City of Auburn Washington

# Comprehensive Water Plan

December 2009

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# City of Auburn

## COMPREHENSIVE WATER PLAN

**December 2009**

Engineers...Working Wonders With Water™

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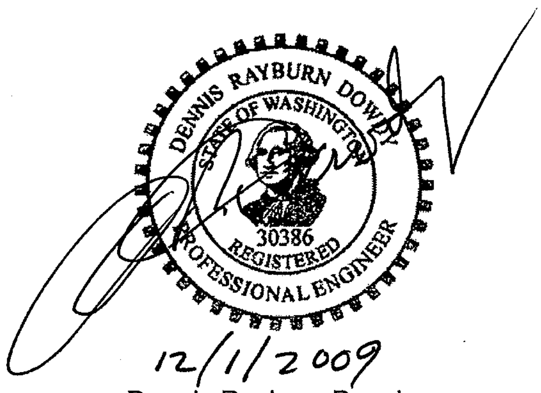
CERTIFICATION

This Comprehensive Water Plan for the City of Auburn, 2009, was prepared in accordance with WAC 246-290-100, under the direction of the following Registered Professional Engineer:




12/1/2009

Dennis Rayburn Dowdy

**City of Auburn**

**COMPREHENSIVE WATER PLAN**

**TABLE OF CONTENTS**

**Page No.**

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF APPENDICES

# DEFINITIONS

| | |
|---|---|
| $\mu$g/L | micrograms per liter |
| AACE | American Association of Cost Estimators |
| AAD | Average Annual Demand |
| ac-ft | Acre feet |
| ADD | Average Daily Demand |
| Algona | City of Algona |
| ASR | aquifer storage and recovery |
| AWS | Auburn Way South |
| AWWA | American Water Works Association |
| BCA | Bilateral Compliance Agreement |
| Bonney Lake | City of Bonney Lake |
| ccf | 100 cubic-feet |
| CCI | cost construction index |
| CCL | Contaminant Candidate List |
| CCR | Consumer Confidence Report |
| CCTF | Corrosion Control Treatment Facility |
| CERB | Community Economic Revitalization Board |
| CEU | continuing education unit |
| CFP | Capital Facilities Plan |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| cfu | colonies forming units |
| CI | cast iron |
| CIP | Capital Improvements Plan |
| CMP | Coliform Monitoring Plan |
| CPR | Conservation Planning Requirements |
| CWD | Covington Water District |
| CWSP | Coordinated Water System Plan |
| CWSSA | Critical Water Supply Service Area |
| DBP | definition by products |
| DI | ductile iron |
| DNS | determination of non-significance |

| | |
|---|---|
| DOH | State of Washington Department of Health |
| DPBR | Disinfection By-Products Rule |
| DWSRF | Drinking Water State Revolving Loan Program |
| Ecology | State of Washington Department of Ecology |
| EIS | Environmental Impact Statement |
| ENR | engineering news record |
| EPA | Environmental Protection Agency |
| ERU | Equivalent Residential Unit |
| GIS | geographic information system |
| GMA | Growth Management Act |
| G.O. | general obligation |
| gpcd | gallons per capita per day |
| gpd | gallons per day |
| gpm | gallons per minute |
| GWMP | Ground Water Management Plan |
| GWR | Groundwater Rule |
| HAA | haloacetic acids |
| HGL | Hydraulic Grade Line |
| HPC | heterotrophic plate counts |
| IA2 | Interlocal Agreement 2 |
| IA3 | Interlocal Agreement 3 |
| IDSE | Initial Distribution System Evaluation |
| ISO | Insurance Services Office |
| Kent | City of Kent |
| LCRMR | Lead and Copper Rule Minor Revisions |
| LID/ULID | Utility Local Improvement Districts |
| LRAA | locational running annual averages |
| LUD | Lakehaven Utility District |
| MCL | maximum contaminant level |
| MCLG | maximum contaminant level goal |
| M/DBP | Microbial/Disinfection By-Product |
| MDD | Maximum Day Demand |
| MG | million gallons |
| mgd | million gallons per day |

| | |
|---|---|
| mg/L | milligrams per liter |
| MIT | Muckleshoot Indian Tribe |
| MMD | Maximum Month Demand |
| M&O | Maintenance and Operational |
| MRDL | maximum residual disinfectant level |
| N | nitrate |
| PAA | Potential Annexation Area |
| Pacific | City of Pacific |
| pCi/L | picoCurie per liter |
| PGG | Pacific Groundwater Group |
| PHD | Peak Hour Demand |
| PHG | public health goal |
| PNR | Public Notification Rule |
| PRV | pressure reducing valve |
| psi | Pounds per square inch |
| PSRC | Puget Sound Regional Council |
| PUD | Public Utilities District |
| PWTF | Public Works Trust Fund |
| RAA | running annual average |
| RCW | Revised Code of Washington |
| R&R | Repair & Replacement |
| RWSA | Retail Water Service Area |
| SCADA | Supervisory Control and Data Acquisition |
| SDC | system development charge |
| SDWA | Safe Drinking Water Act |
| SEPA | State Environmental Policy Act |
| SMP | Standard Monitoring Program |
| SOC | synthetic organic chemical |
| SOS | Save Our Streets |
| SSS | System Specific Study |
| Sumner | City of Sumner |
| TCR | Total Coliform Rule |
| THM | trihalomethanes |
| UCM | Unregulated Contaminant Monitoring |

| | |
|---|---|
| USEPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |
| WAC | Washington Administrative Code |
| WD#111 | King County Water District #111 |
| WETRC | Washington Environmental Training Resources Center |
| WHPA | wellhead protection area |
| WHP | wellhead protection |
| WHPP | wellhead protection plans |
| WQMP | Water Quality Monitoring Act |
| WSP | Water System Plan |
| WSRB | Washington Survey and Rating Bureau |
| WUE | Water Use Efficiency Program |

## 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 comprehensive plan contains timeframes which 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 of Auburn which may depend on funding resources available.

## 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). The City maintains wholesale supply interties with three adjacent water systems: Algona, CWD, and WD#111. 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 of Auburn also has emergency interties with LUD, WD #111 and the Cities of Bonney Lake, Kent, and Pacific.

## 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 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.

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 the retail water service area."

Table ES.1 summarizes the service area policies.

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

| Policy Name | Policy Statement |
|---|---|
| Retail Service Area | The City will plan for and provide water service to all firm customers within the City. As supply permits, the City may provide water to non-firm customers. |
| 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) 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 component out-of-service. |
| Reservoir Storage | Auburn 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 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 distribution mains and 8 feet per second in transmission mains. |
| Water Use Efficiency Goals | The City will target a 1 percent reduction in equivalent residential unit value for each year. |
| Non-revenue water (water leakage) | The City will strive to maintain levels of water leakage for its distribution system at less than 10 percent. |

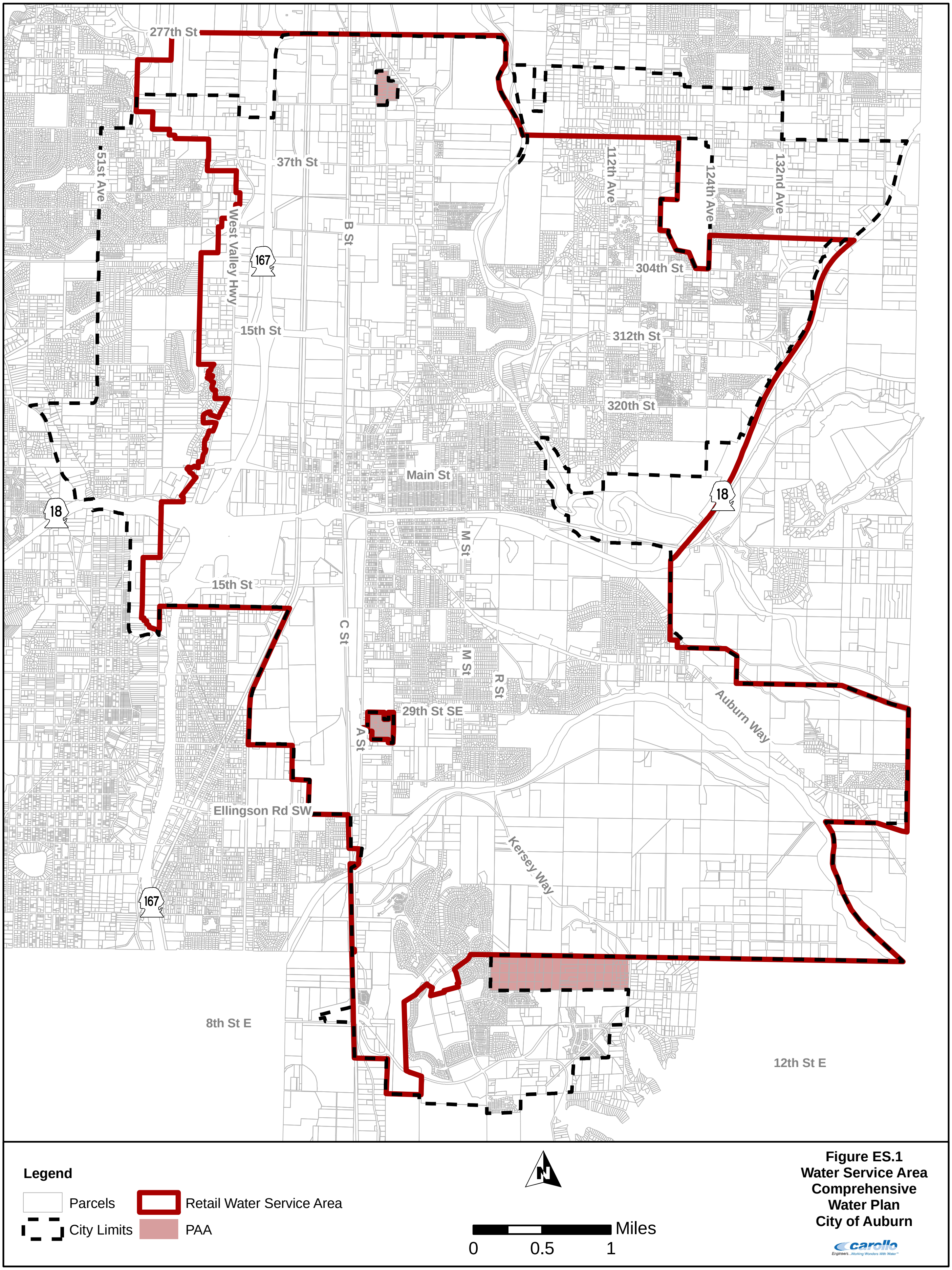



**Figure ES.1**
**Water Service Area**
**Comprehensive Water Plan**
**City of Auburn**

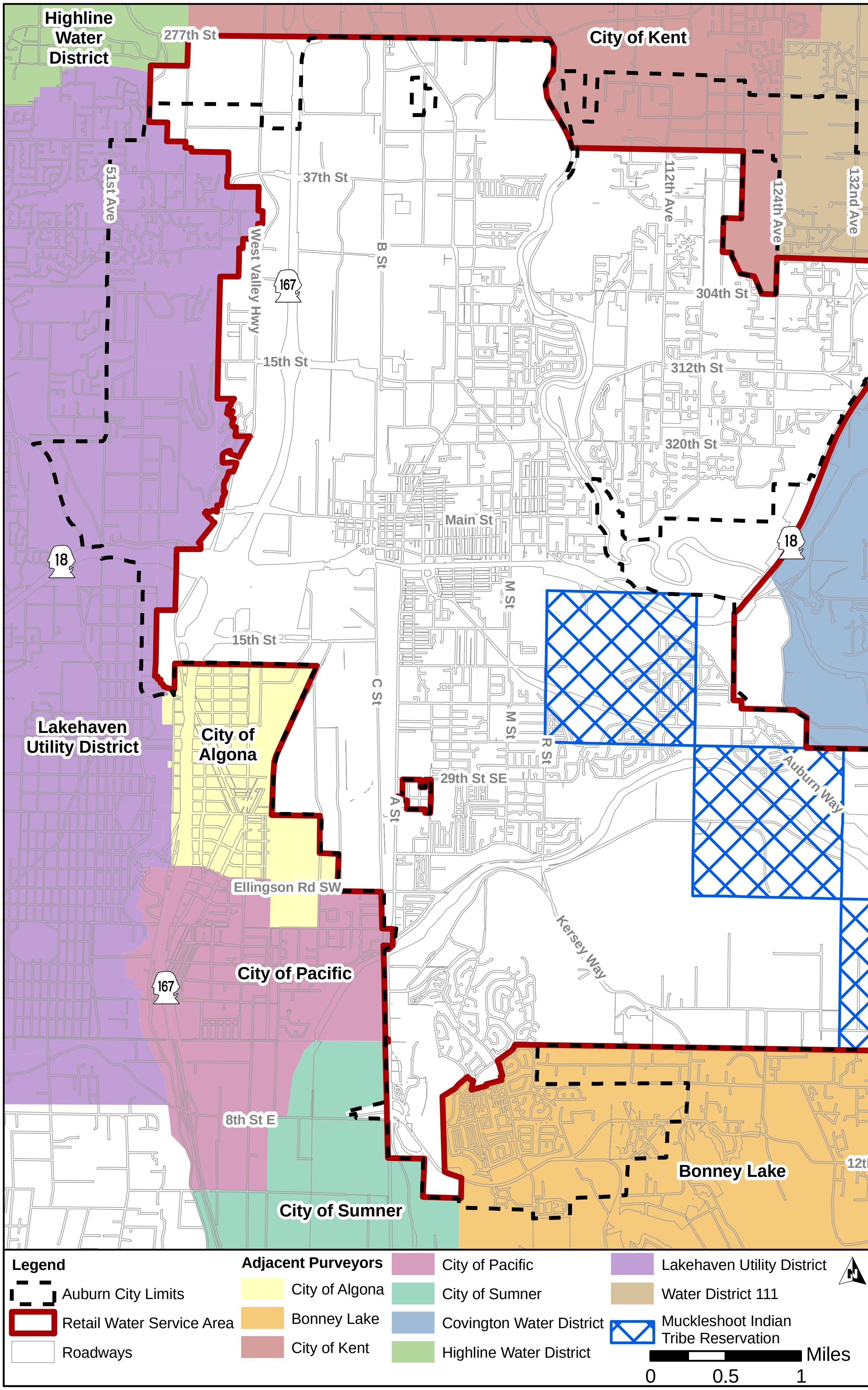



**Figure ES.2**
**Adjacent Purveyors**
**Comprehensive Water Plan**
**City of Auburn**

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## ES.4 WATER REQUIREMENTS

The City produces all of their water from ten well sources and two spring sources. The City provided water to approximately 50,000 people through 12,947 retail accounts as of the end of 2007. Between 2001 and 2007 the average day demand (ADD) has ranged from 8.1 million gallons per day (mgd) in 2005 to 8.9 mgd in 2001 and averaged 8.5 mgd. The maximum day demand (MDD) has ranged from 13.1 mgd (8/5/05) to 15.4 mgd (7/12/02). From 2001 to 2007, the total number of connections increased by 11 percent, while the average annual total water consumed increased by only 9 percent.

The demand of each customer class (single-family, multifamily, commercial, manufacturing, schools, city accounts, and irrigation) can be expressed in terms of equivalent residential units (ERUs) for forecasting and planning purposes. 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 75th percentile of the 2001 through 2007 data was used to select the single-family planning ERU value, which was 230 gallons per day (gpd).

