP including an analysis of available resources from rate revenues, existing reserves, system development charges, debt financing and any special resources that may be readily available (e.g. grants, developer contributions, etc). The capital funding plan impacts the financial plan through use of debt financing (resulting in annual debt service) and the assumed rate revenue resources available for capital funding.

- **Financial Forecast** – This forecast identifies annual non-capital costs associated with the operation, maintenance, and administration of the water system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan ultimately evaluates the sufficiency of utility revenues in meeting all obligations, including operating expenses, debt service, and reserve contributions, as well as any debt service coverage requirements associated with long-term debt. The Financial Forecast analysis is discussed in Section 11.5.

11.3.2 Utility Fund Structure

The City tracks the water utility's revenues and expenditures in a single fund: Fund 430. Conceptually, utility expenditures can be divided into three main types of costs: operating, capital, and debt service. For modeling purposes, it was assumed that the single fund for the water utility is split between three "accounts": operating, capital, and debt reserves. Municipal utilities commonly maintain separate operating, capital, and debt reserves. The initial allocation of the beginning fund balance is discussed in Section 11.5.

- *Operations* – serves as an operating account where operating revenues are deposited and operating expenses are paid.
- *Capital projects* – serves as a capital account where capital revenues are deposited and capital expenditures are paid. Examples of capital revenues include system development charges, grant proceeds, debt proceeds, and contributions from rates.
- *Restricted Bond Reserve* – serves as a restricted account set up to comply with revenue bond covenants.

Splitting a single fund into three separate "accounts" allows the City to apply the City's and industry standard reserve targets to each account. Minimum balance thresholds for these accounts are discussed in the next section, "Financial Policies."

11.3.3 Financial Policies

Following is a brief summary of adopted or recommended financial policies for the City water utility. Adopted policies are drawn from the "Process/Policies" section within the City's Adopted 2015-16 Budget.

Reserve Policies

Utility reserves serve multiple functions; they can be used to address variability and timing of expenditures and receipts; occasional disruptions in activities, costs or revenues; utility debt obligations; and many other functions. The collective use of individual reserves helps to limit the City's exposure to revenue shortfalls, meet long-term capital obligations, and reduce the potential for bond coverage defaults.

- *Operating Reserve* – An operating reserve is designed to provide a liquidity cushion; it protects the utility from the risk of short-term variation in the timing of revenue collection or payment of expenses. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of O&M expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8%) to 120 days (33%) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end of the range more appropriate for utilities with significant seasonal or consumption-based fluctuations.

  The City's adopted policy states that the water utility's target operating reserves should be approximately 90 days (page 36, "Process/Policies"). This is the target assumed in the financial forecast. Based on the City's 2015 budgeted expenditures (excluding depreciation), a 90 day target equates to $2.7 million.

- *Capital Contingency Reserve* – A capital contingency reserve is cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. The reserve could also be used for other unanticipated capital needs, including capital project cost overruns. There are various approaches used in the industry to set an appropriate level for this reserve, such as: 1) choosing a percentage of a utility system's total fixed assets; or 2) determining the cost of replacing highly critical assets or facilities. Following common industry practice, this analysis assumes a minimum capital fund balance equal to 1% of the original cost of plant in service.

- *Bond Reserve* – Bond covenants often establish reserve requirements as a means of protecting an agency against the risk of nonpayment. This bond reserve can be funded with cash on hand, but is more often funded at the time of borrowing as part of the bond principal. A reserve amount equal to annual debt service is targeted.

System Reinvestment Policies

The purpose of system reinvestment funding is to provide for the ongoing rate funding for the replacement of system facilities. Each year, the utility assets lose value, and as they lose value they are moving toward eventual replacement. That accumulating loss in value and future liability is typically measured for reporting purposes through annual depreciation expense. This is based on the original cost of the asset divided by its anticipated useful life. While this expense reflects the consumption of the existing asset and its original investment, the replacement of that asset will likely cost much more, after factoring in inflation and construction conditions. Therefore, the added annual replacement liability is often even greater than the annual depreciation expense. It is prudent to establish a system reinvestment policy that attempts to recover at least a portion of the annual depreciation expense from rate funding. Providing a certain amount of rate-funded capital reinvestment is an approach to ensure that the system does not become too heavily dependent on debt.

The City's adopted policy is to phase in system reinvestment funding over ten years in 10% increments beginning in 2012. To keep rates at their currently-adopted levels through 2017, the system reinvestment strategy for the financial plan begins in 2015 at 10% and increases by 10% per year until 100% of the target is funded.

Debt Policies

Revenue bond covenants typically establish a minimum debt service coverage as a way to protect bondholders against the risk of nonpayment. City policy and the City's current bond covenants both require bonded debt service coverage of 1.25.

The City also has another debt-related policy, which is to maintain a capital structure that does not exceed 50% debt. This is more conservative than the typical industry standard of 60% debt and 40% equity. The City's capital structure from the 2013 financial statement was 31% debt and 69% equity. This forecast projects that the debt level will exceed 50% in 2023 and reach as high as 57% during the 21-year planning period. This level of indebtedness goes above the City's policy target, but it stays within the industry-standard limit of 60% debt and 40% equity.

11.3.4 Capital Funding Plan

The CIP developed for this Plan contains 47 different projects valued at $119 million ($173 million in inflated dollars) over the 2015 to 2035 planning period (excluding the budgeted expenditures for 2014). Costs are stated in 2014 dollars and are escalated to the year of planned spending at an annual inflation rate of 3.5% per year.

Table 11.4 summarizes the expected annual capital expenditures, using budgeted figures for 2014.

Table 11.4 Water CIP
Comprehensive Water Plan
City of Auburn

Year	2014 $	Inflated $
2014	$ 7,662,309	$ 7,662,309
2015	$ 4,883,492	$ 5,054,415
2016	$ 1,975,335	$ 2,116,029
2017	$ 4,073,656	$ 4,516,536
2018	$ 6,916,939	$ 7,937,347
2019	$ 7,017,746	$ 8,334,880
2020	$ 5,293,006	$ 6,506,456
2021	$ 5,346,862	$ 6,802,701
8 Year Total	**$ 43,169,346**	**$ 48,930,672**
2022-2035	$ 83,560,353	$ 131,834,083
Grand Total	**$ 126,729,699**	**$ 180,764,756**

A capital funding plan is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required. After allocating the estimated beginning 2015 fund balance first to the debt reserve and secondly to the operating reserve, there were no funds available for capital.

The SDC is projected to generate an average annual revenue stream of just under $800,000. This is based on an assumed customer growth rate of 1.21% per year. The customer growth percentage is drawn from the previous five years of actual growth (from 2008 through 2013).

The SDC revenue projection assumes the current SDC of $2,424 plus an annual Construction Cost Index adjustment starting in 2015. The City Council is currently reviewing an update of the SDCs. If higher charges are adopted, the increased SDC revenue will allow slightly lower rate increases than those contained in this financial plan.

Table 11.5 summarizes the capital funding plan.

**Table 11.5 Capital Financing Plan
Comprehensive Water Plan
City of Auburn**

Year	Capital Expenditures	Capital Expenditures Inflated	Revenue Bond Financing	Cash Funding	Total Financial Resources
2014	$ 7,662,309	$ 7,662,309	$ -	$ 7,662,309	**$ 7,662,309**
2015	4,883,492	5,054,415	5,150,000	-	**5,150,000**
2016	1,975,335	2,116,029	1,210,111	810,332	**2,020,443**
2017	4,073,656	4,516,536	3,401,164	1,115,372	**4,516,536**
2018	6,916,939	7,937,347	6,823,766	1,113,581	**7,937,347**
2019	7,017,746	8,334,880	7,145,906	1,188,974	**8,334,880**
2020	5,293,006	6,506,456	5,257,771	1,248,685	**6,506,456**
2021	5,346,862	6,802,701	5,377,588	1,425,113	**6,802,701**
8-Year Total	**$ 43,169,346**	**$ 48,930,672**	**$ 34,366,306**	**$ 14,564,367**	**$ 48,930,672**
2022-2035	$ 83,560,353	$ 131,834,083	$ 97,925,278	$ 33,908,805	**$ 131,834,083**
Grand Total	**$ 126,729,699**	**$ 180,764,756**	**$ 132,291,583**	**$ 48,473,172**	**$ 180,764,756**

11.4 AVAILABLE CAPITAL FUNDING RESOURCES

Feasible long-term capital funding strategies should be defined to ensure adequate resources are available to fund the CIP identified in this Plan. In addition to the Utility's resources such as accumulated cash reserves, capital revenues, bond proceeds and system development charges, capital needs can also be met from outside sources such as grants, low-interest loans, and bond financing. The following is a summary of Internal Utility Resources, Government Programs & Resources, and Public Debt Financing.

11.4.1 Internal Utility Resources

Utility resources appropriate for funding capital needs include accumulated cash in the capital "account", bond proceeds and capital revenues, such as system development charges. Capital-related revenues are discussed below.

Utility Funds and Cash Reserves

User charges (rates) paid by the utility's customers are the primary funding source for all utility activities. The rates cover total annual costs associated with operating and maintaining the water system. Rates can pay for capital improvement projects in two ways: either paying for debt service or directly paying for capital projects. Although funding the capital costs directly through rates does not result in the additional interest expense associated with issuing debt, this approach can cause large and/or volatile rate increases.

System Development Charges

A SDC, as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connection to the utility system. The purpose of the SDC is two-fold: (1) to promote equity between new and existing customers; and (2) to provide a source of revenue to fund capital projects. Equity is served by providing a vehicle for new customers to share the cost of infrastructure investment. SDC revenues provide a source of cash flow used to support utility capital needs; revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects.

In the absence of a SDC, growth-related capital costs would be borne in large part by existing customers. In addition, the net investment in the utility already collected from existing customers, whether through rates, charges, and/or assessments, would be diluted by the addition of new customers, effectively subsidizing new customers with prior customers' payments. To establish equity, a SDC should recover a proportionate share of the existing and future infrastructure costs from a new customer. From a financial perspective, a new customer should become financially equivalent to an existing customer by paying the SDC.

Table 11.6 summarizes the City's current SDC schedule.

Table 11.6 Current System Development Charge Schedule
Comprehensive Water Plan
City of Auburn

Meter Sizes (Inches)	SDC
3/4" or less	$2,424
1"	$4,048
1 1/2"	$8,072
2"	$12,920
3"	$24,240
4"	$40,408
6"	$80,792
8"	$129,280
10"	$135,971

A recent SDC study has been completed and City Council is currently evaluating the updated charges.

Local Facilities Charge

While a SDC is the manner in which new customers pay their share of general facilities costs, local facilities funding is used to pay the cost of local facilities that connect each property to the system infrastructure. Local facilities funding is often overlooked in a rate forecast, because it is funded upfront by either connecting customers, developers, or through an assessment to properties - but never from rates. Although these funding mechanisms do not provide a capital revenue source toward funding CIP costs, a discussion of these charges is included in this chapter because of their impact on new customers.

There are several mechanisms that can be considered toward funding local facilities. One of the following scenarios typically occurs:

- The utility charges a connection fee based on the cost of the local facilities (under the same authority as the SDC);
- A developer funds extension of the system to their development and turns those facilities over to the utility (contributed capital); or
- A local assessment is set up called a Utility Local Improvement District (ULID/LID) which collects tax revenue from benefited properties.

A Local Facilities Charge (LFC) is a variation of the system development charge authorized through RCW 35.92.025. It is a city-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of main “fronting” a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and, as such, can accumulate up to 10 years of interest. It typically applies to instances where no developer-installed facilities are needed through developer extension due to the prior existence of available mains already serving the developing property.