The historical MDD peaking factor is the relative magnitude of MDD compared to the ADD. The recommended peaking factor for this planning period, calculated by using the 75th percentile of the peaking factor values between 2002 and 2007, is 1.8. This factor leans toward the higher side of the data range to provide a factor of safety without being overly conservative.

Distribution system leakage (DSL) is calculated as the difference between the total amount of water produced and the sum of water sold and authorized water usage. The Water Use Efficiency (WUE) Rule requires that the three-year average of distribution leakage be maintained at less than 10 percent of the supply. The City has maintained distribution leakage at less than 10 percent of its supply over the past six years, meeting the WUE goal. The City has chosen a planning value of 7.8 percent for DSL by using the 75th percentile of the distribution leakages for the values from 2001 to 2007.

The City projected the growth rate for each customer class in the City's four service areas. The growth rate was applied to the existing accounts. The ADD for each service area is based on multiplying the projected ERUs in their corresponding service area by the planning value of 230 gpd per ERU. The projected MDD is simply the projected ADD multiplied by the MDD/ADD peaking factor of 1.8, as discussed previously. The City has wholesale agreements to sell water to the City of Algona, CWD, 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 through 2014. The City's agreement 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. The total projected annual ADD and MDD along with wholesale demands are summarized in Table ES.2.

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

| Area | 2008 | 2014 | 2018 | 2028 | Ultimate |
|---|---|---|---|---|---|
| **Valley** | | | | | |
| Average Day Demand, mgd | 5.39 | 7.23 | 7.74 | 8.64 | 9.46 |
| Maximum Day Demand, mgd | 9.76 | 13.09 | 14.02 | 15.65 | 17.12 |
| Equivalent Residential Units | 21,610 | 28,997 | 31,040 | 34,661 | 37,925 |
| **Academy** | | | | | |
| Average Day Demand, mgd | 0.67 | 0.88 | 0.97 | 1.11 | 1.85 |
| Maximum Day Demand, mgd | 1.21 | 1.60 | 1.75 | 2.02 | 3.35 |
| Equivalent Residential Units | 2,684 | 3,542 | 3,885 | 4,467 | 7,421 |
| **Lea Hill** | | | | | |
| Average Day Demand, mgd | 1.03 | 1.17 | 1.36 | 1.62 | 2.47 |
| Maximum Day Demand, mgd | 1.87 | 2.13 | 2.46 | 2.93 | 4.46 |
| Equivalent Residential Units | 4,142 | 4,709 | 5,439 | 6,483 | 9,885 |
| **Lakeland** | | | | | |
| Average Day Demand, mgd | 0.43 | 0.54 | 0.61 | 0.65 | 1.49 |
| Maximum Day Demand, mgd | 0.78 | 0.97 | 1.10 | 1.18 | 2.70 |
| Equivalent Residential Units | 1,718 | 2,157 | 2,444 | 2,620 | 5,984 |
| **Total Retail Customers** | | | | | |
| Average Day Demand, mgd | **7.52** | **9.83** | **10.68** | **12.03** | **15.27** |
| Maximum Day Demand, mgd | **13.62** | **17.79** | **19.33** | **21.78** | **27.64** |
| Equivalent Residential Units | **30,154** | **39,405** | **42,809** | **48,230** | **61,215** |
| **Retail With Firm Wholesale (Algona)** | | | | | |
| Average Day Demand, mgd | 7.98 | 10.35 | 11.20 | 12.55 | 15.79 |
| Maximum Day Demand, mgd | 14.56 | 18.91 | 20.44 | 22.89 | 28.75 |
| **Retail With Firm & Interruptible Wholesale (CWD & WD 111)** | | | | | |
| Average Day Demand, mgd | 12.98 | 15.35 | 16.20 | 17.55 | 20.79 |
| Maximum Day Demand, mgd | 19.56 | 23.91 | 25.44 | 27.89 | 33.75 |

## 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 | 40 - 160 |
| Lea Hill | 150 - 515 |
| Academy | 150 - 460 |
| Lakeland Hills | 150 - 570 |

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 has the ability to provide, using a combination of two springs and ten wells, a total supply of 16.5 mgd. 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. Water from the Valley service area is pumped to the Lea Hill and Academy service areas. Due to the observed decline in production of several supply facilities, the City should perform hydrogeologic investigations of the existing wells. An annual well inspection and redevelopment program is recommended. Additionally, several systems are in need of back-up power and improved chlorination facilities.

The City operates and maintains several pump stations to move water throughout the piping network and to provide water at the required service pressures. Due to age, capacity considerations, fire flow demands, and reliability requirements, it is planned that three of the City's pump stations are to be replaced, two expanded, and backup power added to one station.

The City currently maintains a total of 14.7 million gallons (MG) of water storage in seven (7) water reservoirs located throughout the service area. The analysis of storage indicates that all service areas need additional storage for future conditions. To meet the future storage requirements a combination of supply and storage improvements are proposed.

Water treatment in the City of Auburn includes chlorination, corrosion control, and metals removal. All wells, except Well 5, are equipped with some level of treatment. Water quality improvements are proposed at several sites including converting the current gas chlorination systems to hypochlorite. Hypochlorite systems are a safer way to operate disinfection facilities. Manganese treatment is recommended for Wells 3A, 3B, and 7 to allow these wells to be used year-round and to ensure improved water quality.

The City 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 show 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.

Several pipes were identified as deficient due to age, material, or size. Some areas of the distribution system have duplicate pipes. Asbestos-cement, old cast iron pipes, and pipes under 6-inches that serve fire hydrants are all recommended for replacement.

## ES.6 WATER RESOURCES

The City currently holds certificated, primary water rights and claims with a total instantaneous flow (Qi) of 18,555 gpm (26.7 mgd) and an average annual flow (Qa) of 23,300 acre-foot per year (ac-ft/year) (20.8 mgd). The addition of the water right transferred by the City of Algona increases the City's Qi water right to 19,055 gpm (27.4 mgd) and their Qa water right to 23,475 ac-ft/year (21.0 mgd). The City's total instantaneous supply capacity is 16.5 mgd and the total annual capacity is 15.2 mgd, based on the City's ability to pump from the existing system.

The City also needs to plan for supply to the MIT. An agreement dated from 1986 requires that the City provide the tribe with an average annual demand of 2.5 mgd from Coal Creek Springs and a maximum demand during the summer of 1.9 mgd.

Figures ES.4 and ES.5 compare the ADD and MDDs to the water right and the City's ability to pump. As shown in Figure ES.4, the City has sufficient average annual pumping capacity to serve the retail customers, Algona and MIT through 2028. As shown in Figure ES.5, the City has marginally sufficient Qi pumping capacity to serve the retail customers, Algona and MIT. By 2028, the City will need an additional 8.3 mgd of reliable pumping capacity to serve the MDD of the retail customers, Algona and MIT.

To meet the projected deficit, the City has developed a five-part water supply strategy as follows:

- Improve Existing System: The source improvement strategy to meet the future demands begins with a focus on the evaluation and improvement of Well 1. This improvement could add an additional 3.2 mgd of Qi pumping ability. To meet the long-term demands, the City will evaluate improvements to Coal Creek Springs, Well 5B, and the Algona Well.

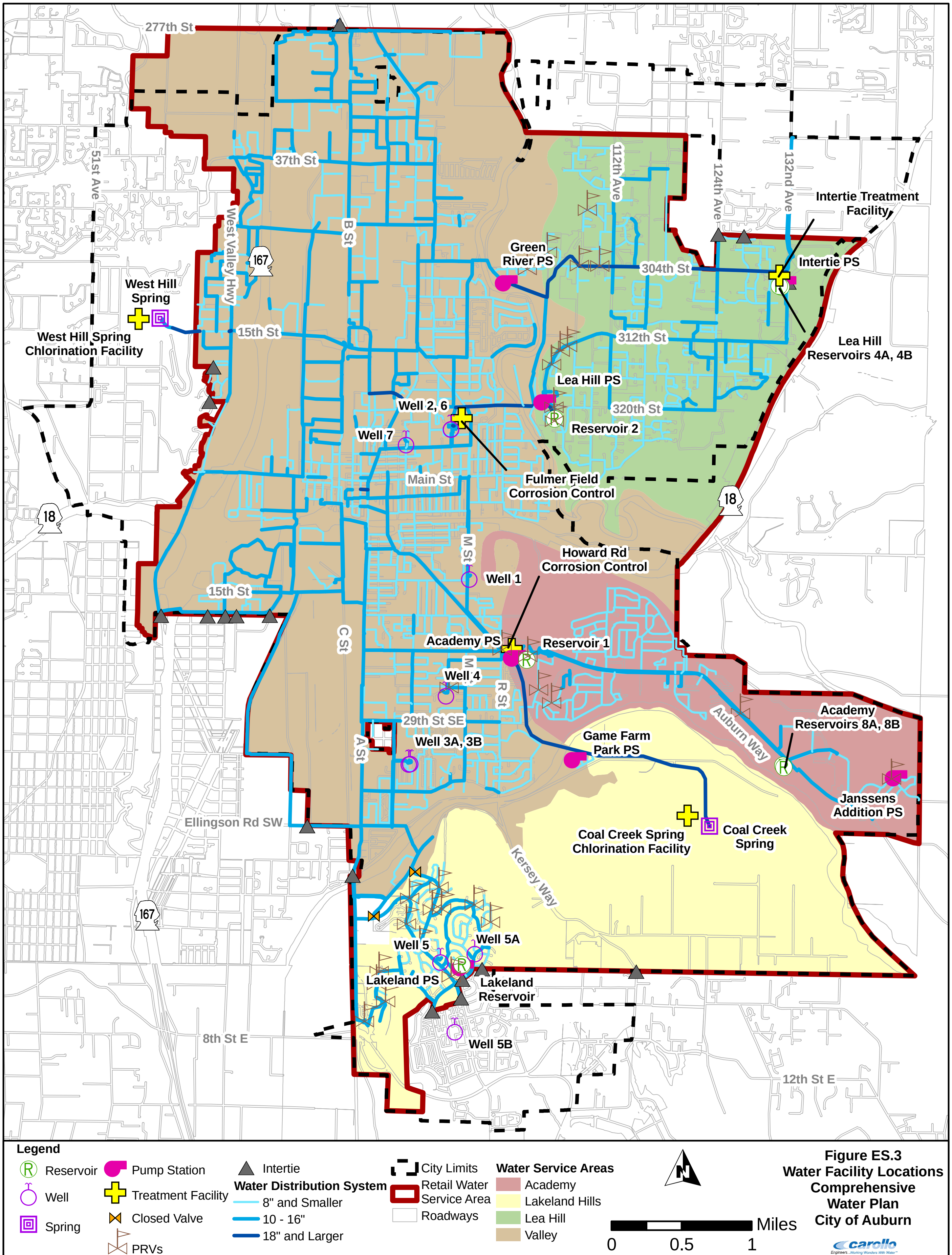


**Figure ES.3**
**Water Facility Locations**
**Comprehensive Water Plan**
**City of Auburn**

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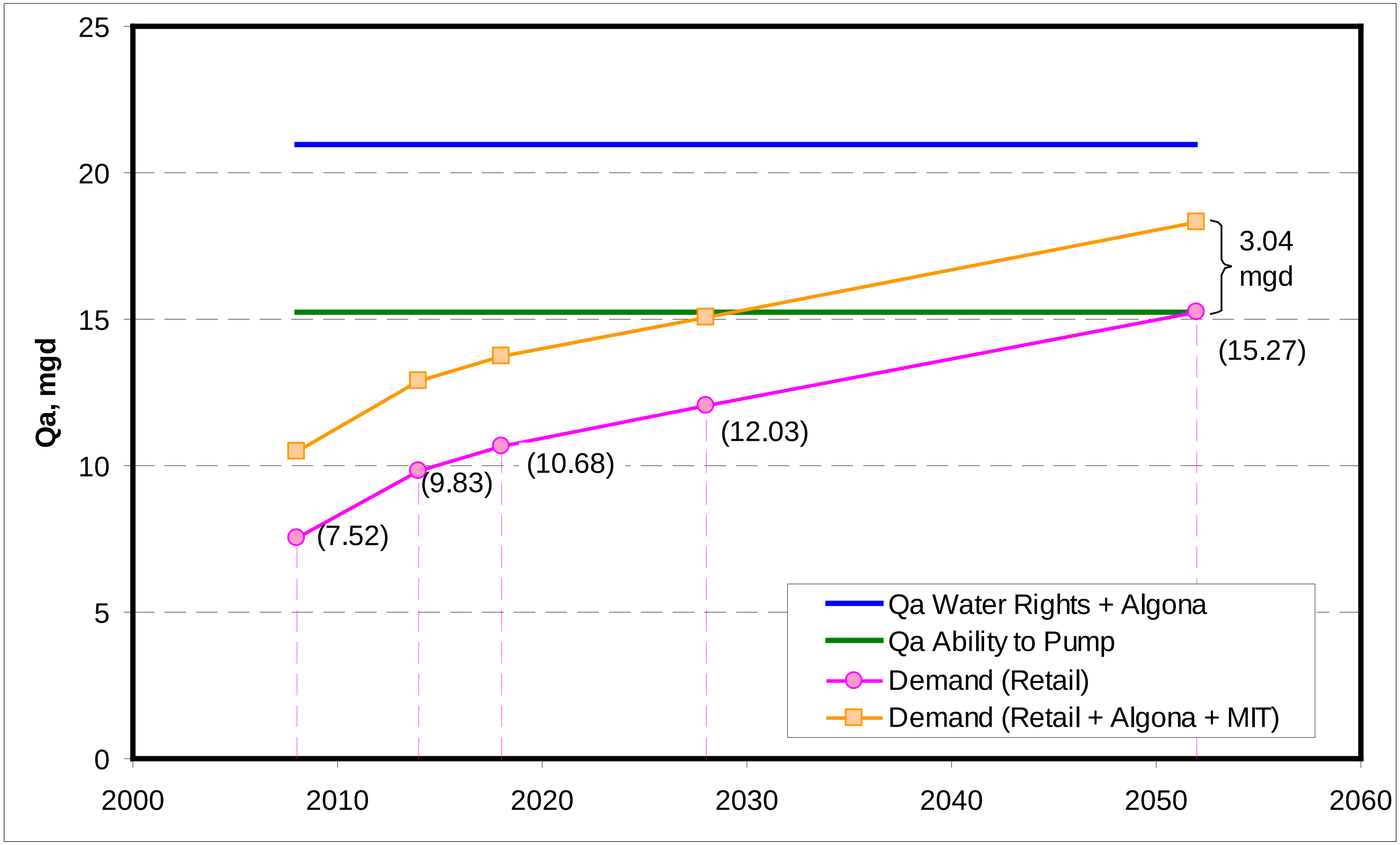


**ADD COMPARISON**

FIGURE ES.4

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

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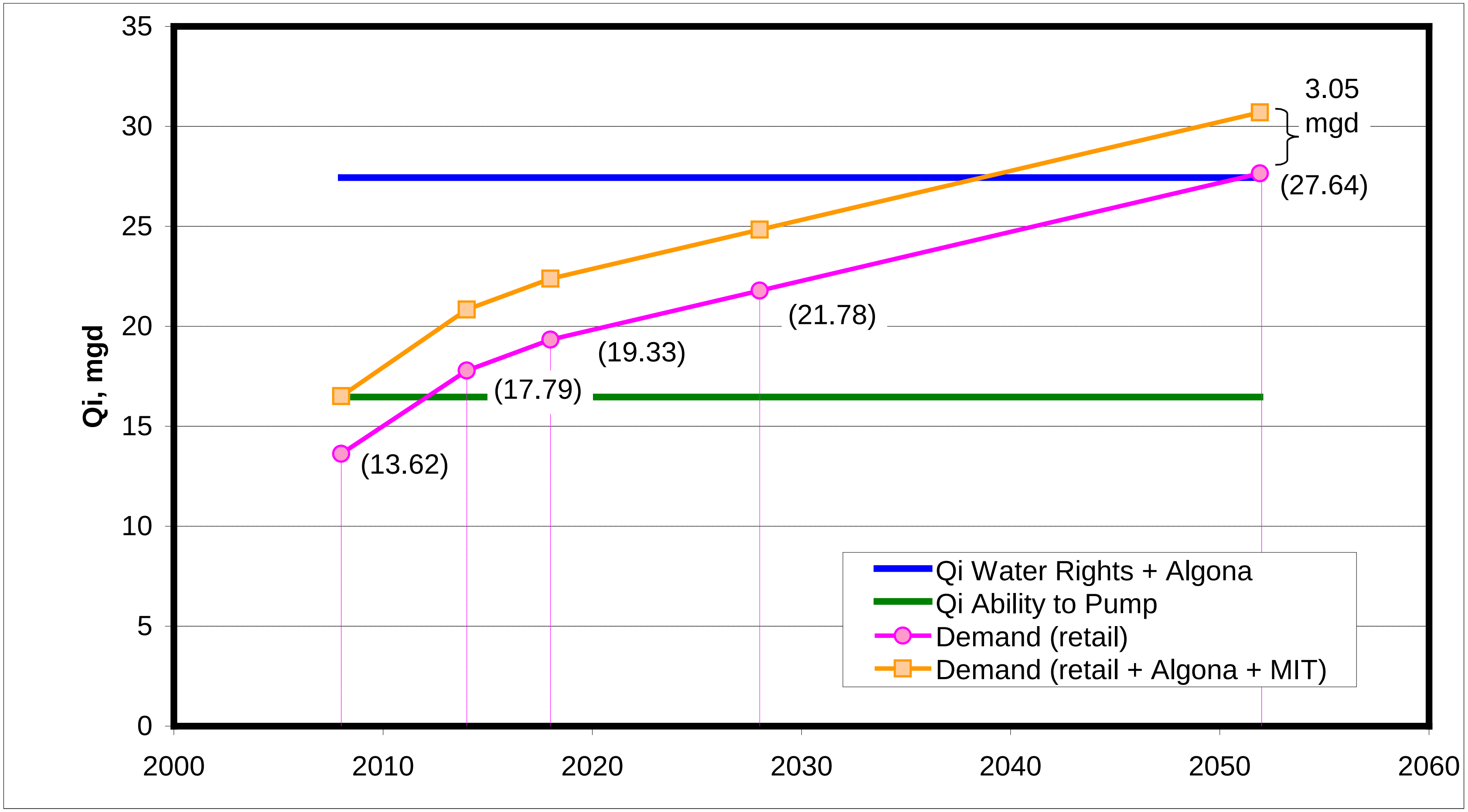


**MDD COMPARISON**

FIGURE ES.5

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

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- Additional Supply from Other Water Purveyors: To meet the projected MDD of the year 2018, the City plans to purchase 2.7 mgd from one or more of their adjacent purveyors. By the year 2018, the City plans to have 3.74 mgd of emergency interties available to fully back-up their largest source, Well 4. To meet the projected MDD for ultimate build-out, the City plans to purchase an additional 0.6 mgd from their adjacent purveyors. Additionally, the City may need to secure additional emergency interties to fully backup Coal Creek Springs as their largest source.
- Secure Additional Water Rights: By the ultimate build-out year, the City will need an additional 1.7 mgd of Qi water rights to serve it's retail customers, Algona and MIT. To address these concerns, the City has an application into the Washington State Department of Ecology (Ecology) for new primary water rights.
- Water Reuse: Reclaimed water is a potential source of supply. Depending on the degree to which reclaimed water is treated, potential uses include irrigation, landscape purposes, manufacturing, industrial operations, and aquifer recharge. This plan proposes that the City conduct a reclaimed water evaluation and participate in future local and regional planning for wastewater reuse.
- Continue the Water Conservation Program: The final element of the City's supply strategy is to continue to reduce demand through a conservation program.

## ES.7 WATER QUALITY

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

1. Take actions recommended by the DOH to prepare for the upcoming Groundwater Rule requirements, including:
   a. Correcting deficiencies identified in the 2008 Sanitary Survey.
   b. Updating the City's emergency response plan; and
   c. Contacting the City's regional office engineer to determine whether treatment provided at the City's wells is sufficient to provide 4-log virus inactivation or removal.
2. Prepare a monitoring plan for the Stage 2 disinfection byproduct rule (DBPR) prior to 2012, for inclusion in the City's water quality monitoring plan (WQMP).
3. Amend the City's Coliform Monitoring Plan to increase the number of samples collected per month to at least 60, in response to the City's population exceeding 50,000 people.
4. Review the City's public notification procedures to confirm they are in compliance with the 2000 revisions to the Public Notification Rule.
5. Complete additional minor amendments to the City's WQMP.

## ES.8 WATER USE EFFICIENCY

The development of the WUE program is the foundation for using water wisely. The 2009-2014 WUE program will be a continuation of the existing program with specific enhancements to the program to comply with current regulations and create an emphasis on efficient water usage. The proposed goal for the 2009-2014 WUE program will target a 1 percent reduction in the ERU value per year. This should reduce the 2008 ERU Planning Value of 230 gpd to 216 gpd by the year 2014. The City feels this goal can be met through the implementation of the measures proposed and a staff position dedicated towards this program.

The 2009-2014 WUE Program assumes water savings from retail customers only. As shown in the Figure ES.6, WUE measures are projected to result in a reduction in retail MDD of 1.04 mgd by 2014, and approximately 3.97 mgd by the year 2028.

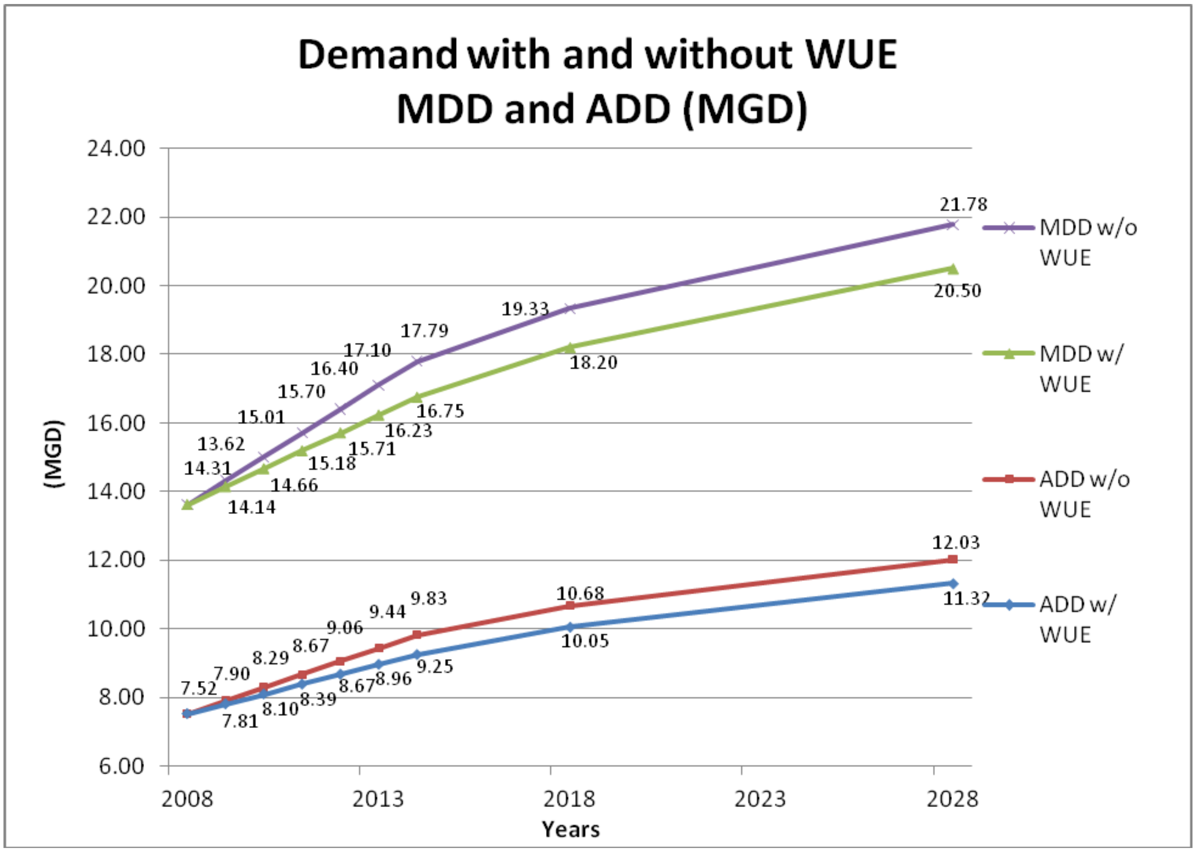



Figure ES.6 Demand Savings

## ES.9 HYDRAULIC ANALYSIS

The City has a hydraulic model (WaterCAD 8.0) of the distribution system for planning and analysis that was used in the previous comprehensive water plan. The hydraulic model includes most of the distribution system mains greater than 6-inches in diameter, the junctions and pressure reducing valves (PRVs) as well as supply sources, reservoirs, and pumping facilities. The City completed numerous projects to improve and expand service since the last Comp Plan in 2001. All of the recent projects and field verified infrastructure was incorporated into the model. Additionally, the model was updated to include the projected demands for 2014 and 2028.

The water distribution network was evaluated using demands that have been estimated for the 6-year and 20-year planning period. To satisfy the City's criteria, the system should be able to maintain pressures between 35 pounds per square inch (psi) and 80 psi at all times except during a fire. The velocity in transmission and distribution mains should be less than 8 feet per second. The system needs to provide fire flow under MDD conditions, while maintaining a minimum pressure of 20 psi or greater. 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 improvements are required to deliver water that meets the City's policy requirements.

## ES.10 CAPITAL IMPROVEMENTS PLAN

The capital improvements plan 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 would be refined during pre-design of the projects. Cost estimates are presented as total project costs in February 2009 dollars. Additionally, since the projected costs will increase with inflation, costs were allocated to each year within the six-year planning period (2009 through 2014) by escalating each project cost to its midpoint of construction assuming an annual compounded inflation rate of 3 percent.

Construction costs assume a 30 percent contingency, 15 percent markup for contractor overhead and profit and a 9 percent sales tax on both services and materials added to the direct construction costs. Project costs were assumed to be the sum of the construction costs, legal and administration costs (assumed to be 15 percent of the construction cost), allied design (assumed to be 20 percent of the construction costs), and services during construction (assumed to be 15 percent of the construction cost).

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 are summarized in Table ES.4. The projects shown are broken down into two categories: 1) capacity and 2) non-capacity. The total escalated costs for capacity related projects over the next six years is $15.9M and the total cost for non-capacity related projects over the next six years is $29.9M.

## 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 2009-2014 Capital Improvement Program (CIP). This viability analysis considers the financial condition of the utility over the past six-year period (2003-2008), the sufficiency of utility revenues to meet current and future financial and policy obligations, and the financial impact of executing the CIP.

For the 2009-2014 planning horizon, the City identified 28 projects valued at $43.6 million in current day dollars ($45.8 million inflated). Sources of funding to support this CIP include capital fund reserves (19%), forecasted system development charge revenues based upon existing rates (6%), a planned bond issuance by the City in 2010 (9%) and new revenue bonding starting in 2010 (66%). Annual debt service for these two bond issuances is forecasted to total approximately $370,000 in 2010, increasing to $3.3 million by 2014.

Operating expenses for the Utility, including annual debt service for the new debt to support the planned CIP, is forecasted to increase to $14.4 million by 2014.

To fund these financial obligations, the primary source of revenue for the utility is collections from water service charges. Total revenues, including revenues under existing water service rates, is forecasted to increase from $9.1 million in 2009 to $12.4 million by 2014. As a result, the financial condition is forecasted to end 2009 with a deficiency of about $300,000 increasing to approximately $1.9 million by 2014.

The City is aware of this financial situation and a comprehensive water rate study is underway to determine the appropriate level of adjustment to water rates over the 2009-2014 planning period. Results from this study is expected by the end of 2009.

## ES.12 MAINTENANCE AND OPERATIONS

The Maintenance and Operations (M&O) Water Division is led by the Water Operations Manager, Water Distribution Manager, and Water Distribution Field Supervisor. Each Manager is familiar with the responsibilities of the other manager positions in order to cope with absences such as vacations, sickness, reserve duty, retirements, and other non-attendance issues. The M&O Manager is designated as manager of the Water Distribution Manager and Water Operations Manager.

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 the majority of personnel carry combination cellular phones and radio units.

Primary operation of the City's Water System is maintained via the supervisory control and data acquisition (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 Public Works 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 Short-Term Capital Improvements Projects (Escalated Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| Project | | Cost in Project Year 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| **Capacity Related Projects** | | | | | | | |
| S-01 | Well 1 Rehabilitation | $ 610,000 | $ 2,070,000 | $ - | $ - | $ - | $ - |
| PS-03 | Green River Pump Station Back-Up Power | $ - | $ 280,000 | $ - | $ - | $ - | $ - |
| PS-05 | New Terrace View Pump Station | $ - | $ - | $ - | $ - | $ - | $ - |
| S-05 | Intertie Infrastructure | $ - | $ - | $ 1,090,000 | $ - | $ - | $ - |
| S-04 | Water Supply Charges (Water Purchase and Emergency Intertie) | $ - | $ - | $ 7,000,000 | $ - | $ - | $ - |
| D-02 | Annual Distribution Improvements Program | $ 109,000 | $ 113,000 | $ 116,000 | $ 119,000 | $ 123,000 | $ 127,000 |
| | **Total Capacity Related Projects** | **$ 719,000** | **$ 2,463,000** | **$ 8,206,000** | **$ 119,000** | **$ 123,000** | **$ 127,000** |
| **Non-Capacity Related Projects** | | | | | | | |
| D-03 | SCADA Upgrades | $ 450,000 | $ - | $ - | $ - | $ - | $ - |
| R-02 | Lakeland Hills New Reservoir | $ - | $ 530,000 | $ 1,810,000 | $ - | $ - | $ - |
| PS-01 | Lakeland Hills Booster Pump Station Improvements | $ 390,000 | $ 1,770,000 | $ - | $ - | $ - | $ - |
| S-07 | Well Inspection and Redevelopment Program | $ 500,000 | $ 515,000 | $ 530,450 | $ 546,364 | $ 562,754 | $ 579,637 |
| D-01 | Annual Distribution R&R Program - High Priority | $ 50,000 | $ 1,100,000 | $ 140,000 | $ 250,000 | $ 150,000 | $ 1,350,000 |
| G-01 | Facilities Evaluation Study | $ 80,000 | $ - | $ - | $ - | $ - | $ - |
| D-04 | Les Gove Waterline Replacement | $ 1,000,000 | $ 700,000 | $ - | $ - | $ - | $ - |
| D-05 | AWS Sewer - R Street SE Utility Improvements | $ 990,000 | $ - | $ - | $ - | $ - | $ - |
| PS-02 | New Academy Booster Pump Station | $ - | $ 580,000 | $ 400,000 | $ 1,600,000 | $ - | $ - |
| PS-07 | Academy Pump Station #1 | $ - | $ - | $ - | $ - | $ 250,000 | $ 830,000 |
| R-01 | Lakeland Hills Reservoir Painting | $ - | $ - | $ - | $ - | $ 700,000 | $ - |
| G-03 /G-04 | Comprehensive Water Plan Update | $ 160,000 | $ - | $ - | $ - | $ - | $ 100,000 |
| S-02 | Well 4 and Intertie Pump Station Improvements | $ 120,000 | $ 500,000 | $ - | $ - | $ - | $ - |