The Developer Extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the SDC required and must be built to City standards. The City is authorized to enter into developer extension agreements under RCW 35.91.020. Part of the agreement between the City and the developer for the developer to extend service might include a late-comer agreement, resulting in a late-comer charge to new connections to the developer extension.

Latecomer Charges are a variation of developer extensions whereby a new customer connecting to a developer-installed improvement makes a payment to the City based on their share of the developers cost (RCW 35.91.020). The City passes this on to the developer who installed the facilities. This is part of the developer extension process, and defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement is in effect for a period of 20 years, unless a longer duration is approved by the City.

LID/ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities (RCW 35.43.042). Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected by a majority of property ownership within the assessment district boundary.

11.4.2 Government Programs & Resources

Grants and Low Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State utilities are available from various Washington State Departments. Grant and loan programs that the City might be eligible for are described in greater detail below.

Department of Commerce

A September 2014 document from the Department of Commerce summarizes various loan and grant programs available ("Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects", found at http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf). A few of those programs are described below:

1. **Community Economic Revitalization Board (CERB)**

CERB, a division of the Washington State Department of Commerce, primarily offers low cost loans; grants are made available only to the extent that a loan is not reasonably possible. The CERB targets public facility funding for economically disadvantaged communities, specifically for job creation and retention. Priority criteria include the unemployment rates, number of jobs created and/or retained, wage rates, projected private investment, and estimated state and local revenues generated by the project. According to their website, "CERB funds a variety of projects that create jobs including (but not limited to) domestic and industrial water, storm and sewer water projects, telecommunications and port facilities." Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes and municipal corporations.

Funding details for the 2013 – 2015 Program are as follows per the Washington Commerce website: "$9 million was appropriated to CERB for the 2013-2015 Biennium. By state law, CERB must award 75% of this funding to projects in rural counties. The Board has also allocated $2,182,500 to be available for construction and planning grants on a first-come, first-served basis."

Program	Funding Limitations
Committed Private Sector Partner Construction	• $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 20% cash match required (minimum, percent of total project cost)
Prospective Development Construction	Available to rural communities only. • $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 50% cash match required (minimum, percent of total project cost)
Planning/Economic Feasibility Studies	• $50,000 grant per project award limit • 25% cash match required (minimum, percent of total project cost)

Further details are available at:

- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/
- http://www.commerce.wa.gov/Documents/2013-15_Policies.pdf
- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/Pages/CERB-Traditional-Programs.aspx

2. **Public Works Board (PWB) Financial Assistance**

The Board's goal is to provide community access to financial and technical resources that help sustain local infrastructure. Cities, towns, counties, and special purpose districts are eligible to receive financial assistance for qualifying projects. When funding is available, the following tools are accessible:

- Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Construction/Pages/default.aspx
  - Funding Cycle: Per the Board website, the Governor's proposed 2015-17 budget offers $69.7M for 19 projects.
  - Program Description: Low-interest loans for local governments to finance public infrastructure construction and rehabilitation. Eligible projects must improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.
  - Terms: For non-distressed communities, a term of five years or less has an interest rate of 1.28% and a term from six to twenty years has an interest rate of 2.55%

- Pre-Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Pre-Construction/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Pre-construction loan program for the 2013-15 biennium.
  - Program Description: Local governments may apply for low interest loans to finance pre-construction activities to prepare a project for construction.
  - Terms: Terms are limited to a five year repayment period (the loan term may be converted to 20-years once the project has secured construction funding) with a 1% interest rate.
- Emergency Loan Program: http://www.pwb.wa.gov/financial-assistance/Emergency-Loan/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Emergency loan program for the 2013-15 biennium.
  - Program Description: The Emergency Loan Program provides funding to address public works emergencies, thereby helping provide immediate restoration of critical public works services and facilities.
  - Terms: Funds are limited to $500,000 per jurisdiction per biennium, and come with a 20-year term (or the life of the project), and a 3% interest rate. No local match is required.
- Energy and Water Efficiency Loan Program: http://www.pwb.wa.gov/financial-assistance/Energy-Water/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Energy and Water Efficiency (EWE) loan program for the 2013-15 biennium.
  - Program Description: The EWE program is designed to encourage energy, water, and efficiency upgrades to existing infrastructure by providing low-cost loans.
  - Terms: The maximum loan amount is $1,000,000. The interest rate is dependent upon the term of the loan. Loans less than 5 years receive a 0.50% rate. Loans between 5 and 10 years receive a 1% interest rate. Loans between 11 and 20 years receive a 1.50% interest rate.
- Drinking Water State Revolving Fund Loan Program: http://www.pwb.wa.gov/financial-assistance/Drinking-Water/Pages/default.aspx
  - Funding Cycle: The DWSRF program has shifted their application cycle to fall, starting September 1, 2014.
  - Program Description: The DWSRF loan program is a federal and state partnership program to provide low-interest loans to finance projects that increase public health protection. A 2012 Washington State law requires all public water systems that receive loans or grants for infrastructure to complete an Investment Grade Efficiency Audit (IGEA). This is an effort to apply energy

efficiency to water systems, similar to DOH's Green Projects that was started in 2009, and may be financed as part of the DWSRF loan.

– Terms: For construction loans, interest rates range from 1% to 1.5% with loan repayment periods of 20 years or life of the project being financed, whichever is less.

Further general resources are available at:

- http://www.pwb.wa.gov/financial-assistance/Pages/default.aspx
- http://www.pwb.wa.gov/Documents/FINAL-MASTER-GUIDELINES.pdf
- http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

11.4.3 Public Debt Financing

General Obligation Bonds

General obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

RCW 39.36.020 states:

> *"(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.*
>
> *(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein."*

While bonding capacity can limit availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs; and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds

Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the

City's other revenue sources. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The City agrees to satisfy these requirements by ordinance as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

11.4.4 Capital Resource Funding Summary

An ideal funding strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume bond financing to meet needs above the utility's available cash resources. G.O. bonds may be useful for special circumstances, but since bonding capacity limits are most often reserved for other City (non-utility) purposes, revenue bonds are a more secure financing mechanism for utility needs. The Capital Financing Strategy developed to fund the updated CIP follows the funding priority below:

1. Available grant funds and/or developer contributions
2. Interest earnings on allocated fund balances
3. Other miscellaneous capital resources
4. Annual revenue collections from SDCs
5. Annual transfers of rate-funded capital or excess cash (above minimum balance targets) from operating accounts
6. Accumulated capital cash reserves
7. Revenue bond financing

11.5 FINANCIAL FORECAST

The Financial Forecast, or revenue requirement analysis, forecasts the amount of annual revenue that needs to be generated by rates throughout the Short Term planning horizon (2015 to 2021). The analysis incorporates operating revenues, O&M expenses, debt service payments, rate funded capital needs, and any other identified revenues or expenses related to utility operations, and determines the sufficiency of the current level of rates. Revenue needs are also impacted by debt covenants (typically applicable to revenue bonds) and specific fiscal policies and financial goals of the utility. For this analysis, two revenue sufficiency "tests" have been developed to reflect the financial goals and constraints of the utility: (1) cash needs must be met; and (2) debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met:

Cash Test

The cash flow test identifies all known cash requirements for the utility in each year of the planning period. Capital needs are identified and a capital funding strategy is established. This may include the use of debt, cash reserves, outside assistance, and rate funding. Cash requirements to be funded from rates are determined. Typically, these include O&M expenses, debt service payments, system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the utility are then compared to total operating revenues (under current rates) to forecast annual revenue surpluses or shortfalls.

Coverage Test

The coverage test is based on a commitment made by the City when issuing revenue bonds. For purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City is required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other utility expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply no additional cushion is required. A 1.25 coverage factor means revenues must be sufficient to pay O&M expenses, annual revenue bond debt service payments, plus an additional 25% of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any utility purpose, including funding capital projects. The existing coverage requirement policy on the City's outstanding revenue bonds is 1.25 times bond debt. In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met – the test with the greatest deficiency drives the level of needed rate increase in any given year.

The financial forecast projects the amount of operating and capital expenditures to determine the annual amount of revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements of the system. In addition to annual operating costs, the revenue of the utility must also meet debt covenant requirements and minimum reserve level targets.

11.5.1 Financial Forecast

The financial forecast is developed from the City's adopted 2015-16 biennial budget documents along with other key factors and assumptions to develop a complete portrayal of the water utility annual financial obligations. The forecast covers the Short Term horizon, 2015 to 2021. The following is a list of the key revenue and expense factors and assumptions used to develop the forecast:

Revenue & Fund Balance Assumptions

- Customer Growth and Demand: Based on a review of six years of historical data, annual customer account growth has averaged 1.21%. Annual volume per account is projected to decline at 1% per year until estimated usage per account aligns with the engineer's Low Demand Scenario of 172 gallons per day per equivalent residential unit (expected to occur in 2027). An analysis of historical volume data supports the assumption that usage per unit will decline from current levels. The net effect of 1.21% customer account growth and 1% decline in usage per account results in a composite retail rate revenue increase of 0.5% per year.
- Adopted Rate Increases: The City adopted rate increases through 2017 of roughly 3.5% per year, which are incorporated into the revenue figures in the forecast. The analysis shows that through 2017, no additional rate increases are needed above the adopted levels.
- Wholesale water revenues are assumed to decrease by nearly $50,000 in 2015, assuming the recommended wholesale rates from a 2014 study are implemented. Future wholesale revenues are projected to increase with an annual CPI adjustment. Miscellaneous revenues are conservatively assumed to stay at their currently budgeted levels. Miscellaneous revenues include late penalties, water applications, rents & leases, etc. The BAB subsidy for the 2010 Revenue Bond is expected to gradually decline in proportion to the annual decline in interest expense.
- Fund balances are based on the estimated beginning balance in 2015 for Fund 430. Depending on resource availability, the balance was allocated to the "accounts" using the following methodology:
  - Debt Reserve: Amount equal to highest annual debt service on existing debt
  - Operating Reserve: Amount equal to the operating reserve target of 90 days
  - Capital Reserve: Remaining funds

  The estimated beginning fund balance in 2015 was approximately $4.5 million, which is enough to fully fund the debt reserve, and provide 76 days in the operating reserve. No resources were available to fund the capital reserve using the defined methodology.
- Interest earnings initially assume a rate of 0.09% applied to beginning of year cash balances based on existing Local Government Investment Pool rates, phasing towards 0.25% over the long term.

Expenditure Assumptions

- General operating expenses are escalated from the budgeted figures at 2.5% per year; labor costs increase at 2.5% per year; and benefits at 5.5% per year.
- State taxes are calculated based on prevailing tax rates.
- Existing debt service schedules were provided by the City and include three existing revenue bond issues as well as four Public Works Trust Fund loans. These obligations represent nearly $2.3 million in annual debt service principal and interest payments in 2015.
- Future debt service has been added as outlined in the capital funding plan. The forecast assumes a revenue bond interest rate of 4.30% based on prevailing rates, as well as an issuance cost of 1% with a 20-year term. City policy dictates a minimum debt service coverage requirement of 1.25.