**Table ES.4 Short-Term Capital Improvements Projects (Escalated Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| Project | | Cost in Project Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| S-03 | Well 7 Back-Up Power | $ - | $ - | $ - | $ - | $ 70,000 | $ 240,000 |
| G-05 | M&O Facility Improvements | $ - | $ - | $ - | $ - | $ 300,000 | $ - |
| G-06 | MIT Master Meters | $ - | $ - | $ 130,000 | $ 400,000 | $ - | $ - |
| D-06 | Street Utility Improvements | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 |
| G-02 | Rate Study | $ 100,000 | $ 48,000 | $ - | $ - | $ - | $ - |
| S-08 | Water Resources Protection Program | $ - | $ - | $ 21,855 | $ 22,510 | $ 23,185 | $ 23,881 |
| R-03 | Annual Reservoir R&R Program | $ - | $ - | $ 53,045 | $ 54,636 | $ 56,275 | $ 57,964 |
| | **Total Non-Capacity Related Projects** | **$ 4,040,000** | **$ 5,943,000** | **$ 3,285,350** | **$ 4,073,510** | **$ 2,312,215** | **$ 3,381,482** |
| | **Total All Projects** | **$ 4,759,000** | **$ 8,406,000** | **$ 11,491,350** | **$ 4,192,510** | **$ 2,435,215** | **$ 3,508,482** |

# INTRODUCTION

## 1.1 PURPOSE

The City of Auburn (City) prepared this Comprehensive Water Plan (Plan) to document the status and analyze the future needs of the water utility system. This plan is largely an updated version of the City's 2001 Plan. 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 improvements projects to meet future water demands. Maintaining a current Plan is required to meet the regulations of the Washington 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 comprehensive plan contains timeframes which 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 of Auburn 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 2007, 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 facilities 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): Estimate the effect of future land uses and population trends on the water system.

- Criteria and Standards (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.
- Description of 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.
- Hydraulic Analysis (Chapter 9): Develop a computerized model for analysis of the system.
- Recommended Improvements (Chapter 10): Assess the capability of the existing water system to meet existing and projected future demands, identify existing water system deficiencies, and develop a program of capital improvements, including priorities for design and construction.
- Financial Program (Chapter 11): Develop a plan for financial backing of required system improvements.
- Operations Program (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), Covington Water District, King County Water District #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 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 Washington Administrative Code (WAC) 246-290-100. The City will submit 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. The Adopting Resolution will be included in Appendix C, upon Plan approval by the City Council.

## 1.8 ACKNOWLEDGEMENTS

Carollo Engineers and their team members, FCS Group and Roth Hill Engineering Partners wish to acknowledge and thank the following individuals for their efforts and assistance in completing this Plan.

- Dennis Dowdy, Public Works Director
- Dennis Selle, City Engineer
- Dan Repp, Utilities Engineer
- Cynthia Lamothe, Water Utility Engineer
- Allen Hunter, Water Operations Manager
- Chad Jordison, Water Distribution Manager

# 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 through the south King County coordinated water-system planning process. The South King County Coordinated Water System Plan (CWSP), dated 1989, documented those service area boundaries. 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 current boundaries of the RWSA match those established in the CWSP with one exception. 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). The City limits, RWSAs, and the PAA are shown on Figure 2.1.

For areas outside the Cities municipal boundaries, the City maintains water franchises that allow for construction, 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 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.

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), remain 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 Hills 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 Coal Creek Pump Station 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 pumps were still in operation in 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 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 1959 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.

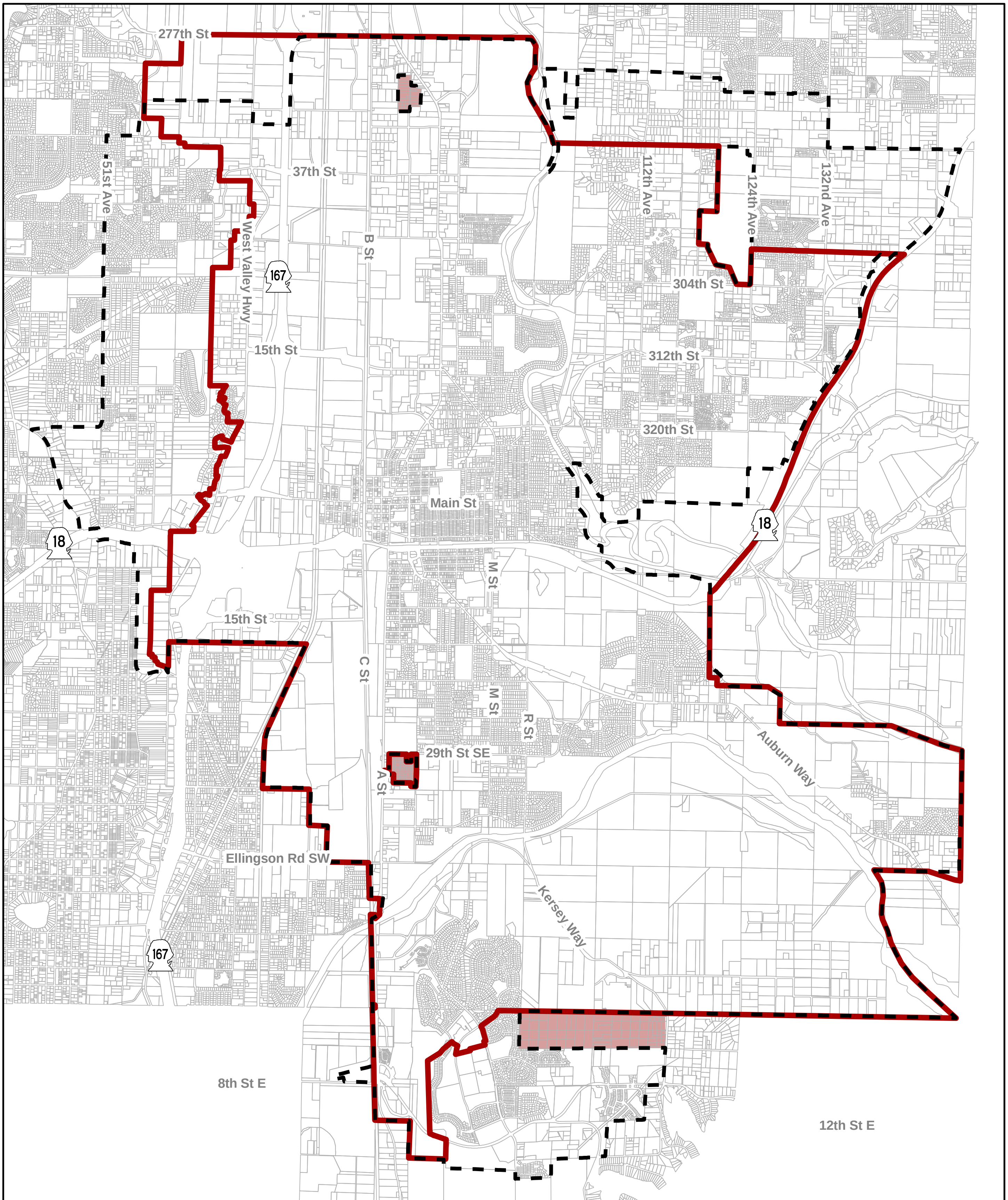



**Figure 2.1**
**Water Service Area**
**Comprehensive**
**Water Plan**
**City of Auburn**

The City expanded service to the Lea Hill area between 1964 and1965. 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 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 perfected 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 of Auburn 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 of Auburn. The supply is on an interruptible basis until the City of Auburn 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 Lakeland Hills Reservoir. This has yet to be completed due to issues associated with taking the reservoir out of service.

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.

As recommended in the 1995 Comprehensive Water Plan, the Aaby Drive Intertie, an intertie to the LUD, was completed in R Street NW. 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 of Auburn in 1998 to allow adequate service to developments within the Lakeland Hills South Planned Unit Development (PUD) in the Lakeland Hills Service Area. 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. The City transferred Aaby Drive pump station and service area to LUD in 2004.

In 2007, the City reestablished its RWSA and that remains unchanged since the 2001 Water Plan.

Many pipeline and other system improvements were implemented since the last plan. A detailed list of the improvements can be found in Appendix D, Disposition of 2001 CIP.

### 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 generally 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 40 to 160 feet); Lea Hill Service Area (service elevation from 150 to 515 feet); Academy Service Area (service elevation from 150 to 460 feet); and Lakeland Hills Service Area (service elevation from 150 to 570 feet). Each service area is further subdivided into smaller hydraulic operating areas, depending on topographic elevations, in order to reduce local pressures.

### 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 Valley: 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 floor.

The City completed an extensive study of the geology and hydrogeology within the City RWSA. The study, generally 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 of Auburn vicinity and further downstream.

## 2.4 ADJACENT WATER PURVEYORS

Several other water purveyors adjoin the City of Auburn RWSA. These include the cities of Algona, Bonney Lake, Kent, City of Pacific (Pacific) and City of Sumner (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. Interties with these adjacent purveyors are discussed later in this Chapter.

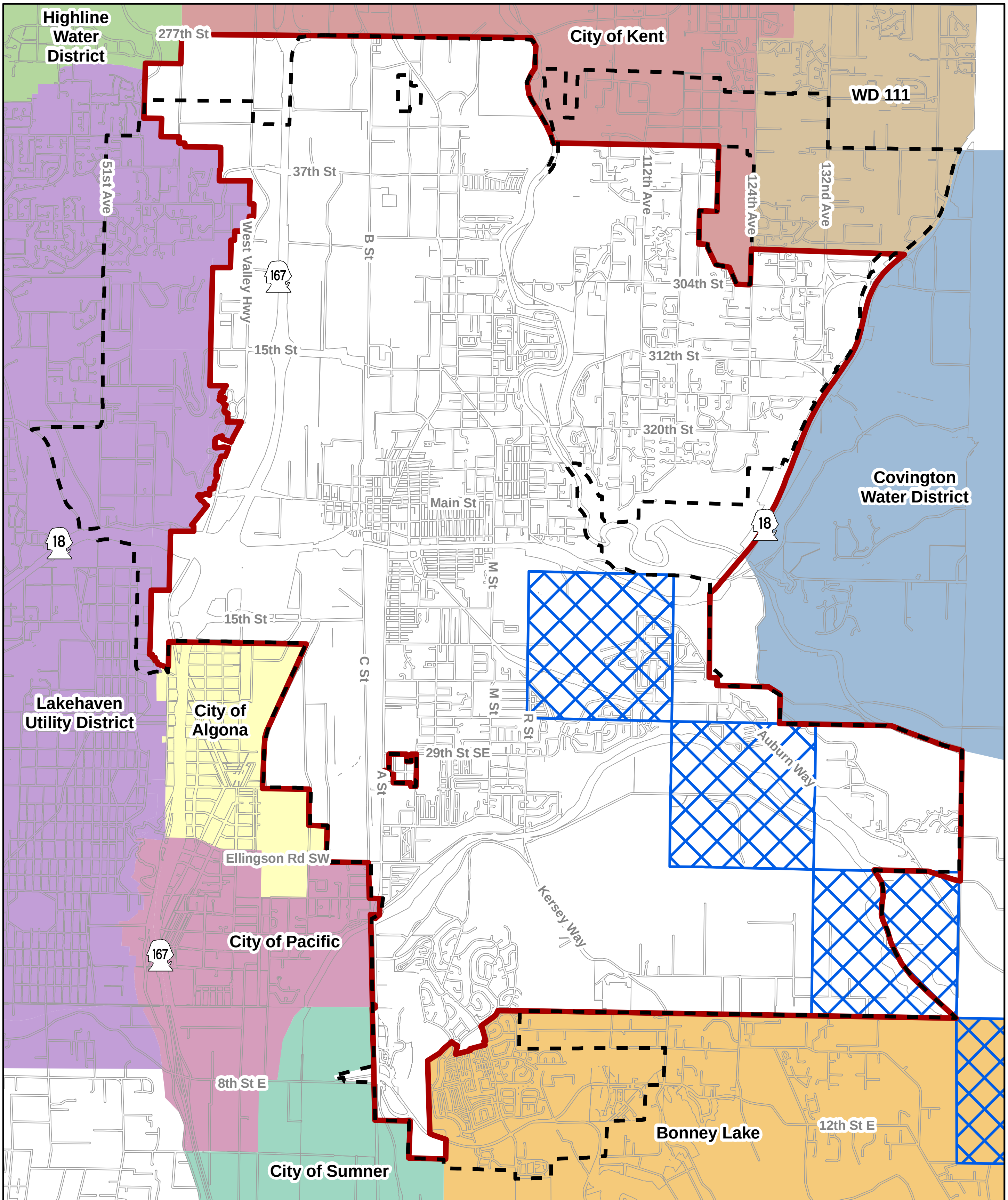
### 2.4.1 City of Algona

Algona is located at the southwest corner of the City of Auburn'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 of Auburn (IA3, dated August 1996). The City of Algona and the City of Auburn 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, a future reservoir in Lakeland Hills which will provide water to Algona, and Well 6 and Well 7 which also will provide water to Algona. Currently Algona is served through the metered Boeing Welded Duct Intertie (located west of Pacific Avenue off lst 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 2,900 and maintains a hydraulic grade line of 245 feet. Algona's water right for the failed well was transferred to the City of Auburn as a provision of the interlocal agreement.

### 2.4.2 City of Bonney Lake

Bonney Lake is located south and east of the City of Auburn RWSA in Pierce County. Bonney Lake serves a population of about 30,500 through a combination of two well fields and two spring sources. The Bonney Lake water system operates over a total of 8 pressure zones with its 748-foot hydraulic grade line pressure zone adjacent to the City of Auburn RWSA.

In 1998, the City of Auburn and Bonney Lake entered into an agreement allowing Bonney Lake to provide interim water service to a portion of the City of Auburn'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 of Auburn has the option to serve the customers within the annexation area. Currently, Bonney Lake provides water service to approximately 1,773 City of Auburn customers.




Legend

- Auburn City Limits
- Retail Water Service Area
- Roadways

Adjacent Purveyors

- City of Algona
- Bonney Lake
- City of Kent
- City of Pacific
- City of Sumner
- Covington Water District
- Highline Water District
- Lakehaven Utility District
- Water District 111
- Muckleshoot Indian Tribe Reservation

0 0.5 1 Miles

**Figure 2.2**
**Adjacent Purveyors**
**Comprehensive Water Plan**
**City of Auburn**

carollo

The City of Auburn 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 of Auburn 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 of Auburn originally established SE 277th Street as the boundary between the two cities. Due to the City of Auburn's annexation of the Lea Hill area, the new boundary between the cities is SE 280th, SE 282nd, and SE 288th streets. The City of Auburn does not anticipate extending its system north of these streets. The Kent water supply source is a combination of springs and wells that serves a population of about 64,000. 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 87 until such time as the City of Kent's system expands.

Water District No. 87 once served the area between the City of Auburn and City of 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 of Auburn's distribution system along "B" Street NW near South 285th Street and along Auburn Way North near South 280th Street. These connections resulted in an intertie between the City of Auburn's water system and the Kent water system at South 277th Street and 78th Avenue SE, which can be opened in an emergency. Kent maintains a hydraulic grade line at the intertie of about 240 feet, which is slightly lower than the City of Auburn's Valley zone. The City of Auburn 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 WD 87 until such time as Kent system expands.

In 2006, the City of Auburn, 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 of Auburn'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 6,026.

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

Pacific's system is operated at a hydraulic grade line of about 250 feet, which is slightly higher than the City of Auburn's Valley zone. Pacific maintains a one-way intertie on

Ellingson Road with the City of Auburn 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 of Auburn's RWSA. Although Sumner and the City of Auburn's RWSA are adjacent at a corner of the two service areas, there are no connections, either emergency or otherwise, and no plans at this time to establish interties.

### 2.4.6 Covington Water District

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

The CWD and WD#111 entered into an IA2 with the City of Auburn 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 of Auburn on an interruptible basis.

In 2005, to avoid unpredictable water sales and create a predictable and reliable cost for wholesale water to be sold by the City of Auburn to CWD and WD#111, the Districts agreed to purchase an average of 1.5 mgd of water from the City of Auburn on a take or pay basis, which means the Districts will pay for the 1.5 mgd whether or not the water is actually taken by the Districts. The 1.5 mgd is a portion of and not in addition to the 5 mgd addressed in IA2.

The CWD 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. The CWD is also participating in the Cascade Water Alliance.

### 2.4.7 Lakehaven Utility District

LUD serves an area to the west of the City of Auburn's RWSA. LUD uses groundwater and an intertie with Tacoma to serve a population of about 106,500. LUD maintains a hydraulic grade line of 578 feet near the City of Auburn's RWSA.

LUD has a service area agreement with the City of Auburn 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 of Auburn'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 agreement the City of Auburn transferred the pump station and distribution system that serves the Aaby Drive neighborhood to LUD.

In 2002, LUD and the City of Auburn entered into an agreement that grants the City of Auburn the right to connect a future intertie to LUD located in the vicinity of 15th Street NW and Terrace Drive.

### 2.4.8 King County Water District #111

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

WD#111 and the City of Auburn 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 of Auburn 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 of Auburn on an interruptible basis.

In 2006, it was agreed upon by the City of Auburn 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.

### 2.4.9 Muckleshoot Indian Tribe

The MIT currently operates a water system on reservation lands east of the City of Auburn. The MIT and the City of Auburn’s water systems are not currently connected by intertie, however, the City of Auburn and the MIT have discussed their future relationship. The City of Auburn 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 of Auburn’s city limits or potential annexation area. The City encourages other systems within the City RWSA to connect to Auburn’s 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. Cities 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 E.

### 2.6.1 Wholesale Interties

The City of Auburn maintains wholesale supply interties with three adjacent water systems: Algona, CWD, and WD#111. The City of Auburn also has a supply contract with the Muckleshoot Indian Tribe 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 Algona

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

### 2.6.3 Covington Water District and King County Water District #111

An intertie between the City of Auburn, 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 of Auburn to provide an emergency supply to Kent's East Hill service area through WD#111.

As part of the IA2 the City of Auburn agrees to provide water, not to exceed a total maximum day demand of 5.0 mgd, to CWD and WD#111. 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 and 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 of Auburn 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 of Auburn 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.

### 2.7.2 City of Kent

The City of Auburn 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 of Auburn hydraulic grade line 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 of Auburn is during emergency conditions when the pressure in the City of Auburn’s system drops below that of Kent’s.

### 2.7.3 City of Pacific

The City of Auburn 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 of Auburn 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 of Auburn before the valves are opened. Pacific has used water from the City of Auburn occasionally.

### 2.7.4 Lakehaven Utility District

LUD and the City of Auburn have a 6-inch intertie located at Aaby Drive and Knickerbocker Drive. Because the City of Auburn’s Valley service area serves elevations below 160 feet, it would be impractical to install small booster-pump stations 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.

In 2002, LUD and the City of Auburn entered into an agreement that grants the City of Auburn 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.

### 2.7.5 King County Water District #111

WD#111 and the City of Auburn 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 of Auburn and WD#111 boundaries. These interties are for emergency use only and are two-way.

## 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. These potential interties are described below.

### 2.8.1 Tacoma Second Supply Pipeline

Tacoma Public Utilities constructed the Second Supply Pipeline Project, which runs through the north end of the City of Auburn’s Retail Water Service Area between 30th and 37th Streets NE.

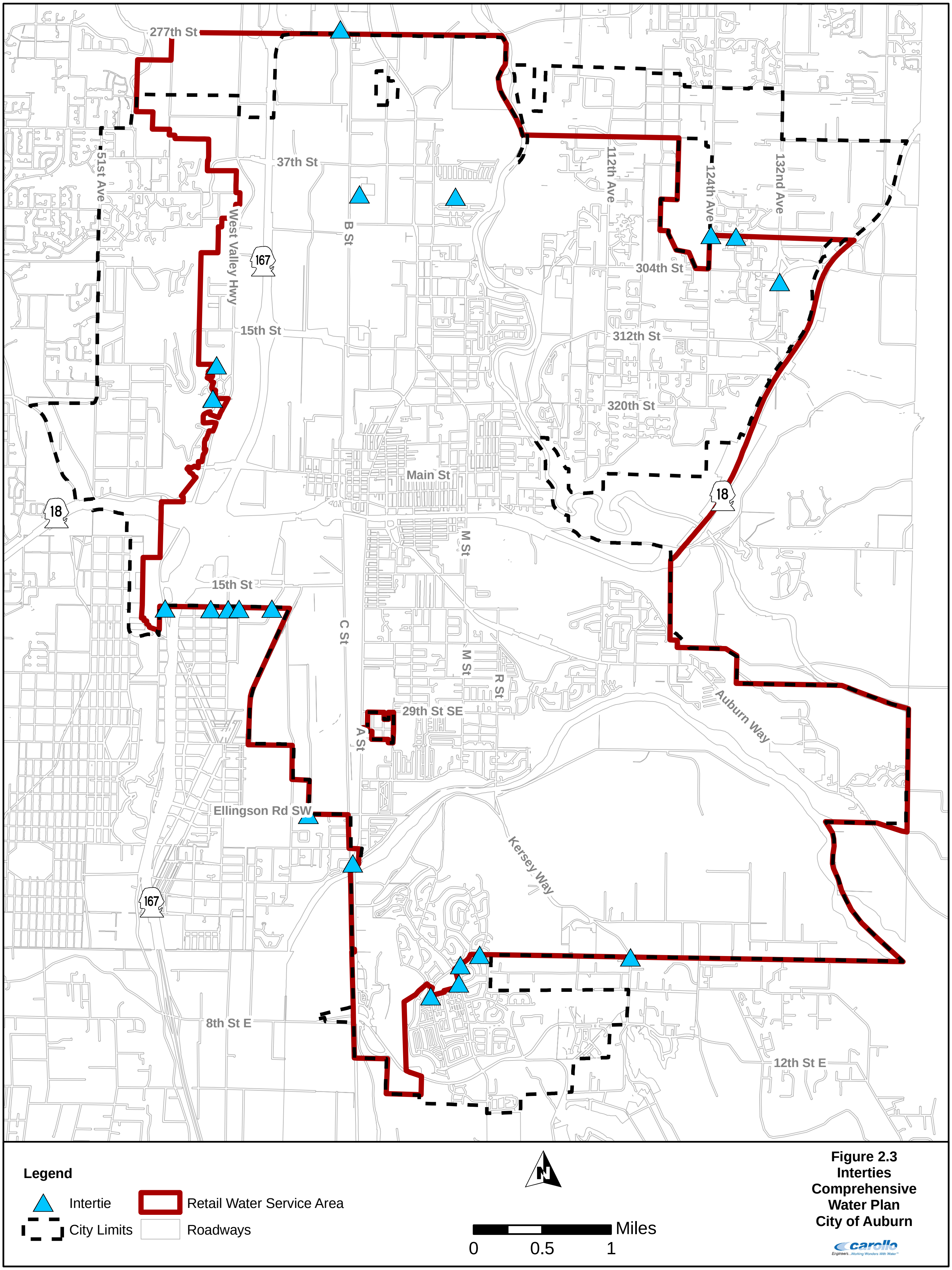



**Figure 2.3**
**Interties**
**Comprehensive Water Plan**
**City of Auburn**

The City of Kent, CWD, and LUD participated with Tacoma in the project. The South King County Coordinated Water-System Plan recommends interties between utilities of the same Critical Water Supply Service Area (CWSSA). Consistent with this recommendation, and as a member of the South King County RWA, the City of Auburn will pursue interties to the Second Supply Pipeline Project that could be used for emergency water supply or for potentially wheeling supply from or to other utilities in the area. The Second Supply Pipeline Project route runs from the east into the Lea Hill service area, across the Green River Valley and then up the west hill into the LUD's service area. Three turnouts for potential future interties were constructed as part of the pipeline project: one on Lea Hill and two in the Valley Service Area. The City is currently evaluating construction of interties.

## 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. Related plans reviewed and a brief synopsis of each plan follows:

**City of Auburn 2001 Comprehensive Water Plan, City of Auburn Public Works, 2001:** The previous Comprehensive Water Plan provided evaluation of needs and recommended improvements to the City system for 2001-2006. The 2001 plan constitutes the basis for this Plan.

**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.

**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.

**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.

**Draft Ground Water Management Plan (GWMP), South King County Regional Water Association, 1999:** 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.

**Comprehensive Plan, City of Auburn Planning Department, 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.

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

**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.

**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 and is amended every two years.

**Water Cost of Service Rate Update Study, City of Auburn, 2000-2003:** The most recent water-rate cost of service study for the City.

**Capital Facilities Plan (2009-2014), City of Auburn Finance Department, 2008:** The Capital Facilities Plan was adopted in 2008 and includes goals, policies, capital improvements and implementation programs as required by the Washington Growth Management Act (GMA), coordinated with the City CIP.

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, 2005, Gray & Osborne, Inc.

City of Bonney Lake, 2006, RH2 Engineering, Inc.

City of Kent, 2002, Kent Public Works Department

City of Pacific, 2000, Gray & Osborne, Inc. / 2002 Parametrix (Amendment)

Covington Water District, 2007, HDR

Lakehaven Utility District, 2006, PACE

King County Water District #111, 2008, Roth Hill Engineering Partners

# 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), not for any satellite systems the City may construct and/or operate. The City may develop criteria and standards for satellite systems that differ from those developed for the City's multi-source municipal water system. 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 existing and future water system within the retail water service area." **(City 2007-2008 Budget)**

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

1. Service Area, Extension, and Service Ownership
2. System Reliability and Emergency Management Plan
3. Fire Protection
4. Coordination and Cooperation with Other Agencies
5. Water System Planning, Design, and Construction

6. Environmental Stewardship

7. Water Use Efficiency

8. Operational

9. Financial

Table 3.1 summarizes the service area policies.

**Table 3.1 Service Area Policies Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Policy Name | Policy Statement |
|---|---|
| Retail Service Area | The City will plan for and provide water service to all firm customers within the City. As supply permits, the City may provide water to non-firm customers. |
| 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) 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 component out-of-service. |
| Reservoir Storage | Auburn 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 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 distribution mains and 8 feet per second in transmission mains. |
| Water Use Efficiency Goals | The City will target a 1 percent reduction in equivalent residential unit value for each year. |
| Non-revenue water (water leakage) | The City will strive to maintain levels of water leakage for its distribution system at less than 10 percent. |

## 3.2 SERVICE AREA, EXTENSION, AND SERVICE OWNERSHIP

Retail service area and extension policies define the Retail Water Service Area and conditions for service extension within those boundaries. The service policies define the level of service provided to water system customers, as well as public and private service ownership and responsibility for water system components.

### 3.2.1 Retail Service Area

The City's water service area boundaries were initially defined through the South King County Coordinated Water Supply Plan dated 1989. This plan defines 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 firm customers. Firm customers are those retail and wholesale customers within the RWSA 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 should be consistent with the goals, objectives, and policies of the City of Auburn Water Comprehensive Plan.

### 3.2.2 Government Consistency

The City's Water Comprehensive Plan will be consistent with local, county, and state land use authorities.

### 3.2.3 Duty to Serve

The City will plan to provide water service to all customers within the City's RWSA. The City does not anticipate changes to its defined RWSA. Revisions to the City's RWSA shall be made only by written agreement and in accordance with local, county and state regulations.

### 3.2.4 Potential Annexation Area

Annexation shall be required as a condition of the City's provision of sewer and/or water utility service to properties within the Potential Annexation Area (PAA) until such time as a joint planning agreement between the City and respective county is in effect. The agreement shall provide for development in the unincorporated PAA to meet City standards. Exceptions to this involve requests for water and/or sewer service for the following:

- Single-family residences on pre-existing lots.
- To address a documented imminent health or safety consideration.
- When a water/sewer availability development agreement has previously been approved by the City and is still valid.
- Public facilities provided that development is otherwise consistent with an applicable adopted capital facilities plan.

In situations where an exception applies, the City shall require the property owner to enter into a legally binding, non-remonstrance pre-annexation agreement with the City. The agreement shall provide for the property owners support for annexation to the City at such time as the City deems annexation appropriate. In these instances, the following conditions shall also apply:

- The property owner/developer shall agree to comply with appropriate City development standards and public facility specifications where such requirements are not superseded by applicable county requirements (in the event of significant conflict between City and county requirements, the City may choose to not extend utility services). Any facilities to be dedicated to the City of Auburn upon completion (e.g. sewer and water lines and appurtenances) shall be built in accordance with City design and construction standards; and
- The property owner/developer shall allow City plan review prior to construction and inspection during construction of all public improvements as they are built, regardless of the ownership of such improvements, and shall reimburse the City for any reasonable costs incurred in such plan review and inspection. **[CE-3, Page 13-2]**

The City shall oppose, and shall seek adjoining jurisdictions agreement to prohibit, additional urban development within Auburn's Potential Annexation Area, unless adequate urban governmental services (including but not limited to storm and sanitary sewer systems, water utility systems, adequate streets and arterials, parks and open spaces, fire and police protection services, emergency medical services, public schools and public transit service) are provided concurrent with development. Exceptions to the requirement for urban sanitary sewer and water utility service may be permitted pursuant to a non-remonstrance agreement between the City and the property owner and satisfying the requirements of the King County Board of Health for property situated in King County or the Pierce County Board of Health for property situated in Pierce County. **[CE-10, Page 13-5]**

### 3.2.5 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 standards. This conditioning of service ensures that the water system and other infrastructure 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 believes that all residents of the City within the retail water service area should 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.

### 3.2.6 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; Ordinance 4878 § 3, 1996) [13.06.090 Connection]**

Connections to the public water system shall be made in accordance with City of Auburn design and construction standards. **(Ordinance 5849 § 1, 2004; Ordinance 5216 § 1, 1999; Ordinance 4878 § 3, 1996) [13.06.100 Connection]**

### 3.2.7 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]**

### 3.2.8 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. The City may extend the water system to ensure orderly system development, in which case, the property owner shall be responsible for an equitable share of extension costs at the time of connection to the City's system. Water-system extensions shall be constructed to current City criteria and standards and shall be sized to serve the level of development contemplated in the City's Water Comprehensive Plan.