The rate strategy focuses on the Short Term period. The City should review the proposed rates and rate assumptions annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 11.7 summarizes the annual revenue requirement for the Short Term planning horizon based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Table 11.7	**Financial Forecast Comprehensive Water Plan City of Auburn**							
Revenue Requirements	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Assuming Existing Rates:								
Revenue								
Rate Revenues	$ 12,071,396	$ 12,551,796	$ 13,052,630	$ 13,574,815	$ 13,640,474	$ 13,706,451	$ 13,772,746	$ 13,839,363
Non-Rate Revenues	1,071,265	1,293,870	1,116,441	1,127,924	1,141,527	1,155,615	1,169,311	1,183,237
Total Revenue	**$ 13,142,661**	**$ 13,845,666**	**$ 14,169,071**	**$ 14,702,739**	**$ 14,782,001**	**$ 14,862,065**	**$ 14,942,057**	**$ 15,022,600**
Expenses								
Cash Operating Expenses	$ 10,421,745	$ 10,863,101	$ 10,992,073	$ 11,331,416	$ 11,626,816	$ 11,931,862	$ 12,246,988	$ 12,572,590
Existing Debt Service	2,270,041	2,267,061	1,988,072	2,186,555	2,183,681	1,995,274	1,989,408	1,902,806
New Debt Service	-	425,480	525,457	806,453	1,370,215	1,960,593	2,394,977	2,839,260
Rate-Funded System Reinvestment	-	120,135	244,751	353,399	392,784	414,582	551,341	543,002
Additions to Operating Reserve	-	-	-	-	139,001	75,217	69,451	88,536
Total Expenses	**$ 12,691,785**	**$ 13,675,777**	**$ 13,750,352**	**$ 14,677,822**	**$ 15,712,498**	**$ 16,377,528**	**$ 17,252,165**	**$ 17,946,194**
Cash Surplus / (Deficiency)	$ 450,876	$ 169,889	$ 418,719	$ 24,917	$ (930,497)	$ (1,515,463)	$ (2,310,108)	$ (2,923,594)
Annual Rate Adjustment		**0.00%**	**0.00%**	**0.00%**	**7.75%**	**4.47%**	**5.77%**	**4.16%**
Cumulative Annual Rate Adjustment		**0.00%**	**0.00%**	**0.00%**	**7.75%**	**12.57%**	**19.07%**	**24.01%**
After Rate Increases:								
Rate Revenues	$ 12,071,396	$ 12,551,796	$ 13,052,630	$ 13,574,815	$ 14,698,205	$ 15,429,135	$ 16,398,735	$ 17,162,724
Net Cash Flow	450,900	169,900	418,700	24,900	139,000	75,200	69,500	88,500
Debt Service Coverage - Revenue Bonds	2.16	1.88	1.90	1.83	1.73	1.54	1.52	1.45
Debt Service Coverage - All Debt	1.62	1.49	1.68	1.49	1.46	1.40	1.39	1.37

The last two rows of Table 11.7 show the projected debt service coverage for both bonded debt and total debt. Bonded debt service coverage—which legally cannot drop below 1.25—is projected to stay at or above 1.45 throughout the life of the forecast. Debt service coverage for total debt (including state loans) is recommended to be at least 1.0, and throughout the life of this forecast, it is projected to stay at or above 1.37.

In 2012, the City Council adopted annual rate increases of 3.5% in 2015, 2016, and 2017. This analysis shows that the adopted rates will generate sufficient revenue to meet operating expenses and the utility policy goals as discussed herein for the 2015 to 2017 period. Based on the assumptions in the forecast, no incremental rate increases (above adopted amounts) are needed through 2017.

Rate increases averaging just above 5.5% per year are needed in 2018 and beyond to cover projected O&M expenses, debt service payments, system reinvestment funding, coverage requirements, and other stated financial policy objectives.

11.5.2 City Funds and Reserve Balances

Table 11.8 shows a summary of the projected ending City operating, capital and debt reserve balances through 2021. The operating reserve ends at 90 days of operating expenditures; the capital reserve ends at $1.5 million, which is below the target of $1.6 million, but within an acceptable range; and the debt reserve ends at $4.6 million, which is enough to cover one year of annual debt service.

Table 11.8 **Cash Balance Summary**
Comprehensive Water Plan
City of Auburn

Ending Reserves	2014	2015	2016	2017	2018	2019	2020	2021
Operating	$ 2,569,745	$ 2,429,591	$ 2,702,969	$ 2,727,885	$ 2,866,886	$ 2,942,103	$ 3,011,555	$ 3,100,091
Capital	2,499,930	905,917	1,115,372	1,113,581	1,188,974	1,248,685	1,425,113	1,458,613
Debt	2,270,041	2,692,541	2,517,617	2,798,613	3,362,376	3,768,561	4,202,945	4,564,503
Total	**$ 7,339,716**	**$ 6,028,050**	**$ 6,335,958**	**$ 6,640,079**	**$ 7,418,237**	**$ 7,959,350**	**$ 8,639,613**	**$ 9,123,207**

11.6 EXISTING RATE STRUCTURE & PROJECTED SCHEDULE

The City's existing retail water rate structure for inside-City customers is comprised of nine rate classes. The retail rate schedule for the single-family residential customer class consists of a base monthly charge and a three-tiered increasing block volume rate structure based upon the amount of water consumed as measured in 100 cubic feet increments (ccf). The retail rate schedule for non-single family residential customer classes consist of a base monthly charge and a single volume rate based upon the amount of water consumed as measured in ccf. The City also has wholesale contracts to provide water service to the City of Algona and Water District #111.

Retail water utility customers residing outside of the City's political boundaries are assessed charges based upon the inside-City rate schedule plus a 50% premium (ACC 13.06.360). Low-income single-family residential customers are provided a 50% discount to the rates presented. To qualify for a low-income discount, a customer must be 62 years of age or older and meet low-income guidelines as defined by the US Department of Housing and Urban Development (ACC 13.24 and 13.24.030).

The City's current increasing block rates for residential customers adequately address water conservation goals within the rate structure, consistent with the state's guidelines for a rate structure that encourages water demand efficiency (WAC 246-290-100).

A recent detailed review of the City's rate structure has been completed in the 2014 Retail Rate Study and, among other items, recommends the following adjustments:

- Combine the "Schools" and "City Accounts" (non-irrigation) classes within the existing "Commercial" class
- Incorporate cost of service adjustments between various customer classes
- Revise base charge to increase with size of meter (future study)

Table 11.9 presents the City's existing retail water rate schedule for each customer class under the adopted rates through 2017. No rate increases above adopted levels are necessary through 2017. The table then incorporates necessary rate increases starting in 2018 and continuing through 2021.

Table 11.9 Projected Rate Schedule
Comprehensive Water Plan
City of Auburn

Monthly Rate Schedule Water Utility	Existing 2014	Adopted 2015	Adopted 2016	Adopted 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021
Annual:		0.0%	0.0%	0.0%	7.8%	4.5%	5.8%	4.2%
Cumulative:		0.0%	0.0%	0.0%	7.8%	12.6%	19.1%	24.0%
Single Family								
Base Rate	$14.54	$15.05	$15.57	$16.12	$17.37	$18.15	$19.19	$19.99
1-7 CCF Rate	$2.88	$2.99	$3.09	$3.20	$3.45	$3.60	$3.81	$3.97
7.01-15 CCF Rate	$3.53	$3.65	$3.78	$3.91	$4.21	$4.40	$4.66	$4.85
15.01+ CCF Rate	$4.01	$4.15	$4.29	$4.44	$4.78	$5.00	$5.29	$5.51
Non-Single Family								
Multifamily - Base	$43.33	$44.85	$46.42	$48.04	$51.77	$54.08	$57.20	$59.58
Multifamily - CCF	$3.02	$3.13	$3.24	$3.35	$3.61	$3.77	$3.99	$4.15
Commercial - Base	$43.33	$44.85	$46.42	$48.04	$51.77	$54.08	$57.20	$59.58
Commercial - CCF	$3.45	$3.57	$3.69	$3.82	$4.12	$4.30	$4.55	$4.74
Manufacturing - Base	$43.33	$44.85	$46.42	$48.04	$51.77	$54.08	$57.20	$59.58
Manufacturing - CCF	$2.80	$2.90	$3.00	$3.11	$3.35	$3.50	$3.70	$3.86
Schools - Base	$43.33	$44.85	$46.42	$48.04	$51.77	$54.08	$57.20	$59.58
Schools - CCF	$3.26	$3.38	$3.50	$3.62	$3.90	$4.07	$4.31	$4.49
City Accounts - Base	$43.33	$44.85	$46.42	$48.04	$51.77	$54.08	$57.20	$59.58
City Accounts - CCF	$4.01	$4.15	$4.29	$4.44	$4.78	$5.00	$5.29	$5.51
Irrigation - Base	$14.62	$15.13	$15.66	$16.21	$17.47	$18.25	$19.30	$20.10
Irrigation - CCF	$4.01	$4.15	$4.29	$4.44	$4.78	$5.00	$5.29	$5.51
Algona - Base	$68.47	$70.86	$73.34	$75.91	Per Contract			
Algona - CCF	$2.24	$2.32	$2.40	$2.48	Per Contract			
WD #111 - Base	$175.00	$175.00	Per Contract					
WD #111 - CCF	$0.97	$0.99	Per Contract					

Low Income Discount: 50%
Outside City Multiplier: 1.50

Algona & WD#111 rates subject to change pending the 2014 Wholesale Rate Study
Rate increases for 2018-2021 are assumed to be applied "across-the-board"

11.7 AFFORDABILITY

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

According to City staff, the median household income for the City of Auburn in 2012 was $49,996. This figure was inflated to $51,810 at 2014 levels assuming annual Consumer Price Index adjustments. Table 11.10 presents the City's estimated single family water rate with the projected rate increases for the forecast period. The affordability mark (Monthly Bill*12 ÷ Median Income) averages 0.86% throughout the study period. As shown in the following table, the City's water rates remain well within the affordability range throughout the planning horizon.

Table 11.10 below presents the results of the affordability test.

Table 11.10 Affordability Test
Comprehensive Water Plan
City of Auburn

Year	Inflation	Median HH Income	Projected Monthly Bill	% of Median HH Income
2014	2.50%	$51,810	$34.70	0.80%
2015	2.50%	$53,106	$35.98	0.81%
2016	2.50%	$54,433	$37.20	0.82%
2017	2.50%	$55,794	$38.52	0.83%
2018	2.50%	$57,189	$41.51	0.87%
2019	2.50%	$58,619	$43.36	0.89%
2020	2.50%	$60,084	$45.86	0.92%
2021	2.50%	$61,586	$47.77	0.93%

Note: Assumes single family 3/4", 7 ccf per month.

11.8 CONCLUSION

The analysis indicates that the adopted rates in 2015, 2016, and 2017 are sufficient to meet the utility financial obligations as presented in this forecast. No additional increases are proposed for 2015 through 2017. Based on the forecast, required rate increases for 2018 through 2021 average about 5.5% per year, for a cumulative increase of 24.0%.

This evaluation also finds that the water rates with projected rate increases would remain within the defined threshold of affordability.

OPERATIONS AND MAINTENANCE

12.1 INTRODUCTION

This chapter provides an overview of the City of Auburn's (City) Water Utility organization and operation. The purpose of the chapter is to document existing procedures and to identify areas where improvements or changes could enhance system operation.

12.2 WATER SYSTEM MANAGEMENT & PERSONNEL

12.2.1 Mission Statement

The mission statement of the City's Water Utility is to provide for the efficient, environmentally sound and safe management of the existing and future water system within the City's service area.

12.2.2 Department Overview

The Water Utility is responsible for providing potable water to the City's customers that meets or exceeds the recognized standards of today and in the future by efficiently administering, operating and maintaining the water supply. The Water Utility will also continue to enhance its customer service through public education and information. A primary responsibility of the Water Utility is implementing the Comprehensive Water Plan (Plan).