The City should work cooperatively with King and Pierce County to ensure that water-system facilities constructed within the Auburn RWSA meet or exceed the respective minimum County design standards. All water-system facilities within the Water Service Area should be constructed to the same standards and should be consistent with criteria and standards used for the system inside the City. This requirement is to ensure that incorporation of an area into the City at some future time does not necessitate water-system improvements and the associated financial burden on the water utility.

The City shall continue it's policy of requiring that water system extensions needed to serve new development shall be built prior to or simultaneous 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.

### 3.2.9 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]**

### 3.2.10 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)]**

Exempt the following from the concurrency management program **[CFP Policy 1.4, (Page 11)]**:

- Development vested by RCW 19.26.095, 58.17.033, or 58.17.170.
- Development that creates no added impact on public facilities.
- Expansions of existing development that were disclosed and tested for concurrency as part of the original application.

### 3.2.11 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 or the back-flow prevention assembly. 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]**

### 3.2.12 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.

The City may consider, on a case-by-case basis, assisting other water providers with water service.

### 3.2.13 Satellite Systems

The conditions for City ownership of a satellite system shall be determined on a case-by-case basis. Requirements, such as information on the water supply and water right, information on the installed equipment, reliability (including emergency power), and the required financial protection (reserve amount) will be evaluated.

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 SYSTEM RELIABILITY AND EMERGENCY MANAGEMENT PLAN

System reliability policies and criteria define the City's standards to construct and maintain reliable water system infrastructure and equipment. The Emergency Management Plan states the City's responsibility to maintain an updated Emergency Response Plan and to take reasonable action in case of emergencies.

### 3.3.1 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.

### 3.3.2 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.

### 3.3.3 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.

### 3.3.4 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.

### 3.3.5 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

### 3.3.6 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.
- 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]**

### 3.3.7 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.

## 3.4 FIRE PROTECTION

The fire protection policies outline the City's fire flow requirements and the City's commitment to system improvements.

### 3.4.1 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.

### 3.4.2 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]**

### 3.4.3 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.

### 3.4.4 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.

### 3.4.5 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 areas 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.

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.

### 3.4.6 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. Table 3.2 provides the duration for various fire flows.

**Table 3.2 Fire Flow Duration Criteria**
**Comprehensive Water Plan**
**City of Auburn**

| Required Fire Flow | Duration |
|---|---|
| 2,000 gpm or less | 2 hours |
| 2,001 to 3,000 | 3 hours |

| Table 3.2 Fire Flow Duration Criteria<br>Comprehensive Water Plan<br>City of Auburn | |
|---|---|
| **Required Fire Flow** | **Duration** |
| 3,001 to 4,000 | 4 hours |
| 4,001 to 5,000 | 5 hours |
| 5,001 to 6,000 | 6 hours |
| 6,001 to 7,000 | 7 hours |
| 7,001 to 8,000 | 8 hours |

## 3.5 COORDINATION AND COOPERATION WITH OTHER AGENCIES

These policies summarize the City's willingness to coordinate and cooperate with other agencies, as well as to enter interlocal agreements with neighboring jurisdictions for provision of water service.

### 3.5.1 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.

### 3.5.2 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.

### 3.5.3 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.

## 3.6 WATER SYSTEM PLANNING, DESIGN, AND CONSTRUCTION

Water system planning policies define the methods and procedures the City uses to determine what facilities are needed to meet anticipated growth within the City's service area and the Urban Growth Area. These also provide guidance for design and construction of facilities.

### 3.6.1 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 existing firm customers and growth within its Retail Water Service Area. Future water demands will be estimated using existing water usage patterns and projected future populations provided by the Puget Sound Regional Planning Council. Effects of past water conservation will be considered when projecting future water needs.

### 3.6.2 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.

### 3.6.3 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) 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 in Section 3.3.

### 3.6.4 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]**

### 3.6.5 Individual Property 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]**

### 3.6.6 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]**

### 3.6.7 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]**

### 3.6.8 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]**

### 3.6.9 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.

### 3.6.10 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.

### 3.6.11 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.

### 3.6.12 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.

### 3.6.13 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.

### 3.6.14 Distribution System Materials and Configuration

Pipe velocities shall not exceed 8 feet per second in distribution mains and 8 feet per second in transmission mains.

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 (minimum) 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]**

# 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.

## 3.7.1 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)]**

## 3.7.2 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 contaminates. **[EN-84, (Page 9-16)]**

## 3.7.3 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.

## 3.7.4 Cross-Connection Control

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 (Cross Connection Control) 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 (DOH). 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)]**

The City reserves the right to require any customer to install, as a condition of water service, a pressure reducing valve, 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) [13.12.040]**

### 3.7.5 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.

### 3.7.6 Coal Creek Spring's 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)]**

### 3.7.7 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)]**

### 3.7.8 Septic Systems

The City shall discourage the use of septic tanks except in those areas that are designated for rural uses and have suitable soils. **[EN-9, (Page 9-3)]**

### 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)]**

## 3.8 WATER USE EFFICIENCY

The water use efficiency policies summarize the City's responsibility to continue promoting programs that address water efficiency and implement the use of the best available technology.

### 3.8.1 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. 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.

### 3.8.2 Conservation Promotion

The City shall promote water conservation and the wise use of water resources. **[CF-20, (Page 5-6)]**

### 3.8.3 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 ACC 13.06.360. Deduct meters, as defined in Chapter 13.20 ACC, shall not be used to supply water for irrigation. **(Ordinance 5849 § 1, 2004) [13.06.230]**

### 3.8.4 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]**

### 3.8.5 Non-Revenue Water

The City will strive to maintain levels of water leakage for its distribution system at less than 10 percent.

### 3.8.6 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.

### 3.8.7 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.

### 3.8.8 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.

### 3.8.9 Water Use from Fire Hydrants

All hydrant water sales shall be metered and require a hydrant meter use permit that authorizes use of hydrants.

### 3.8.10 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.

### 3.8.11 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)]**

## 3.9 OPERATIONAL

The operational policies summarize the City's commitment to resolving customer complaints, and providing a safe work environment, training, and certification opportunities for its employees.

### 3.9.1 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.

### 3.9.2 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.

### 3.9.3 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.

### 3.9.4 Customer Service

The City is committed to resolving customer complaints. All complaints are recorded and forwarded to the Customer Service Representative for resolution.

### 3.9.5 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.

### 3.9.6 Continuing Education

The City supports continuing educational opportunities that may include seminars, conferences, and college coursework.

## 3.10 FINANCIAL

The financial policies summarize the City's general financial policies and criteria, including water rate structure, development charges, capital improvements financing, and reserves.

### 3.10.1 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]**

### 3.10.2 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.

### 3.10.3 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.

### 3.10.4 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 either city sanitary sewer facilities or water facilities or both. A storm drainage utility systems development charge is imposed upon all lands in the City, except those lands exempted under this chapter, which fees and charges shall be as set forth on the City of Auburn fee schedule.

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 every 3 years. 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) [13.41.030 Utility systems development charge imposed – Rates – Review]**

### 3.10.5 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 biennially and be financially constrained for the appropriated budget period. **[Capital Budget BBP Policies – 3, (Page 41)]**

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.

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)]**

### 3.10.6 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)]**

### 3.10.7 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 15 years. The water utility also may collect an overhead amount on this charge to pay for processing the agreement and payments. **(Water Plan)**

### 3.10.8 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]**

### 3.10.9 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.

### 3.10.10 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.

### 3.10.11 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.

### 3.10.12 Water Rate Uniformity

Water rates should be uniform for all water utility customers of the same class throughout the City.

### 3.10.13 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.

### 3.10.14 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 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)]**

### 3.10.15 Charges for Services Outside the City Limits

The City may include a rate adjustment for water service outside the City limits.

### 3.10.16 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.

# WATER REQUIREMENTS

The purpose of this chapter is to present an analysis of historical water use from 2001 to 2007, and provide projections for the planning period of 2008 to 2028. The planning data generated is used to estimate future water demand and supply needs for the City of Auburn's (City) water system. Historical consumption and supply data were used to develop the value of an Equivalent Residential Unit (ERU) and the maximum-day peaking factor. This data was then used to convert the population projections into projected average and maximum day future demands for the planning period. The future water demands were used to establish criteria for the hydraulic analysis of the water system and for development of the recommended Capital Improvement Program.

The consultant team met with the City staff to discuss the methods for determining the ERU planning value, peaking factor, and distribution leakage percentage. In this meeting, it was agreed upon that the 75 percentile of historical data would be used in calculating these values.

## 4.1 SOURCE

The City produces all of their water from ten well sources and two spring sources. The annual quantity of water produced is summarized in Table 4.1 below and is measured and recorded at each source daily. These data were provided by the City.

**Table 4.1 Total Water Produced<br>Comprehensive Water Plan<br>City of Auburn**

| Year | Water Produced (MG) |
|---|---|
| 2001 | 3,239 |
| 2002 | 3,035 |
| 2003 | 3,080 |
| 2004 | 3,082 |
| 2005 | 2,957 |
| 2006 | 3,030 |
| 2007 | 3,134 |

## 4.2 HISTORICAL CONNECTIONS AND WATER USE

The City provided water to 12,947 retail customers as of the end of 2007. From 2001 to 2007, the total number of connections increased by 11 percent, while the total water consumed only increased by 9 percent. Table 4.2 shows the total number of connections by customer class from 2001 to 2007.

### 4.2.1 Retail Customer Classes

Single-family residences account for 81 percent of system connections and 28 percent of water use. There have been 943 new single-family connections, or an increase of 10 percent, since 2001.

The multifamily customer class has gained 77 connections since 2001. There are 957 accounts using 18 percent of the total water.

There are 1,086 commercial accounts that make up 8 percent of the system connections. However, this customer class uses 15 percent of the total water. There have been 107 new commercial connections, or an increase of 11 percent, since 2001.

The manufacturing and industry class connections have decreased by nine connections or 19 percent since 2001. They represent 0.3 percent of the total system connections, but represent 10 percent of total consumed.

**Table 4.2 Historical Number of Connections by Customer Class**
**Comprehensive Water Plan**
**City of Auburn**

| Customer Class | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| Single-family/Duplex | 9,539 | 9,787 | 9,832 | 9,931 | 10,009 | 10,199 | 10,482 |
| Multifamily | 880 | 892 | 887 | 893 | 1,040 | 915 | 957 |
| Commercial | 980 | 1,017 | 1,026 | 1,035 | 1,315 | 1,069 | 1,086 |
| Mfg/Industry | 48 | 50 | 40 | 40 | 73 | 39 | 39 |
| Schools | 36 | 35 | 36 | 36 | 94 | 38 | 39 |
| City Accounts | 19 | 26 | 25 | 29 | 32 | 27 | 28 |
| Irrigation | 136 | 199 | 206 | 174 | 255 | 339 | 316 |
| Wholesale | 7 | 8 | 6 | 6 | 15 | 7 | 7 |
| **Total** | **11,645** | **12,014** | **12,058** | **12,144** | **12,833** | **12,633** | **12,954** |

The schools and city accounts classes are the smallest in terms of number of connections and water use. The school accounts are consuming 3 percent of the total water and the city accounts are consuming 0.3 percent of the total water. City accounts are growing at 47 percent increasing by nine connections since 2001.

Irrigation accounts have grown the most, gaining 180 new connections from 2001. There are 316 accounts and they consume 4 percent of the total water.

Figure 4.1 depicts the percentages of volume of water sold by customer class from 2001 to 2007. Single-family residential customers consume the most water as a customer class, accounting for 28 percent of total retail water sales. Figure 4.2 shows the total volume consumed by customer class. The wholesale customers account for the second largest volume of water sold. Multifamily, commercial, and industrial customers also account for a significant portion of water. Consideration of each of these customer classes, along with projected wholesale amounts, is essential in projecting future water demand.

### 4.2.2 Wholesale Customers

The City has wholesale agreements to sell water to the City of Algona (Algona), Covington Water District (CWD), and King County Water District #111 (WD#111).

The current contract with Algona is a firm wholesale contract that became effective October 21, 2002 and expires at the end of 2014. The contract requires the City to deliver 525,000 gallons of average day demand (ADD) and 1,114,000 gallons of maximum day demand (MDD) through 2014.

The City's agreement with CWD and WD#111 is on an interruptible basis and requires the City to sell 2.5 million gallons per day (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.

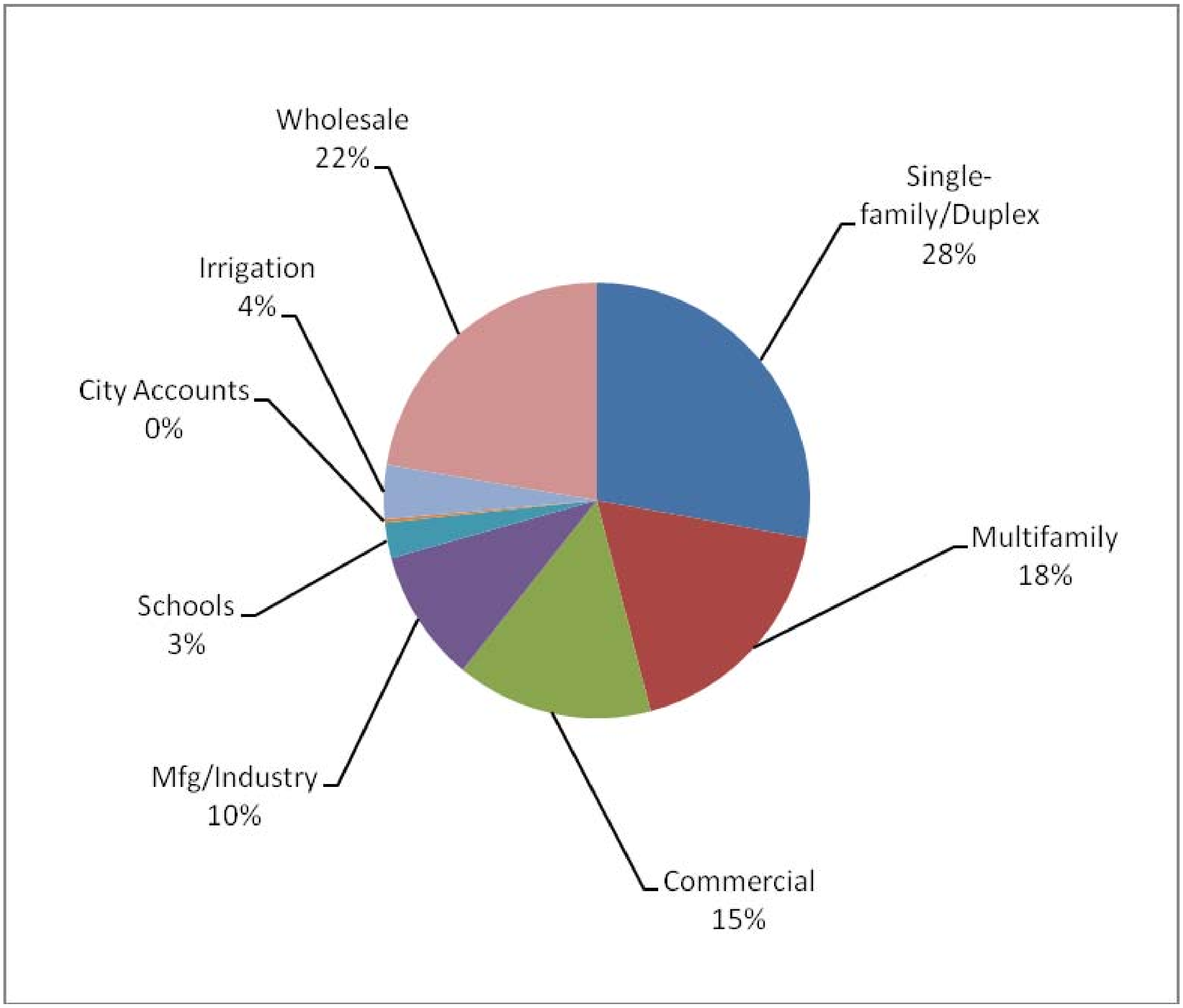
Copies of these agreements are included in Appendix E.

## 4.3 EQUIVALENT RESIDENTIAL UNITS

The demand of each customer class can be expressed in terms of ERUs for forecasting and planning purposes. 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 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 2001 through 2007, the average quantity of water used by one typical, full-time single-family residence ERU is equal to 221 gallons per day (gpd).

**Table 4.3 Historical Annual Average Water Consumption by Customer Classification (Gallons per Account)**
**Comprehensive Water Plan**
**City of Auburn**

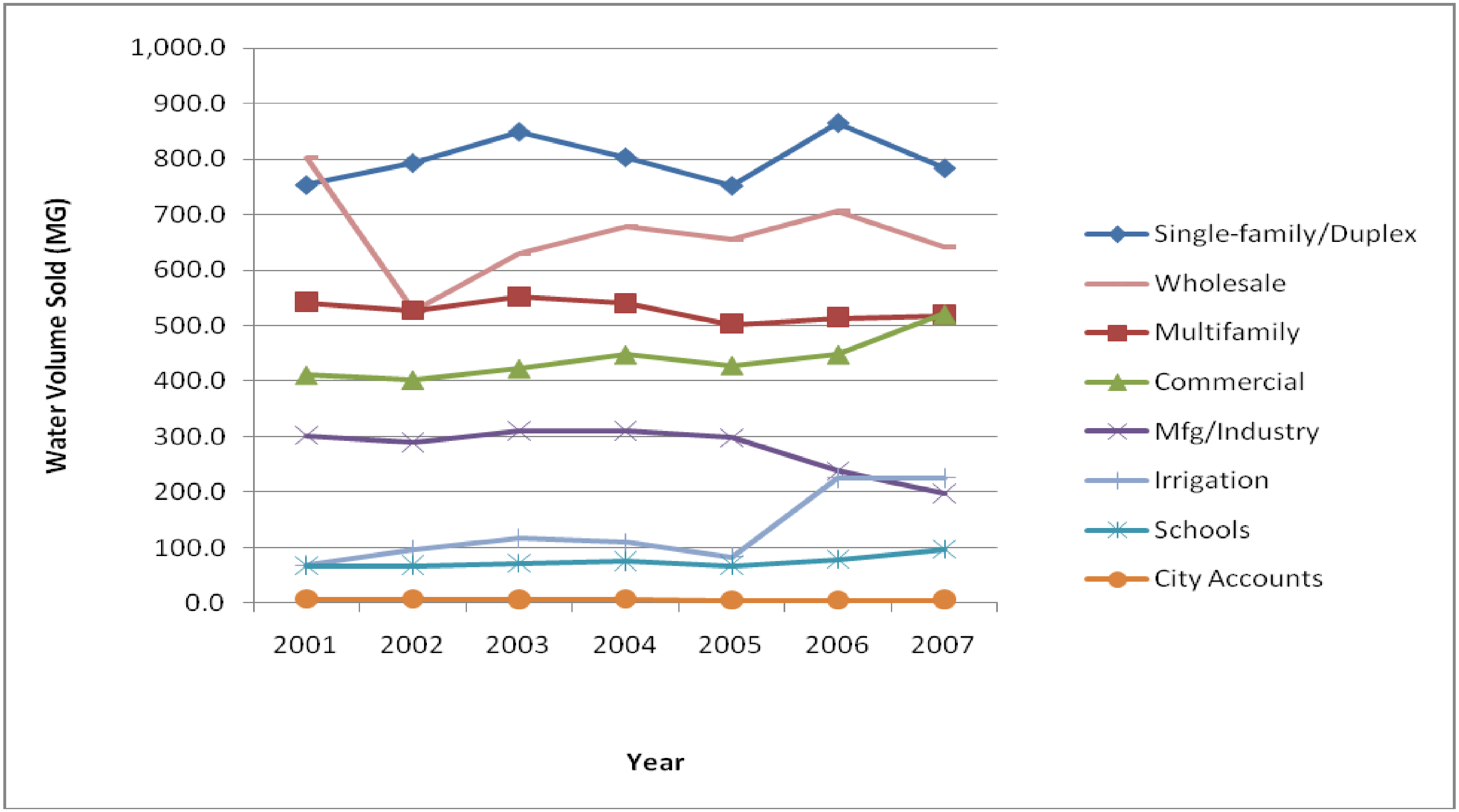
| Classification | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Average | 6-yr avg. | Planning Valve | ERUs per Account |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Single-family/ Duplex | 217 | 222 | 236 | 222 | 206 | 232 | 205 | 220 | 221 | 230 | 1.0 |
| Multifamily | 1,685 | 1,618 | 1,704 | 1,656 | 1,322 | 1,540 | 1,484 | 1,573 | 1,554 | 1,650 | 7.2 |
| Commercial | 1,149 | 1,084 | 1,130 | 1,186 | 892 | 1,149 | 1,315 | 1,129 | 1,126 | 1,180 | 5.1 |
| Mfg/Industry | 17,270 | 15,861 | 21,259 | 21,282 | 11,187 | 16,746 | 13,894 | 16,786 | 16,705 | 20,130 | 87.5 |
| Schools | 5,135 | 5,310 | 5,404 | 5,739 | 1,993 | 5,677 | 6,779 | 5,148 | 5,150 | 5,720 | 24.9 |
| City Accounts | 1,041 | 803 | 721 | 691 | 548 | 558 | 636 | 714 | 660 | 710 | 3.1 |
| Irrigation | 1,377 | 1,320 | 1,548 | 1,718 | 888 | 1,816 | 1,951 | 1,517 | 1,540 | 1,790 | 7.8 |
| Wholesale | 314,263 | 180,456 | 288,064 | 309,957 | 119,625 | 276,110 | 251,647 | 248,589 | 237,643 | | |
| Total (Not Including Wholesale) | 27,874 | 26,218 | 32,002 | 32,494 | 17,036 | 27,718 | 26,264 | 27,087 | 26,956 | | |
| Distribution System Leakage | 8.6% | 10.7% | 3.7% | 3.3% | 5.3% | - | 4.36% | 6.0% | 6.0% | 7.8% | - |




**PERCENT CONSUMED BY CUSTOMER CLASS**

FIGURE 4.1

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*




**HISTORICAL ANNUAL WATER CONSUMED (MG)**

FIGURE 4.2

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

Because water use varies, an ERU planning value higher than the average is generally recommended for demand forecasting. The 75th percentile of all the six-year values was used to select the single-family/duplex planning ERU value, which is 230 gpd. The other customer class planning values was also selected by determining the 75th percentile from all the six-year values. Also on Table 4.3 are the ERUs per account for each customer class. This is based on the planning value of 230 gallons per ERU. The number of non-single-family/duplex ERUs per account range from 3.1 for City accounts to 87.5 for Manufacturing/Industry accounts.

## 4.4 HISTORICAL WATER DEMANDS

### 4.4.1 Average and Maximum Demands

The average and maximum water demands on the entire water system rather than ERUs are also fundamental values when performing system and supply analyses. Table 4.4 illustrates the historical ADD, MDD, and peaking factors from 2001 to 2007. For 2001 to 2007, the ADD has fluctuated throughout this planning period with a reduction of 3.2 percent from 2001 to 2007.

MDD is used for storage and fire flow analyses. Determination of MDD is critical because it is the benchmark for supply capability, pump station discharge rates, reservoir capacity, and pump sizes. The MDD from 2001 to 2007 fluctuates from year to year between 13.13 mgd and 15.35 mgd.

**Table 4.4 Historical Annual ADD, MDD, Peak Day, and Peaking Factor**
**Comprehensive Water Plan**
**City of Auburn**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Avg. |
|---|---|---|---|---|---|---|---|---|
| Water Produced (MG) | 3,239 | 3,035 | 3,080 | 3,082 | 2,957 | 3,030 | 3,134 | 3,080 |
| Average Day Demand (ADD) (mgd) | 8.90 | 8.32 | 8.55 | 8.54 | 8.10 | 8.30 | 8.61 | 8.47 |
| Maximum Day Demand (MDD) (mgd) and Max Day Date | 13.92 | 15.35 | 14.22 | 15.04 | 13.13 | 15.17 | 14.25 | 14.47 |
| | 6/24/01 | 7/12/02 | 8/4/03 | 7/30/04 | 8/5/05 | 8/4/06 | 7/11/07 | - |
| Peaking Factor (1) | 1.56 | 1.85 | 1.66 | 1.76 | 1.62 | 1.83 | 1.65 | 1.70 |

Notes:

(1) Peaking factor is equal to the maximum day demand divided by the average day demand (MDD/ADD).

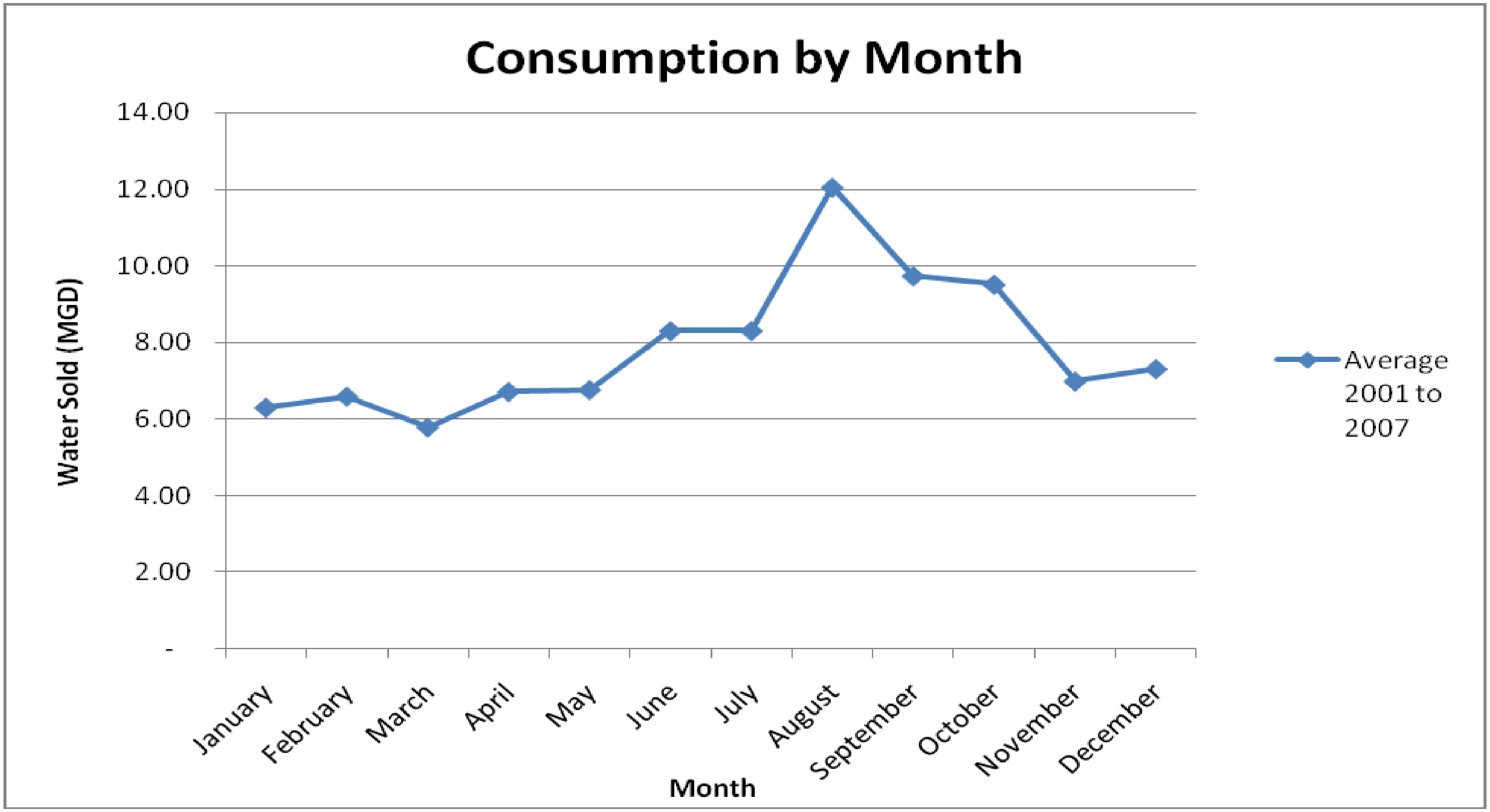
The historical peaking factor, shown in Table 4.4, is the relative magnitude of MDD compared to ADD. Like the MDD, the peaking factor fluctuates. The average annual peaking factor of 1.70 shown in Table 4.4 is significantly lower than typical regional peaking factors. This is likely due to consistent use year round by Commercial and Manufacturing/Industry customers. The peaking factor has remained relatively consistent since the 2001 Comprehensive Plan value of 1.75.

The recommended peaking factor for this planning period is calculated by using the 75th percentile of the peaking factor values between 2002 and 2007, which is 1.8. This factor leans toward the higher side of the data range to provide a factor of safety.

### 4.4.2 Seasonal Demands

In order to better assess Auburn's water use and prepare for future growth, an analysis was also performed on seasonal water use. Figure 4.3 provides a representation of the seasonal water usage, which depicts the variation in the total system consumption throughout the year. The graph is created by averaging the consumption by month for 2001 to 2007. Figure 4.4 shows the variation of water use for each customer class throughout the year. This graph is based on the average monthly water use from 2001 through 2007. Customers are billed bimonthly, with half of the customers billed each month. Based on water use patterns shown in Figure 4.4, summer was defined to be May through October and winter to be November through April. Manufacturing/Industry customers are not shown on the graph, as they typically do not see summer/winter use patterns. The winter months show a relatively constant monthly usage, while summer months show an increase, peak, and decrease in water usage. The most dramatic peaks were from the school account, which can be attributed to watering of play fields and landscaping. Although the residential class experiences a peak in the summer month compared to the other customers, residential customers remain relatively flat throughout the year.