12.2.3 Internal and External Factors

The objective of the Water Utility is based on compliance with internal and external factors. An internal Work Plan Overview is generated at the beginning of each work year with a review process at the end of the year. The Work Plan Overview describes budget goals, performance measures, engineering tasks, capital projects, and maintenance and operations tasks. External factors include adoption of goals, recommendations and standards established by the following regulatory or professional practice agencies:

Washington State Department of Health	(DOH)
Washington State Department of Ecology	(Ecology)
American Public Works Association	(APWA)
Association of Washington Cities	(AWC)
Department of Homeland Security	(DHS)
American Water Works Association	(AWWA)
Washington Cities Insurance Authority	(WCIA)
Municipal Research and Services Center of Washington	(MRSC)
United States Environmental Protection Agency	(USEPA)

12.2.4 Water Utility Division Organization

The Auburn Water Utility is operated as a utility enterprise under the direction of the Community Development & Public Works (CDPW) Director. The CDPW Department is responsible for planning, design, construction, operation, maintenance, quality control, and management of the water system. Within the CDPW Department, Engineering Services has the responsibility for comprehensive water system planning, development of a Capital Improvement Program (CIP), as well as programming the design, construction and inspection of projects related to the water system and is under the direction of the CDPW Director and the Assistant Director of Engineering/City Engineer.

The Operations Services of the CDPW Department is responsible for the day-to-day management of the Utility and is under the direction of the CDPW Director, the Assistant Director of Public Works Operations, the Water Manager, the Water Operations Supervisor, and the Water Distribution Supervisor. The Water Division operates and maintains the water system, performing daily operation and inspection, water quality monitoring as required by DOH and line management of the Water Utility.

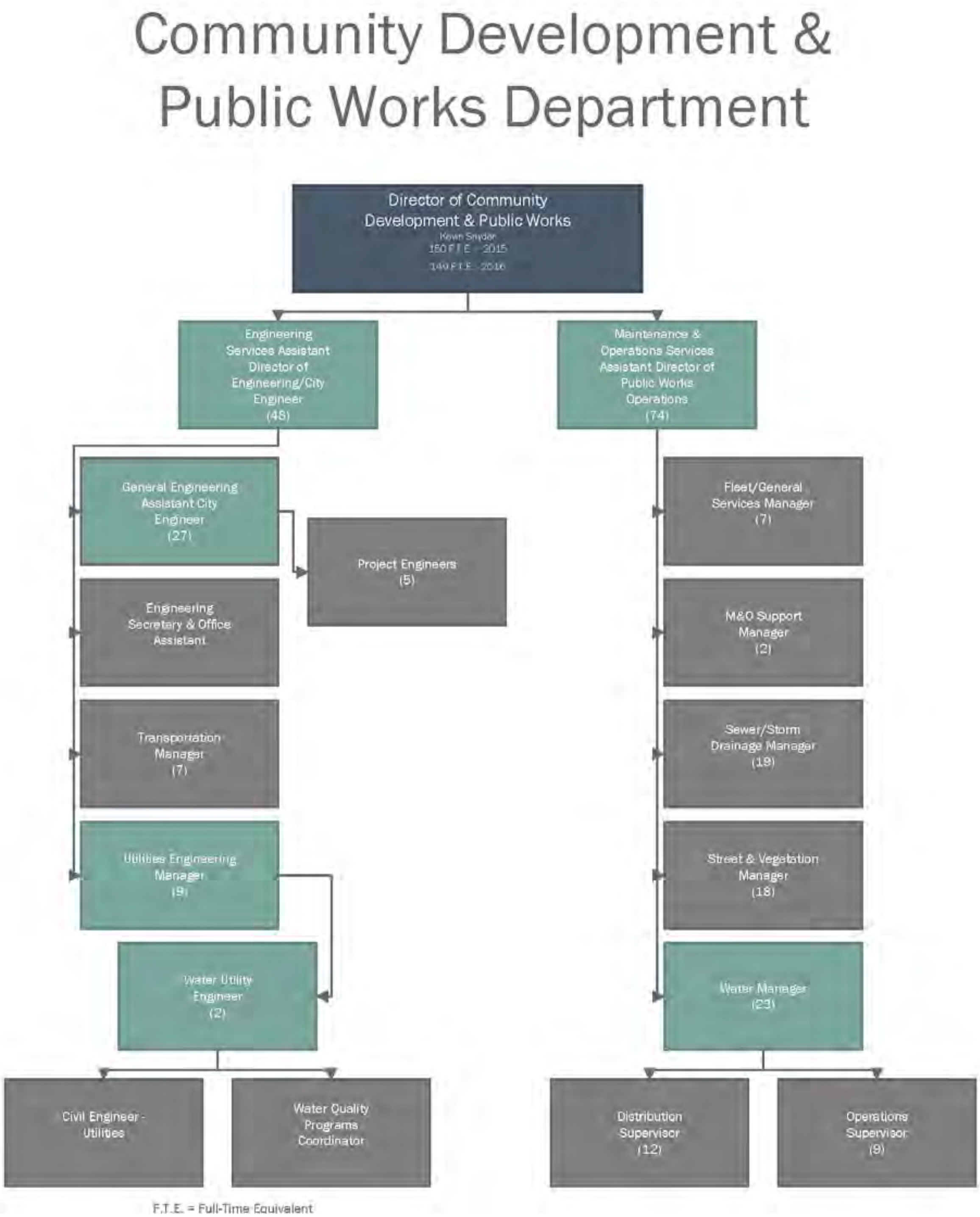
The Assistant Director of Public Works Operations is designated as the manager of the Water Manager. The Water Manager is designated as the manager of the Water Operations Supervisor and the Water Distribution Supervisor. The Water Manager is designated as the individual responsible for the water system Maintenance & Operations (M&O) staff. The organization of the Water Utility is shown on Figure 12.1. The water division technical support staff from Engineering Services is listed in Table 12.1. The responsibilities of each of the water division technical support staff are summarized below:

- Utilities Engineering Manager and Water Utility Engineer: Are primarily responsible for development of the comprehensive water plans, water capital facility plan, annual project budgeting, technical design, and construction standards, “as-built” drawings, and designs, utilized in the construction of the water systems facilities. They also provide technical computations, water modeling and other analysis required to support system operation. Additional responsibilities include engineering, consultant contracts, capital projects planning, and customer assistance with City code, drawings and permits.
- Water Quality Program Coordinator: Provides assistance with the Water Quality and Water Conservation Programs.
- Capital Project Manager and Project Engineers: Are responsible for the management of the design and construction of capital projects, including consultant.

Table 12.1 Technical Support
Comprehensive Water Plan
City of Auburn

Title	Department	Division
Utilities Engineering Manager	Community Development & Public Works	Engineering
Water Utility Engineer	Community Development & Public Works	Engineering
Water Quality Programs Coordinator	Community Development & Public Works	Engineering
City Engineer/Assistant City Engineer	Community Development & Public Works	Engineering
Capital Project Manager	Community Development & Public Works	Engineering
Project Engineers	Community Development & Public Works	Engineering
Utilities Technician	Community Development & Public Works	Engineering
Utilities Civil Engineer	Community Development & Public Works	Engineering
GIS Database Staff	Innovation & Technology	GIS

- City Engineer/Assistant City Engineer: Is responsible for issuance of the City's Design and Construction Standards.
- Utilities Technician: Provides assistance with permit related activities involving connections to the water system or extensions of the water system. The Technician is also responsible for customer inquiries and assistance with applications.
- Utilities Civil Engineer: Provides assistance with "as-built" drawings, designs, standards, specifications, and customer assistance regarding projects.
- Geographic Information System (GIS) Database Specialists: Transfer data from "as-built" drawings to the GIS database. GIS is a mapping software program that records and locates infrastructure related to the water system. The Specialists are also responsible for provision of maps and statistics to staff within the CDPW Department.



AUBURN WATER UTILITY ORGANIZATION

FIGURE 12.1

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

Personnel lists for Engineering and M&O staff that are responsible for daily operations are shown on Table 12.2and Table 12.3. Operations staff provide daily operations and maintenance of wells, corrosion control treatment facilities, pump stations, and reservoirs. They also implement the cross connection control program and provide locating services for all City utilities. Distribution staff maintains the complete distribution system including water mains, valves, hydrants, and meters, and reads meters for billing.

Auburn has a mayor-council form of government, therefore, the CDPW Director reports to the Mayor. The City Council provides oversight of the Water Utility regarding policy, planning and management of the water system.

12.2.5 Communication System

The City maintains a robust communication system to contact Water Utility personnel during normal work hours and after hours. This system is necessary to respond to customer requests, routine maintenance or emergency situations. Maintenance staff vehicles and other rolling stock are all equipped with radios and personnel carry cellular phones. The Water Utility also has access to an inventory of portable emergency use radio units should they be required.

A Standby Call-Out Program was initiated in 2006 to ensure that coverage for after-hour response was guaranteed. One staff member in Operations and one staff member in Distribution always carry a dedicated cell phone during their off hours. Standby duration runs for one week before responsibility is rotated to the next staff member on the roster.

Water problems involving service leaks, quality issues, main breaks, broken hydrants, etc. that occur outside normal working hours are reported through the City's 911 emergency response system. An "Emergency Call-Out List" is provided to the emergency operators who will attempt to contact the designated standby Water Distribution or Water Operations employee based on the type of service required. If contact cannot be made, the 911 operator will try to make contact with the Water Manager. If contact is not made, the operator will contact the designated Standby Public Works Maintenance and Operation Supervisor.

Table 12.2 Operations Staff
Comprehensive Water Plan
City of Auburn

Position	Primary Function(s)	Certification(s)[1]	Certificate Number
Water Operations Supervisor	Management	WDM-3 CCS WTPO	5651 5651 5651
Cross Connection Control Specialist	Cross Connection Control Backflow Assembly Tester	CCSBAT WDM-1	10503 B4690 10503
Cross Connection Control Specialist	Cross Connection Control Backflow Assembly Tester	CCS BAT WDM-1	11600 B5779 11600
Distribution Specialist	Distribution Operations Maintenance	WDM-4 WDS CCS	3969 3969 3969
Distribution Specialist	Distribution Operations Maintenance	WDM-4 WTPO BAT	6961 6961 B3821
Maintenance Worker II	Operations Maintenance	N/A	N/A
Maintenance Worker II	Operations Maintenance	N/A	N/A
Maintenance Worker II	Operations Maintenance	N/A	N/A
Water Manager	Management	CCS WTPO WDM-3 BAT	9698 9698 9698 B3817
Assistant Director of Public Works Operations	Management	WDM-3 WDS CCS	4742 4742 4742
Water Utility Engineer	Management	WDM-4	13490

Notes:
(1) WDM-4 = Water Distribution Manager 4
WDM-3 = Water Distribution Manager 2
WDM-2 = Water Distribution Manager 2
WDM-1 = Water Distribution Manager 1
WDS-2 = Water Distribution Specialist
CCS - Cross-Connection Specialist
BAT = Backflow Assembly Tester
WTPO = Water Treatment Plant Operator

**Table 12.3 Distribution Staff
Comprehensive Water Plan
City of Auburn**

Position	Primary Function(s)	Certification(s)[1]	Certificate Number
Water Distribution Supervisor	Management	WDM-1	11286
Maintenance Worker II	Construction Maintenance	WDM-1 WDS CCS	9873 9873 9873
Maintenance Worker I	Maintenance	N/A	N/A
Maintenance Worker II	Construction Maintenance	N/A	N/A
Maintenance Worker II	Construction Maintenance	N/A	N/A
Maintenance Worker I	Maintenance	N/A	N/A
Maintenance Worker I	Maintenance	N/A	N/A
Maintenance Worker II	Construction Maintenance	N/A	N/A
Maintenance Worker II	Customer Service	N/A	N/A
Maintenance Worker	Meter Reader	N/A	N/A
Maintenance Worker	Meter Reader	N/A	N/A
Maintenance Worker II	Unidirectional Flushing Dead-end Flushing Valve Exercising	WDM-1	11964
Maintenance Worker II	Unidirectional Flushing Dead-end Flushing Valve Exercising	BAT	B5583
Water Manager	Management	CCS WTPO WDM-3 BAT	9698 9698 9698 B3817
Assistant Director of Public Works Operations	Management	WDM-3 WDS CCS	4742 4742 4742
Water Utility Engineer	Management	WDM-4	13490

Notes:

(1) WDM-4 = Water Distribution Manager 4
WDM-3 = Water Distribution Manager 3
WDM-2 = Water Distribution Manager 2
WDM-1 = Water Distribution Manager 1
CCS = Cross-Connection Specialist
BAT = Backflow Assembly Tester
WTPO = Water Treatment Plant Operator

There are ten staff members on the Standby List and one of them has call-out responsibility for an entire week until it rotates to the next staff member. The 10 staff on the Standby List are as follows:

- Water Manager
- Water Distribution Supervisor
- Water Operation Supervisors
- Sanitary Sewer and Storm Drainage Manager
- Sanitary Sewer Supervisor
- Storm Drainage Supervisor
- Streets and Vegetation Manager
- Street Supervisor
- Vegetation Supervisor
- Fleet/General Service Manager

There are also three other maintenance staff members on standby that can be called out as needed. The staff members are employed by Sanitary Sewer Division, Storm Drainage Division and Street Division. The 911 operator also has phone access to the other Public Works staff, if the situation warrants it.

Telemetry alarms that occur after hours are handled by an automated Supervisory Control and Data Acquisition (SCADA) alarm and an automated dialer for notification called WIN911. The SCADA alarm calls standby staff from the WIN911 list. If no one responds within 15 minutes, then WIN911 calls the Water Operations standby staff on the call out list. The system will continue to cycle through the roster of seven employees until contact is made.

12.3 OPERATOR CERTIFICATION

12.3.1 Operator Certification Program

The Washington Administrative Code (WAC) 246-292, requires minimum standards for the certification status of water operators. Also, the City has recognized the value of having a knowledgeable and well-trained staff operating the Water Utility and encourages employees to obtain the highest level of certification available. The City currently serves a population of greater than 50,000, which classifies their distribution system into a group 4 according to WAC 246-292-040.

The City pays for annual certification fees, provides time and tuition for certification training courses and allows time for certification examinations. In addition, the City provides opportunities for staff to obtain continuing education units (CEUs) to maintain certification. Professional growth requirements for certification CEUs are monitored and maintained by the Washington Certification Services. Water Utility Staff and their certifications are listed in Table 12.2 and Table 12.3 for Operations and Distribution, respectively.

12.3.2 Education and Training Program

Continuing educational opportunities are fundamental elements for staff in the Water Utility. The Water Utility training budget is funded so as to support staff in maintaining their technical awareness and skill sets. Seminars, conferences, and college coursework; 1) broaden their knowledge and; 2) allow them to network with other professionals involved in Water Utility work. Subjects include cross connection control, pumps, motors, pressure reducing valves, hydrants, chlorination, generators, forklift training, confined space, first aid, CPR, electrics, and other essential topics.

The majority of staff is tasked with specific job functions during their normal work shift and the consistent nature of the work allows them to complete their jobs in a very professional and efficient manner. However, all staff is rotated through an active cross training program to cope with employee absences such as vacation, sickness, retirement, and termination.

12.4 SYSTEM OPERATION AND CONTROL

The City's water system is comprised of booster pump stations, chlorination stations, corrosion control facilities, reservoirs, springs, and wells. These components all work together to ensure that water is available to meet customer demands. Primary operation of the water system is maintained via the SCADA computerized control system. A software program called Wonderware works in association with SCADA to provide real time graphical display of system data for staff interpretation and control. The SCADA system is often referred to as the Telemetry system based on one of the definitions of Telemetry (the science and technology of the transmission and measurement of data from a distant source). The City's SCADA system is located in the Public Works M&O Building, 1305 C ST SW and responsibility for the system falls under the Water Manager and associated staff. Some of the functions that SCADA monitors, records, and controls include the following:

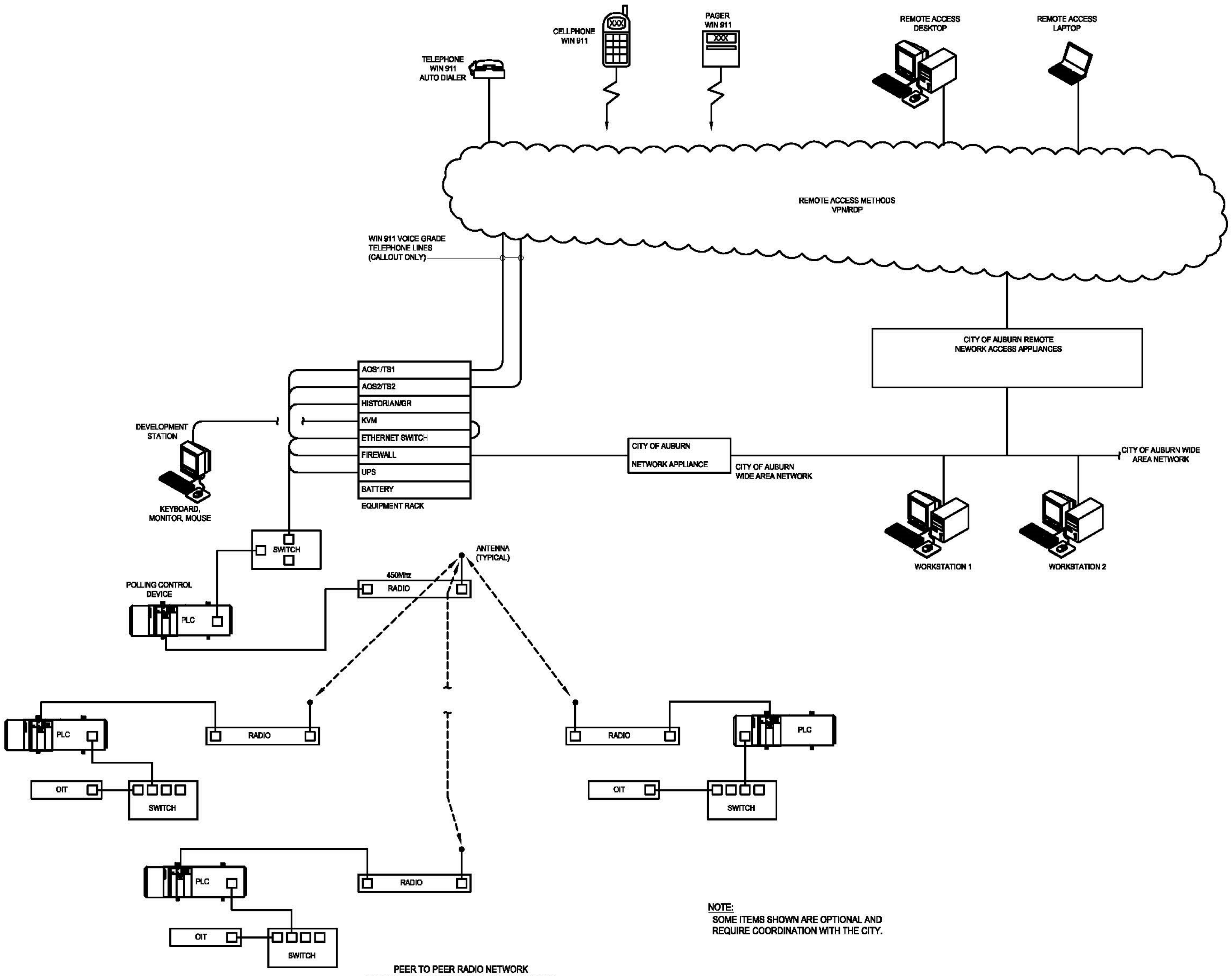
- Reservoir Levels
- Source meter production
- Pumps
- Motors
- Valves
- Chlorination

- Pressures: Low, High, Discharge, Suction
- Alarms: Intrusion, Fire, Generator Run, Low Fuel, Overflows, Failures, Turbidity

Status reports are continuously received via radio, and information regarding system demand is used to determine system activation. The SCADA system includes logic programming which automates the process; however, Operations staff can manually override most computer decisions if necessary. The alarm infrastructure is linked to WIN911 for after-hour call-out and response.

All of the data monitored by the SCADA system is electronically recorded by a computer server maintained by the Innovation & Technology (IT) Department. A back-up copy is made each evening to ensure that records are retrievable should hardware or software failures occur. SCADA records are available to all Public Works staff via the City's computer server. Access and control of the system is relegated to two dedicated computer terminals at the M&O Building.

A system overview of SCADA components and interaction is shown in Figure 12.2. The SCADA software and historical data in maintained on the City's Wide Area Network (WAN). Staff have access to the system via workstations connected to the WAN or remote network applications. A telephone connection provides the autodialer for WIN911 notification to phones or pagers. An Ethernet radio connected to the computer system at M&O Building sends and receives radio signals to/from the Programmable Logic Controllers (PLC) at the water facilities. PLCs at the facilities are also able to communicate directly with each other via radio signal.



SOFWARE LICENSE LIST

AOS1
AS PLATFORM/BOOTSTRAP
TOPSERVER

TS1
AS PLATFORM/BOOTSTRAP
INTOUCH FOR SP TSE
HISTORIAN CLIENTS
ACP THINMANAGER
TS CALS

HISTORIAN/GR
AS PLATFORM/BOOTSTRAP
HISTORIAN
AS DEVELOPMENT
MSOFFICE

AOS2
AS PLATFORM/BOOTSTRAP
TOPSERVER

TS2
AS PLATFORM/BOOTSTRAP
INTOUCH FOR SP TSE
HISTORIAN CLIENTS
ACP THINMANAGER
TS CALS

WORKSTATION 1
AS PLATFORM/BOOTSTRAP
WIN911
MSOFFICE

WORKSTATION 2
AS PLATFORM/BOOTSTRAP
WIN911
MSOFFICE

AS = WONDERWARE APPLICATION SERVER
CAL = MICROSOFT CLIENT ACCESS LICENSE

NOTE:
SOME ITEMS SHOWN ARE OPTIONAL AND
REQUIRE COORDINATION WITH THE CITY.

SCADA SYSTEM DIAGRAM

FIGURE 12.2

CITY OF AUBURN
COMPREHENSIVE WATER PLAN

The SCADA Upgrade Project, which is to be completed in 2015, has modernized the City's SCADA system. Major components were replaced throughout the system to provide more reliable communication. The new hardware, in conjunction with software upgrades, also provides additional control of the city's facilities. Upgrades to the SCADA system were completed in 2014. Physical site improvements associated with the project will be completed in 2015.

12.4.1 Inspections, Preventive Maintenance, Repairs, and Replacement

Systematic inspection of Water Utility facilities is conducted on a daily or weekly basis by Distribution Specialists under direction of the Water Operations Supervisor as summarized in Table 12.4. The inspection process serves a number of purposes as follows:

- System Confirmation - proper operation of automated control and monitoring equipment
- Sound Check - listen for unusual noises
- Well Levels - static and dynamic
- Equipment Check - pumps, motors, valves, chlorination, heaters, vents, generators, etc.
- Security Verification - intrusion, vents, hatches, locks, gates, graffiti, etc.

A portion of the maintenance tasks handled by the Operations staff are associated with a Preventive Maintenance Program and some of those activities are arranged to coincide with the Facility Inspection Schedule shown in Table 12.4. The maintenance activities are based on equipment manufacturer recommendations and maintenance staff observations for infrastructure located within and outside the facility. Preventive maintenance tasks are essential for reliable operations and preservation of investment so adherence to the program is stressed. Additional maintenance activities handled by Water Operations staff include repairs, replacement, small improvement projects, and response to customer requests. The majority of customer requests are usually associated with water quality concerns and water pressure issues. Those requests are handled by the Cross Connection Specialists due to their experience with such matters.

The Distribution staff is involved in the same activities as Water Operations staff in regard to inspection, preventative maintenance, repairs, replacement, and response to customer requests. Water Distribution staff customer request activities are usually in response to damage or leaks involving mainlines, service laterals, meters, meter boxes, and hydrants. Other Distribution tasks include fire flow testing, system flushing, meter installation, and miscellaneous small improvement projects.

Table 12.4 Water Operations - Facility Inspection Schedule
Comprehensive Water Plan
City of Auburn

Type of Facility	Facility Name	Daily Inspection 5 Day Workweek	Weekly Inspection
Booster Pump Station	Academy Booster Pump Station	X	
Booster Pump Station	Lea Hill Booster Pump Station	X	
Booster Pump Station	Terrace View Booster Pump Station	X	
Booster Pump Station	Lakeland Hills Booster Pump Station	X	
Booster Pump Station	Green River Booster Pump Station	X	
Booster Pump Station	Lea Hill Intertie Booster Pump Station	X	
Booster Pump Station	Academy East Booster Pump Station	X	
Booster Pump Station	Braunwood Booster Pump Station	X	
Booster Pump Station	Wilderness Game Farm Park Booster Pump Station		X
Chlorination Station	Lea Hill Intertie Booster Pump Station (Re-chlorination)	X	
Chlorination Station	Terrace View Booster Pump Station (Re-chlorination)	X	
Chlorination Station	Coal Creek Springs - Gas	X	
Chlorination Station	West Hill Springs - Gas	X	
Chlorination Station	Well 3A – Gas (when well is in operation)	X (when on)	X (when off)
Chlorination Station	Well 3B – Gas (when well is in operation)	X (when on)	X (when off)
Chlorination Station	Well 4 - Gas	X	
Chlorination Station	Fulmer Field Corrosion Control Facility – Onsite Generated Hypochlorite (treats Well 2, 6, and 7 sources)	X	
Chlorination Station	Well 5A - Gas	X	
Chlorination Station	Braunwood Well - Gas	X	
Corrosion Control Facility	Howard Road Corrosion Control Facility (treats Coal Creek Springs source)	X	
Corrosion Control Facility	Fulmer Field Corrosion Control Facility (treats Well 2, 6 and 7 sources)	X	
Treatment Facility	Well 5B (treats iron and manganese)		Off-line
Reservoir	Reservoir 1	X	
Reservoir	Reservoir 2	X	

Table 12.4 Water Operations - Facility Inspection Schedule Comprehensive Water Plan City of Auburn			
Type of Facility	**Facility Name**	**Daily Inspection 5 Day Workweek**	**Weekly Inspection**
Reservoir	Lea Hill Reservoirs 4A & 4B (2 storage tanks)	X	
Reservoir	Academy Reservoir 8A & 8B (2 storage tanks)	X	
Reservoir	Lakeland Reservoir 5	X	
Reservoir	Lakeland Reservoir 6	X	
Reservoir	Braunwood Reservoir	X	
Spring	Coal Creek Springs	X	
Spring	West Hill Springs	X	
Well	Well 1 (usually off)	X (when on)	X (when off)
Well	Well 2		Off-line
Well	Well 3A (usually off)	X (when on)	X (when off)
Well	Well 3B (usually off)	X (when on)	X (when off)
Well	Well 4	X	
Well	Well 5	X	
Well	Well 5A	X	
Well	Well 5B (usually off)		Off-line
Well	Well 6	X (when on)	X (when off)
Well	Well 7	X (when on)	X (when off)
Well	Braunwood Satellite Well	X	
Intertie	Tacoma B Street Intertie		X
Intertie	Tacoma 132nd Avenue Intertie		X

12.4.2 Reservoir Maintenance

Reservoirs are a fundamental part of the water distribution system. Reservoirs act as storage and regulating devices for water flow and maintaining them in prime physical condition is an essential activity. The Water Utility began a rigorous reservoir maintenance program in 1997 and it has evolved into an annual routine function. Each year, two of the reservoirs have their interiors thoroughly inspected by a contractor experienced in reservoir maintenance. The annual inspection process is based on a rotational schedule to ensure inspection of each reservoir on a 5-year timetable.

Since the reservoirs are usually filled with water, a diver must conduct the inspection. The diver is equipped with lights and an audio/video device to record the process. Issues of concern include corrosion, cracks, and condition of coating on the walls, valve, fasteners, etc. The diver is also equipped with a vacuum unit to remove sedimentation. The contractor also gives the exterior of the reservoir a visual inspection in regard to the same elements noted for the interior of the reservoir. The recording is reviewed by the contractor, a report is generated based on the interior and exterior inspection and a copy of the report and recording are given to the Water Manager and Water Utility Engineer for review.

If the report and recording indicate that a reservoir is in need of major repair, relining or repainting, another contractor is acquired for a recommended course of action. If interior work is required, the reservoir must be drained of water. In those situations, a carefully orchestrated timetable and shifting of water resources is necessary to balance maintenance with the needs of the City's customers.

12.4.3 Pressure Reducing Valve Stations

Pressure Reducing Valve Stations (PRV) are inspected every month by Water Operations Staff. The checklist includes condition of the vault, valves, inlet pressure, outlet pressure, and pilot controls. Staff inspections are supplemented by a more thorough inspection and calibration process conducted annually by a contractor that specializes in PRVs. Repair or replacement maintenance, unless minor, is usually performed by the noted contractor. Rebuilds of PRVs is typically done every three to five years based on the re-build schedule.

12.4.4 Utility Locating Service

Two Water Utility staff are designated as the Utility Locators for all City utilities (Water, Storm Drainage, Sanitary Sewer, and Street lights and traffic signals) and additional staff may also be present to provide flagging when safety issues arise. The quantity of location requests varies on a daily basis, but averages out to a full time commitment. The Utility Locators report to the Water Operation Supervisor, but location requests may be made indirectly by the Water Distribution, Sanitary Sewer, or Storm Drainage Supervisors as necessary.

12.4.5 Hydrant Inspection

In 1999 a hydrant inspection goal was initiated. The intent was to inspect, repair, and test at least one third of the water hydrants in the system each year. The importance of this program cannot be understated since hydrants are the first defense against loss of life or property due to fire. The inspection also improves water quality due to the stagnant water that is purged from the hydrant stubs. A water de-chlorination program, in response to Ecology guidelines, was initiated in 2001 to treat water purged from hydrant stubs. The Water Distribution Supervisor has made hydrant inspection a year-round routine task of Water Utility operations. Secondary maintenance of the hydrants such as rust removal, painting, street reflector replacement, clearing obstructions, etc. is handled by seasonal part time staff when time permits.

12.4.6 Dead-end Flushing

An important component of water quality control is dead-end line flushing. The City has approximately 640 dead-end mains throughout the distribution system. The water in dead-end mains tends to stagnate due to lack of turnover and this can have a critical impact on water quality to customers in the immediate vicinity. Flushing dead-ends is the only effective way to purge the lines of stagnate water and associated particulate matter. In the year 2000, an engineering consulting firm was hired to assist the City with the development of a Dead-end Flushing Program. They examined the City's distribution system via GIS data and supplemented the study with field inspections. A comprehensive operating procedure detailing separate flushing instructions for each dead-end was developed. Maintenance staff, under the direction of the Water Distribution Supervisor, follow the program instructions and record their activities. This program has been incorporated into the Unidirectional Flushing program, see Section 12.4.8.

12.4.7 Valve Exercising

The AWWA technical manual, entitled M44 - Distribution Valves: Selection, Installation, Field Testing, and Maintenance, suggests that valve exercising should be conducted each year and more frequently for valves 16 inches and larger.

The Water Utility's Valve Exercising Program has been initiated and will continue in concert with the Unidirectional and Dead-end Flushing programs. Historically, distribution valves have only been exercised on a limited and sporadic basis. Through the Valve Exercising Program, the City's goal is to exercise 25 percent of the distribution valves each year. Note, hydrant foot valves are exercised as part of the hydrant inspection process.

Opening and closing valves by hand is a repetitive, ergonomically unsafe and time consuming task. The City has purchased a portable valve exercising machine and vacuum device to speed up removal of debris that collects in the bottom of valve boxes. Valves requiring repair or replacement are documented and corrected by City Staff or contractors.

Additionally, Distribution staff work with GIS staff to correct inaccurate valve information in the City's GIS data.

12.4.8 Unidirectional Flushing

In 2013, the City implemented a comprehensive Unidirectional Flushing (UDF) program to flush its water system. The program's goals, included

- Improving cleaning of accumulated deposits on pipes,
- Reduce water use, as compared with conventional flushing, and
- Reduce the impact on customers

The Water Distribution Supervisor is responsible for a UDF program to maintain Water Quality.

UDF concentrates flow within a pipe by closing valves and using specific hydrants to isolate each pipeline and create flow in a single direction. The concentrated flows increase velocities within the pipe that results in scouring of accumulated deposits on pipes. UDF may remove sand, gravel, plastic, biofilms, and other accumulated materials that are not removed by conventional flushing. The cleaned mains may have improved water clarity or color, reduced turbidity, and improved chlorine residual.

Flushing times of a half hour or less are typical, which can equate to substantial water savings. Therefore, UDF is an important component of the City's Water Use Efficiency program. The reduced flushing time also limits the impact on the Water Utility's customers.

As previously mentioned, the City has incorporated the valve exercising and dead-end flushing programs into the UDF program. Valves not used as part of a flushing sequence along each pipe length are exercised by distribution system staff to complete the Valve Exercising Program. While the UDF program flushes dead-end mains, more frequent dead-end main flushing may be required for water quality reasons. The UDF program also provides static pressure measurements

The City has completed the UDF of the Lea Hill Service Area in 2014 and expects to complete the Valley Service Areas in the spring of 2015. These Service Areas have historically had aesthetic issues due to manganese deposits. The City is implementing the UDF program in a phased approach for each service area. The City intends to develop and implement UDF programs for the Academy and Lakeland Hills Service Areas in the short-term to medium-term planning horizon. The City's goal is to conduct UDF flushing of approximately 20 percent of the system each year.

12.4.9 System Loss Program

The City has committed to an active System Loss Program to maintain water loss under 10%. The achievement is documented each year in the Distribution System Leakage Report. Elements of the Program include Leak Detection, Source Meter Calibration, Large Meter Testing, and Meter Replacement. Each of these is discussed in detail below.

12.4.10 Leak Detection

The City is committed to a tight, non-leaking water distribution system. Each year an experienced Leak Detection Contractor inspects approximately 25 percent of the water distribution system. The remaining sections are inspected in the following year(s). The contractor is accompanied by one maintenance worker under the direction of the Water Distribution Supervisor. The inspection process is usually conducted between the months of May through July. Leaks, when located, are immediately scheduled for repair by maintenance staff. A report is generated and submitted to the City shortly after close of the inspection process. The report details miles of system inspected, the areas and infrastructure under focus, leaks located and estimated loss of water in gallons per minute (gpm) per leak.

In 2016, the City plans to purchase leak detection equipment and implement an in-house Leak Detection program. An advantage to the purchase of equipment would be the ability to locate leaks or spot check the system at any time without making appointments or suffering delays.

12.4.11 Source Meters

Source meters, also known as production meters, measure the amount of water emitted from the City's springs and wells. They are calibrated by an outside contractor under the direction of the Water Operations Supervisor and if a meter cannot be calibrated properly, it is replaced with a new one. Propeller source meters are being replaced with electromagnetic (MAG) meters in conjunction with planned capital improvements projects, or as budget allows.

12.4.12 Meter Replacement Program

The City will begin installing an Automated Metering Infrastructure (AMI) system in 2015, referred to as the Water Meter and Billing System Improvements project. The system will automatically receive meter reads via radio transmission and integrate the data into the City's billing software. The benefits of an AMI system include increased accuracy and efficiency; early leak detection; high usage, zero usage, and backflow detection; and improved customer service. This saves staff time associated with regular meter reading, missed or incorrect reads, final reads for customer account close-out, and confirmation of high reads for potential leaks. An optional interactive customer portal will allow customers to view their monthly, daily and hourly usage to see exactly when they are using water and how much. This will allow them to better understand their water usage, encourage conservation, and potentially save money.

Complete meter change out will occur along with installing the AMI system. The City currently has over 14,000 meters ranging in size from ¾" to 10". New meters with radios will be installed over a 3-5 year period. The AMI system is anticipated to have a 20-year life. This includes the system components and batteries in the radios. Meter replacement will be on a 20-year program to coincide with the AMI system.

12.4.13 Meter Services

Water Distribution staff are responsible for all new service connections under 3 inches and contractors are usually secured for installation of sizes 3 inches and larger. Repairs, retrofits or replacements of existing services are typically conducted by Water Distribution Staff unless unusual circumstances arise. Meter services consist of meters, meter vaults, meter boxes, service lines, valves, setters, resetters, and other associated equipment.

The City uses master meters when beneficial to the City and its customers. Master meters are currently used at several mobile home parks and Muckleshoot Indian Tribe (MIT) commercial properties.

12.4.14 Large Meter Testing

Large meters are devices that measure water consumed by customers with significant demand requirements. They are usually employed by the following customer class:

- Commercial
- Farms or Parks – Irrigation
- Schools
- Multifamily Complexes
- Industrial / Manufacturing Businesses
- Wholesale Customers
- Municipal Buildings

Large meters are defined as water meters three inches or larger. There are a total of 215 large meters in the system. All large meters are calibrated for accuracy each year usually between the months of April and June as part of the City's System Loss Program. Calibration of large meters is conducted by an outside contractor, but one maintenance staff member under the direction of the Water Distribution Supervisor assists in the process. If a meter cannot be calibrated, it is replaced with a new one.

12.4.15 Distribution System Corrosion Inspection

One program that the Water Distribution Division would like to activate, if additional funds and manpower are available, is Distribution System Corrosion Inspection program. A large percentage of the City's piping system is constructed of metal and this material is subject to corrosive deterioration. Corrosion is an electrochemical reaction whereby metal is eroded and reduced. It is virtually impossible to stop corrosion of metal pipe but it can be substantially retarded if proper anti-corrosive measures are taken.

The distribution system corrosion inspection will identify pipes that serviceable life can be extended by corrosion resistance measures. The two most popular measures taken to resist corrosion are coatings and anode packs. Coatings are electrical insulator types of finishes applied to a surface. Most pipes are coated but the coating is subject to damage and decay. Damage from soil stress such as contraction and expansion can rip coatings from pipes. Pinholes in the insulation, also known as holidays, can allow seepage between the coating and pipe and accelerate corrosion. Penetration of the pipe occurs even more rapidly when pinholes are present than it would on a bare line.

Anode packs are metal cylinders that are connected to a metal structure via electrically conductive wires and inserted into the ground adjacent to the structure. The ground is subject to stray electric currents and these currents are the electrical component of the electrochemical nature of corrosion. Anode packs become the sacrificial metal to corrode in lieu of the structure. A Distribution System Corrosion Inspection program would determine where anode packs are required. The program, if initiated, would benefit customers in two ways as follows: 1) it could save substantial amounts of money by reducing unnecessary, early replacement of pipe and 2) it would reduce possible disruptive service to the City's customers that could occur if pipe replacement was necessary.

12.5 WATER FACILITIES EVALUATION STUDY

The City completed an extensive water Facilities Evaluation Study in 2014. The study conducted a physical inspection and evaluation of 40 of the City's 97 water supply facilities. Inspections included pump stations, treatment facilities, reservoirs, wells, transmission mains and pressure reducing stations. Inspections considered general conditions, corrosion and rust, structural deficiencies, ability to meet current code, and operational constraints. In addition to the inspections, the remaining useful life of the facilities were developed in an desktop analysis for pump, motor, pipe, valve, general electrical equipment, and major electrical equipment.

Where notable deficiencies were identified in the inspections or assets exceeded their usable life, improvements were recommended. Recommended improvements and a schedule, summarized in Appendix R, were developed. Improvements less than or equal to $10,000 were considered capital maintenance projects, which the City staff or small works contractor will address as part of the normal M&O budget. Similarly, the identified PRV improvements, regardless of price, will be addressed as part of the City's normal valve rehabilitation and replacement program. Improvements greater than $10,000 were considered capital improvement projects. These larger improvement projects were incorporated into capacity related improvements, when possible, or included in the CIP as a separate project.

Based on the observed facilities, general maintenance improvements are recommended for each facility to create a schedule of improvements based on the facility's remaining useful life. Regular facility inspections are also recommended, as summarized in Table 12.5. Additionally, maintenance plans were developed for each inspected water system facility. These plans included the improvement type, estimated project cost and frequency the improvement is required.

Table 12.5	Recommended Inspections Water System Plan City of Auburn	
Asset Type	**Recommended Inspection**	**Frequency (years)**
Pump	Perform pump test	5
Motor	Check motor amp draw	5
Reservoir	Inspect coating thickness	5
Reservoir	Inspect reservoir interior	5
PRV Station	Inspect for corrosion and signs of flooding	1
Structure	Inspect for cracks in grout (where applicable)	1
Piping	Inspect for general coating conditions	3

12.6 WATER QUALITY PROGRAM

The Water Operations staff maintains an active and ongoing program of Water Quality Monitoring and reporting to ensure a safe, high quality water supply. Two staff members are responsible for water quality monitoring, sampling, control, and record keeping. The Water Operations staff also receives assistance from the Engineering Services - Water Quality Program Coordinator. A detailed description of the City's water quality monitoring and results is presented in Chapter 7, which includes the following:

- Summary of the City's water quality monitoring programs.
- Summary of recent water quality testing results.
- Summary of the Wholesale Interties Blending Evaluation.

The City's Water Quality Monitoring Program is detailed in a manual entitled "City of Auburn Public Water System Water Quality Monitoring Plan." Additionally, the City has a Coliform Monitoring Plan. These Plans comply with the DOH regulations for Group A Public Water Systems. All sampling is conducted in accordance with annual Water Quality Monitoring Schedule received from DOH. The City samples for inorganic and physical parameters, synthetic and volatile organic compounds, asbestos, nitrate and nitrite, radionuclides, coliforms, residual chlorine, disinfection byproducts, lead and copper and fluoride. Additional sampling also occurs based on special requests by DOH or by customers concerned about water quality issues involving unusual taste, odor, or color.

The Water Manager maintains hard copies of the water quality analysis laboratory reports. These reports are kept at the Maintenance and Operations facility in files organized by years and analysis type. As specified by DOH regulations, chemical analysis reports are kept indefinitely and bacteriological reports are maintained for a minimum of five years.

The City will comply with the Follow-Up Action Requirements of WAC 246-290-320 whenever Water Quality results exceed a prescribed level. The Water Utility also complies with the requirements of WAC 246-290 for public notification, as established by the SDWA and the DOH. Forms for “Water Boil Notification” and “Drinking Water Problem Corrected Notification” have been developed and are available for immediate distribution if necessary. A list of the appropriate print, TV and radio media to contact for public notice are included in Chapter 15 of the Public Works Emergency Response Manual. An additional procedure described in the Emergency Response Manual to address Water Quality issues involves an “Action Plan for Water System Contamination Via Threat Warning”.

The City maintains equipment to perform some basic water quality monitoring functions. However, all testing required for water quality regulatory compliance is contracted to independent testing laboratories. The current primary laboratory used by the City is:

Water Management Laboratory
1515 80th Street East
Tacoma, Washington 98404
206-531-3121

If testing cannot be done on a timely basis, the City also uses the following laboratory:

Analytical Resources, Inc.
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200

12.7 EMERGENCY RESPONSE PROGRAM

The City has prepared a Public Works Emergency Response Manual as a guide for management of emergency situations. It was developed in 1999 in response to the potential impact of Y2K and it is updated annually at the first of the year. The manual is not all-inclusive for every type of disaster that could occur but it is a valuable tool for dealing with many of the emergency situations that most municipalities could face. The primary objectives of the Public Works Emergency Response Manual are the protection of life and property and restoration of essential services as quickly as possible.

The Emergency Response Manual contains a detailed table of contents and the Manual is tabbed to allow quick access to information being sought. Three copies of the Manual have been published. One copy is available at the M&O Building, the second copy resides in Engineering Services with the City Engineer, and the third is located at the Valley Regional Fire Authority, Station 31. The manual is also available in digital format on the City’s computer server.

The Public Works Emergency Response Manual is only one element of the City's overall Emergency Response Plan. There is also a master response program for the entire City and it is documented as the City's Comprehensive Emergency Management Plan (CEMP). The material in the CEMP provides guidance to the Emergency Management Organization for mitigation, preparedness, responsibilities, recovery operations, training, and community education activities. The CEMP also describes the functions of local government and incorporation of essential non-governmental organizations into the Emergency Management Organization. Copies are located in each City Department, the Public Works M&O Building, and the Valley Regional Fire Authority, Station 31. The CEMP is also available in digital format on the City's Emergency Operation Center (EOC) computer server.

An additional emergency response manual that is available for use is the Water Division Intertie Locations and Policy Manual. The Manual contains contact names, addresses and phone numbers for cities and water districts that have intertie connections with the City. Included are photos of the intertie vaults, valves, and meters along with information for activating or deactivating an intertie. Three copies of the Manual have been published. One copy is available at the M&O Building, the second copy resides in Engineering Services with the Water Utility Engineer, and the third is located at the Valley Regional Fire Authority, Station 31.

The City has been involved with several Table Top Exercises to prepare for emergencies and they are an ongoing feature of the City's Emergency Response Program. Staff, depending on their position, have also been trained for emergencies in accordance with the Federal Emergency Management Authority (FEMA) under the auspices of Homeland Security. The training program, known as the National Incident Management System (NIMS), offers educational classes tailored for the Incident Command System (ICS).

The NIMS and ICS program is a solid blueprint for Federal and Local emergency command activities but it doesn't provide the type of response details needed by Public Works maintenance staff and managers. Consequently, the Public Works Emergency Response Manual is the reference tool referred to on a more intimate scale.

12.7.1 Vulnerability Assessment

The City's Vulnerability Assessment (VA) was prepared in 2004 under the guidance of an engineering consultant firm and it was submitted to the USEPA on November 15, 2004. A Water System Security Improvement Plan (WSSIP) was also prepared in conjunction with the VA to prevent or significantly lessen the impact of intrusive activities.

Many of the recommendations noted in the WSSIP have been addressed by completing the SCADA system upgrade and physical security project. Remaining items will be addressed as part of planned CIP projects or as budget allows.

12.8 SAFETY PROCEDURES

The City has a comprehensive safety program that meets Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations. The safety policies and procedures for the water department are documented in 25 policies that are summarized in Table 12.6. The full text of the policies and procedures are included in Appendix S. The policies cover the full range of hazards staff may experience while operating the water system. These include, but are not limited to, operation of motor vehicles and equipment, chemicals, confined spaces, falls, traffic, and fires. Each policy includes a purpose, organization affected, references, the policy, definitions, procedures to implement the policy, and responsibilities for the implementation. Responsibilities are assigned to individual role, such as employee, supervisor, or safety manager. The policies and procedures clearly identify contact information of the applicable regulating agencies in case of a serious incident. All policies are available on the City's intranet.

Table 12.6 Safety Policies and Procedures
Comprehensive Water Plan
City of Auburn

Number	Policy Name	Description
300-01	Workplace Health & Safety	Document workplace health and safety policy
300-03	Hearing Conservation	Implement program to protect employee hearing
300-04	Personal Protective Equipment	Establish policy that requires employees to always use personal protective equipment when performing certain tasks or when in an unsafe environment
300-05	Flagger Certification	Flagger certification requirements
300-06	First Aid	Employee first aid training, first aid supplies and emergency stations
300-07	Hazard Reporting	Procedure to report an obvious or potential safety or health hazard
300-08	Incident Reporting	Procedures for reporting non-vehicular incidents
300-09	On The Job Injury	Establish policy to monitor on-the-job injuries
300-10	Safety Inspection of City Owned Facilities	Procedure for inspection of all City-owned and operated facilities
300-11	Central Safety Committee	Establish function and structure of Central Safety Committee
300-13	Emergency Evacuations of City Buildings	Procedure for evacuation of City buildings in the event of an emergency

Table 12.6	Safety Policies and Procedures Comprehensive Water Plan City of Auburn	
300-14	Safety Restraints & Seat Belts	Requires mandatory use of safety restraints/seat belts while driving or riding in the City vehicles
300-15	Excavation Trenching & Shoring	Establish policy for shoring and sloping all excavations or trenches over four (4) feet in depth
300-16	Safety Line Procedure All Cranes, Backhoes, & Hoists	Procedures for controlling moving loads being hoisted or swinging ground or truck using hoists, backhoes, cranes, or any mechanical device use in moving loads
300-17	Chemical Hazard Communication (Worker Right To Know)	Establish chemical and global hazard communication program to assure the health and safety of City employees
300-18	Welding, Brazing, & Cutting	Procedure for welding, cutting or brazing work or practices which may result in an injury or death
300-19	Lockout & Tagout	Requirements for the lockout or tagout of energy isolating devices
300-20	Bloodborne Pathogens	Procedure to prevent exposure to blood or other substances and materials that may carry bloodborne pathogens. Procedures for decontamination of equipment and evaluation and treatment of employees who experience exposure.
300-21	Reporting Vehicle Accidents	Procedure for reporting vehicle accidents
300-22	Heat Related Illness	Training for potential heat related illness
300-23	Confined Spaces	Procedures for entering a confined space
300-24	Green Housekeeping Guidelines	Procedures that sustain a "Green Cleaning" environment
300-25	Respiratory Protection Program	Procedures that will prevent employees from inhaling hazardous airborne chemicals
300-26	Fall Protection & Rooftop Safety	Procedures for rooftop safety and use of fall protection
300-27	Powered Industrial Trucks	Training, operation and safety of powered industrial vehicles

In addition to the policies, all M&O staff receives safety training. The content of the training are periodically reviewed and update, if necessary, through departmental and city-wide safety committees. Human Resource/Risk Management department maintains information and schedules safety training.

The City maintains appropriate safety equipment and information. Each vehicle and each facility has a fire extinguisher and first aid kit. All staff use personnel protective equipment, such as hard-hats, safety glasses, safety vests, etc. Climbing equipment and lockout/tagout equipment is available and stored at M&O or the Well 7 storage. Additionally, each site that has chemicals has Safety Data Sheets (SDS) book that contains the Material Safety Data Sheets (MSDS) for all chemicals on hand. A master of all chemicals used by the Water Utility is maintained at the M&O Building.

12.9 CROSS CONNECTION CONTROL PROGRAM

The City's Cross Connection Control Program (provided in Appendix T) protects the public water system as defined by WAC 246.290.010, WAC 246.290.490, and Auburn City Code (ACC) 13.12 from contamination via cross connection hazards. It describes minimum operating policies, provides guidelines for installation, testing and maintenance of approved backflow prevention assemblies, permitting process, inspection and survey requirements for existing and new water service connections. The program is maintained by two Cross Connection Specialists under direction of the Water Operations Supervisor. The specialists are responsible for identification and elimination of potential and actual cross connections and contamination hazards within the public water system.

12.10 WELLHEAD PROTECTION PROGRAM

The City's wellhead protection program is key to managing potential sources of groundwater contamination prior to their entry into the drinking water system. The wellhead protection plan (WHP) was updated as part of the Plan and summarized in Chapter 6. Engineering Services staff are charged with implement the program. Staff track and follow up on construction projects, spills, and monitor possible contamination sources, as possible.

12.11 WATER SHORTAGE CONTINGENCY PLAN

The City of Auburn adopted Ordinance 5787 on August 4, 2003, enacting Auburn City Code (ACC), Chapter 13.14 titled "Water Shortage Emergency Response Regulations" in response to a water shortage in the Lakeland Hills Water Service Area. However, the ordinance covers future shortages throughout the City. ACC 13.14 gives the Mayor the authority to declare various stages of water emergencies and to implement water conservation measures. The City has developed a Water Shortage Contingency Plan, attached in Appendix U, which establishes actions and procedures during impending or actual water shortages. These actions will help maintain levels of service essential for public health and safety, minimize adverse impacts on economic activity, and protect our customer's lifestyle. The plan addresses both progressive situations, such as those that are weather-related, and more drastic and immediate situations such as facility emergencies (e.g., a pipeline break). Initial stages of the Water Shortage Contingency Plan may coincide with efforts in the Water Use Efficiency program; however, it is distinct as it is a response to a specific situation and it may lead to mandatory restrictions and curtailment.

12.12 CUSTOMER COMPLAINT RESPONSE PROGRAM

One Water Distribution staff is assigned as a Customer Service Representative. This individual is responsible for meter turn-on and turn-off, delinquency notices, meter rereads, new service reads, final service reads, leak adjustments, high consumption investigations, account documentation, and other duties as assigned. The employee maintains a modified work schedule, which provides more flexibility in dealing with emergency service requests by customers.

The Water Utility, along with the rest of Public Works transitioned to an asset management software system called CarteGraph. CarteGraph software has the ability to revolutionize the City's business practice if used to its full potential. Implementation was completed in 2006 with a software update in 2014. Some of the benefits include the following:

- Ability to assign and track citizens complaints and requests
- Produce work orders
- Monitor work and maintenance projects
- Track costs for labor, equipment, and material
- Enhanced inventory control
- Integration with GIS
- Benchmark analysis
- Generate reports
- Track infrastructure conditions – GASB 34

The City has a customer service program accessible by the public and City staff via the City Internet Website. Customers fill out the online Citizen Report form and describe the services they are seeking. The submitted form downloads into the CarteGraph system for review and action by staff.

12.13 RECORDKEEPING AND REPORTING

All recordkeeping and reporting follows DOH regulations as specified in WAC 246-290-480. The Water Manager maintains hard copies of the water quality analysis laboratory reports. These reports are kept at the M&O building in files organized by year and analysis type. Analytical laboratories submit reports directly to DOH. As specified by the regulations, chemical analysis reports are kept indefinitely and bacteriological reports are maintained for a minimum of five years. Additionally, Construction Completion Reports are submitted to

DOH, as required. Construction Completion Reports for distribution main projects are maintained on file at the City are available upon request by DOH in accordance with WAC 246-290-125.

Water production and water purchased source meters are read daily (during the work week). Paper copies are scanned at the end of the month and digital copies in pdf format are maintained on the City computer server by month and year. Summary spreadsheets are also maintained on the computer server by year. This data is added to the monthly DOH reports. Records are maintained for a minimum of 10 years.

Chlorine residual samples are collected in the distribution system and analyzed on a weekly basis. Summary spreadsheets are maintained on the City computer server by year. Records are maintained for a minimum of three years.

Monthly reports containing water production and treatment data are submitted to DOH by the 10th day of the following month using forms provide by DOH. Signed paper copies are scanned to produce a digital copy and are maintained on the City computer server by year. Digital copies are maintained for a minimum of 10 years.

The majority of records that Water Utility collected in the past are based on hard copy paper forms. This includes forms that track maintenance and inspection records used for pumps, valves, meters, reservoirs, hydrants, operating equipment, etc. A portion of the integration process with CarteGraph involved the collection and collation of historical data into a form that can be downloaded into the software system. The City's goal is a near-paperless documentation system that can be accessed by staff in the office, field or home on a 7 day, 24 hour basis. Existing electronic records include:

Cross Connection Control Program

Cross Connection Control documentation is managed with Tokay software. The Tokay software is tailored specifically for Cross Connection Control, is simple to use, and very comprehensive.

Water Meter Consumption

Water meter consumption records are maintained by the Finance Department using the SpringBrook Utility Billing System. These records include customer account data for classes of customers, billing, service, comments, and questions. The system also includes a tracking feature for water sold each month as well as an annual total of water sales. The tracking feature is useful because data on water consumption by customer type and season supports the City's Water Use Efficiency Program per Chapter 8. The Finance Department also provides staff with monthly financial reports in regard to Water Utility operations. There is no intent to replace SpringBrook with the CarteGraph system.

Supervisory Control and Data Acquisition (SCADA)

The SCADA system monitors, records and controls water system operations at various facilities. The records are electronically recorded by a computer server maintained by the Innovation & Technology Department and a back-up copy is made each evening to ensure that records are retrievable should hardware or software failure occur. There is no intent to transfer SCADA records into the CarteGraph system at this point in time or in the future. Please note that the SCADA system is discussed more thoroughly in the System Operation and Control section of this chapter.

Water Meter Reading

Water service meters are read every two months for single family residential customers, and monthly for all other meters. Responsibility for meter reading resides with two staff members in the Water Department but Water staff are available as backup readers when required. Staff employ a computerized data logging system to record consumption and the data is automatically downloaded into the City Utility Billing System when the logging unit is docked. This will change with the implementation of AMI.

12.14 CUSTOMER REQUEST RESPONSE PROGRAM

As described in the above section, the CarteGraph system has the ability to assign and track customer requests, which includes complaints and produce work orders. The City maintains a list of requests and identifies the work done to respond to any requests from the public. The City classifies the citizen reported issues in five (5) categories:

- Water Appearance: contains all requests related with the color of the water (brown, discoloration, cloudy, etc.)
- Odor: contains all requests related to water smell (chemical, sulfur, chlorine smell, etc.)
- Pressure: contains all requests related to change in water pressure (pressure drop, very high water pressure, fluctuation in pressure, etc.)
- Taste: contains all requests related to water taste (poor, bitter, strong chlorine taste, etc.)
- Water Quality: contains all requests related to a combination of odor, taste, and discoloration issues.

Customer requests are entered into the CarteGraph and a work order is generated. Typically, a distribution staff member or team will investigate the issue and respond directly to the customer.

Table 12.7 summarizes the number and type of requests or complaints since 2009. The City conducted substantial public outreach as part of the UDF flushing program, since flushing can create short-term issues. This outreach is credited with maintaining requests within historical ranges. The substantial decrease in appearance requests are believed to be due to a combination of the cleaner distribution mains due to the UDF program and the increased use of the Tacoma Wholesale Supplies.

Table 12.7 Summary Customer Requests
Water System Plan
City of Auburn

Category	2009	2010	2011	2012	2013	2014
Appearance	26	11	16	19	11	5
Odor	2	2	8	5	2	2
Pressure	19	18	5	17	13	17
Taste	3	6	2	4	4	2
Water Quality	3	0	1	3	0	1
Total	**53**	**37**	**32**	**48**	**30**	**27**

12.15 SUMMARY OF IMPROVEMENTS

The City operates and maintains an efficient, environmentally sound and safe water system. The evaluation of O&M program and practices identified recommended improvements. The majority of these recommended improvements were identified in the Facility Evaluation Study.

The improvements include:

- Complete remaining items identified in the 2012 Sanitary Survey
- Address improvements identified in the Facilities Evaluation Study
- Conduct inspections of facilities at frequency recommended in the Facilities Evaluation Study
- Begin distribution system corrosion inspection, as funds are available
- Develop UDF Program for Academy and Lakeland Hills Service Areas
- Implement an in-house Leak Detection program, as funds are available
- Complete SCADA Upgrades