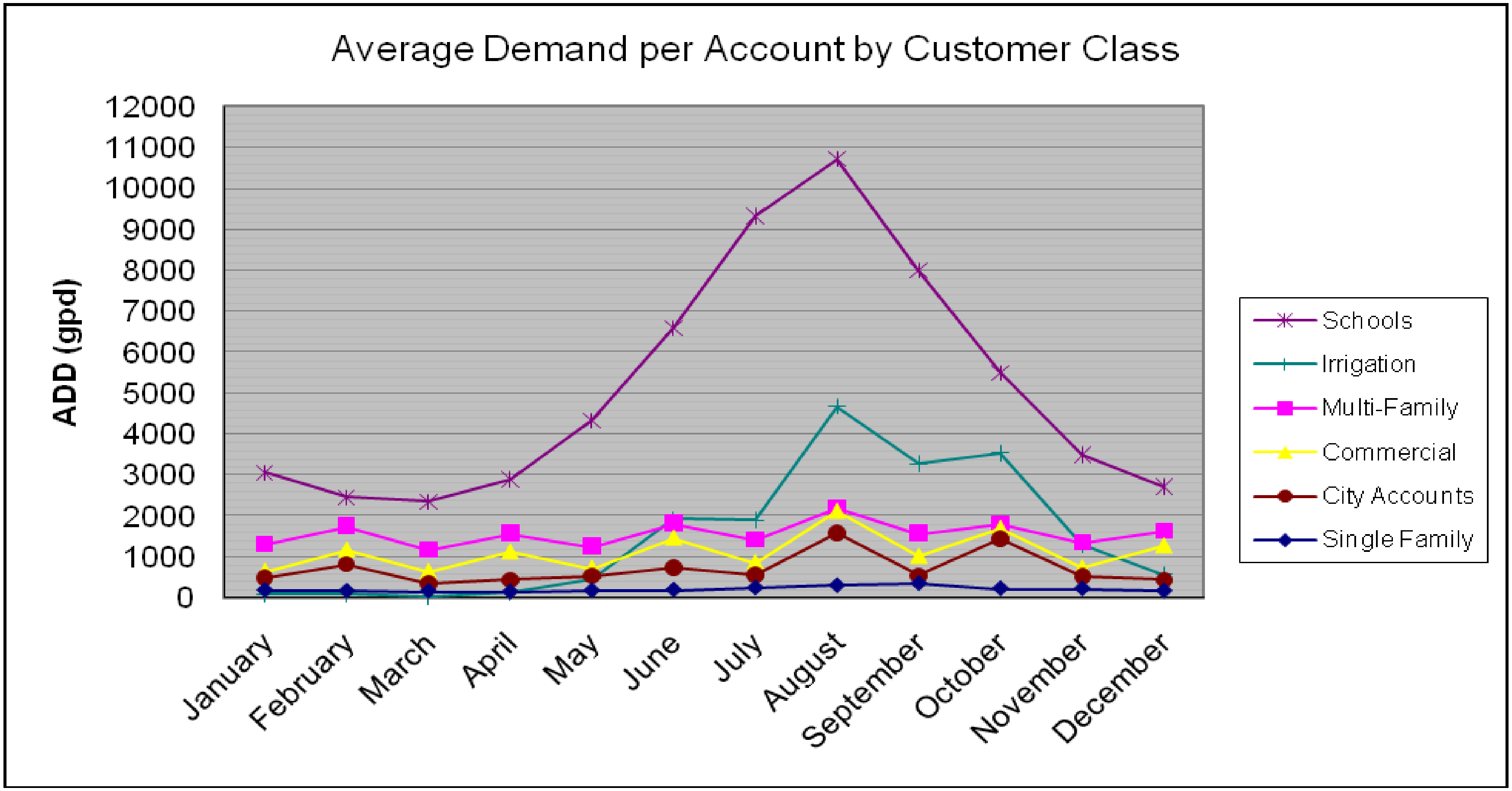
The average summer and winter ADD by customer class for 2001 to 2007 are shown in Table 4.5. These values can be used to project future water demand by season. For residential customers, the winter demand value is also an indicator of base indoor use, and the summer demand value shows increased seasonal outdoor use. Conservation measures can therefore be targeted to either indoor or outdoor use, and similarly tracked and measured.




**AVERAGE CONSUMPTION BY MONTH FOR 2001 TO 2007 (INCLUDING WHOLESALE) (MGD)**

FIGURE 4.3

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*




**AVERAGE DEMAND PER ACCOUNT BY CUSTOMER CLASS (2001 TO 2007)**

FIGURE 4.4

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

| **Table 4.5 Average Seasonal Average Day Demand Comprehensive Water Plan City of Auburn** | | |
|---|---|---|
| | **Winter(1) ADD (gpd/account)** | **Summer(2) ADD (gpd/account)** |
| Single-Family/Duplex | 183 | 257 |
| Multifamily | 1,467 | 1,682 |
| Commercial | 937 | 1,322 |
| Mfg/Industry | 15,793 | 17,791 |
| Schools | 2,841 | 7,414 |
| City Accounts | 518 | 909 |
| Irrigation | 382 | 2632 |

Notes:

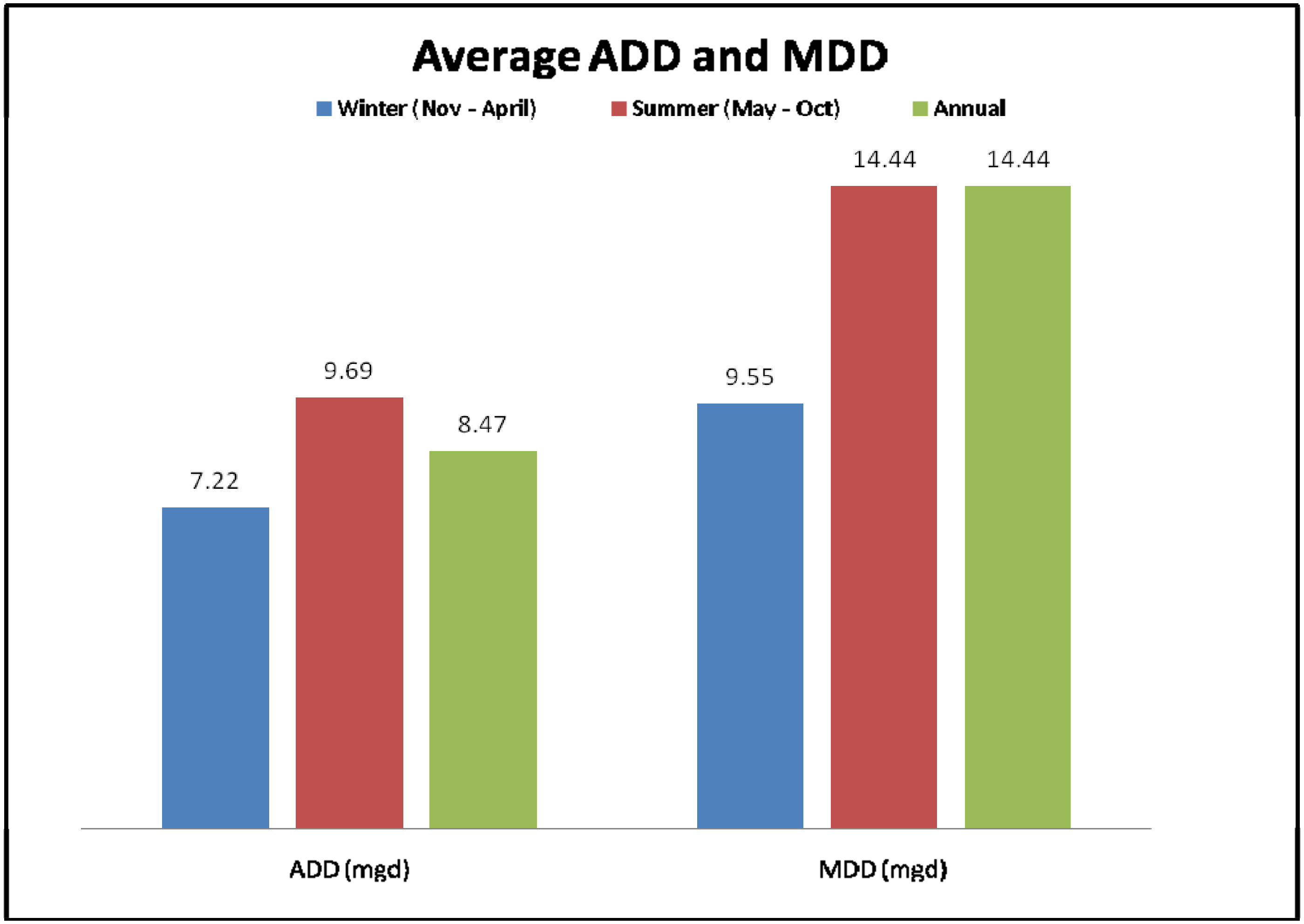
(1) Winter is defined as November through April.
(2) Summer is defined as May through October.

Seasonal peaking factors are typically lower than the annual peaking factor as shown in Table 4.6. As shown, the annual peaking factor average for 2001 to 2007 is 1.70, whereas the average summer and winter peaking factors are 1.49 and 1.32 respectively. The difference in the average for 2001 to 2007 ADD and MDD, seasonally and annually, is graphically depicted in Figure 4.5. The peaking factor comparing summer MDD to winter ADD is 2.01. This value shows the large difference between the summer peaking demands and winter average demands and also can be applied to projected MDD to find a projected winter ADD. By finding projected winter, summer, and annual ADD and MDD values, a more efficient supply system can be designed by using specific supply sources during different seasons.

## 4.5 DISTRIBUTION LEAKAGE

Distribution leakage is calculated as the difference between the total amount of water produced and the sum of water sold and authorized water usage. The Water Use Efficiency (WUE) Rule requires that the three-year average of distribution leakage be maintained at less than 10 percent of the supply. Distribution leakage 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 using credible means. All water that is not accounted for is considered distribution leakage.

The City has maintained distribution leakage at less than 10 percent of its supply over the past six years, meeting the WUE goal. Accounted-for non-revenue uses are shown in Table 4.7 and detailed in the System Loss reports. The variation in percent non-revenue water is largely due to flushing practices.




**AVERAGE ANNUAL AND SEASONAL ADD AND MDD FOR 2001 TO 2007**

FIGURE 4.5

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

**Table 4.6 Historical Annual and Seasonal ADD, MDD, and Peaking Factor**
**Comprehensive Water Plan**
**City of Auburn**

| | | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Average |
|---|---|---|---|---|---|---|---|---|---|
| Annual | Date | 6/24/01 | 7/12/02 | 8/4/03 | 7/30/04 | 8/5/05 | 8/4/06 | 7/11/07 | - |
| | ADD (mgd) | 8.90 | 8.32 | 8.55 | 8.54 | 8.10 | 8.30 | 8.61 | 8.47 |
| | MDD (mgd) | 13.92 | 15.35 | 14.22 | 15.04 | 13.13 | 15.17 | 14.25 | 14.44 |
| | Peaking Factor | 1.56 | 1.85 | 1.66 | 1.76 | 1.62 | 1.83 | 1.65 | 1.70 |
| Summer May - October | Date | 6/24/01 | 7/12/02 | 8/4/03 | 7/30/04 | 8/5/05 | 8/4/06 | 7/11/07 | - |
| | ADD (mgd) | 9.72 | 9.90 | 9.86 | 9.77 | 9.03 | 9.66 | 9.91 | 9.69 |
| | MDD (mgd) | 13.92 | 15.35 | 14.22 | 15.04 | 13.13 | 15.17 | 14.25 | 14.44 |
| | Peaking Factor | 1.43 | 1.55 | 1.44 | 1.54 | 1.45 | 1.57 | 1.44 | 1.49 |
| Winter November - April | Date | 4/18/01 | 11/7/02 | 12/4/03 | 4/30/04 | 11/10/05 | 01/22/06 | 12/18/07 | - |
| | ADD (mgd) | 8.07 | 6.70 | 7.19 | 7.27 | 7.16 | 6.93 | 7.24 | 7.22 |
| | MDD (mgd) | 13.85 | 8.30 | 10.11 | 9.41 | 8.48 | 8.59 | 8.14 | 9.55 |
| | Peaking Factor | 1.72 | 1.24 | 1.41 | 1.29 | 1.18 | 1.2407 | 1.12 | 1.32 |

**Table 4.7 Historic Distribution Leakage**
**Comprehensive Water Plan**
**City of Auburn**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 3-year Average | Overall Average |
|---|---|---|---|---|---|---|---|---|---|
| Total Produced (MG) | 3,239 | 3,035 | 3,080 | 3,082 | 2,957 | 3,030 | 3,134 | 3,041 | 3,080 |
| Total Sold (MG) | 2,955 | 2,710 | 2,959 | 2,972 | 2,793 | 3,080 | 2,992 | 2,955 | 2,923 |
| Accounted-for Non-revenue (MG) | 6.2 | Unknown | 7.8 | 7.4 | 6.9 | 7.4 | 5.1 | 6.5 | 6.8 |
| Distribution Leakage (MG) | 278 | 325 | 113 | 103 | 157 | 128[1] | 137 | 147 | 186 |
| Distribution Leakage (% of Total) | 8.6% | 10.7% | 3.7% | 3.3% | 5.3% | 4%[1] | 4.4% | 4.3% | 6.0% |

Note:

(1) Date not included in calculations and analysis.

75th percentile of Distribution Leakage is 7.8.

Water purchased, water sold, and total distribution leakage for 2001 through 2007 is shown in Table 4.7. The three-year average was calculated using 2004, 2005, and 2007 at 4.3 percent of the supply. The 2006 distribution leakage date was not included in the calculations due to the production data being greater than the sales data. This error is likely due to data tracking discrepancies and therefore is not used in the analysis. Over the past seven years from 2001 to 2007, not including 2006, distribution leakage averaged 6.0 percent. Given the WUE rule requires a 10 percent or less distribution leakage, the city has chosen a planning value by using the 75th percentile of the distribution leakages for the values from 2001 to 2007 which is 7.8 percent.

## 4.6 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 single-family and multifamily residential 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 Puget Sound Regional Council (PSRC) are at the transportation analysis zone level. The City used this data in conjunction with local land use designations.

### 4.6.1 Existing Land Use

Existing zoning designations for the City of Auburn Water Service Area are shown on the Comprehensive Zoning Map, Figure 4.6. As discussed above, land use is governed by the Auburn Comprehensive Plan within the City limits; King County in unincorporated King County (an area generally east of the City), and Pierce County in unincorporated Pierce County (an area generally south of the City).

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

### 4.6.2 Future Land Use

Future land-use patterns for the Water Service Area are expected to correspond to existing uses. 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.

While it is likely the City of Auburn will annex much of the unincorporated land within the City's 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 20 years, annexation should have little impact on current land-use patterns. The Auburn Comprehensive Plan recognizes the need for a variety of residential land uses and anticipates that areas to be annexed to the City will remain primarily residential as defined in the appropriate existing county planning documents. Future land use for the planning period should conform to the Comprehensive Land Use Map, Figure 4.7.

## 4.7 PROJECTED GROWTH RATES

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. However, significant changes to the regional economy will continue to affect growth timing and patterns. 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. Although these factors were considered in developing the information included within this Plan, it should be noted that the rates of future growth will likely vary from those included within the Plan due to the shifting of growth between areas within the City and between the City and adjoining jurisdictions.

Growth projections were prepared by the City. They were categorized by customer classification, which included, single-family, multifamily, commercial employment, and manufacturing employment. The projections for the Lakeland service area were modified in September 2008 due to recent development interest in the east portion of the service area. These projections were then broken down further into each individual water service area shown in Table 4.8. The methodology is discussed and detailed tables of the growth projections by Transportation Analysis Zones can be found in Appendix F.

The growth rate percentages were calculated from Table 4.8 and are represented in Table 4.9. For example, Lea Hill single-family population projections show an increase from 8,832 people in 2008 to 9,929 people in 2014, an increase of 8 percent. These rates will be applied to the customer connections for their projections. Negative growth percentages represent a shift in land uses. For example, for the overall service area, the single-family population from 2008 to 2014 reduces by 0.4 percent, while the multifamily increases by 69 percent, which represents a shift from single-family to multifamily. This shift is most likely attributed to the redevelopment of downtown Auburn.

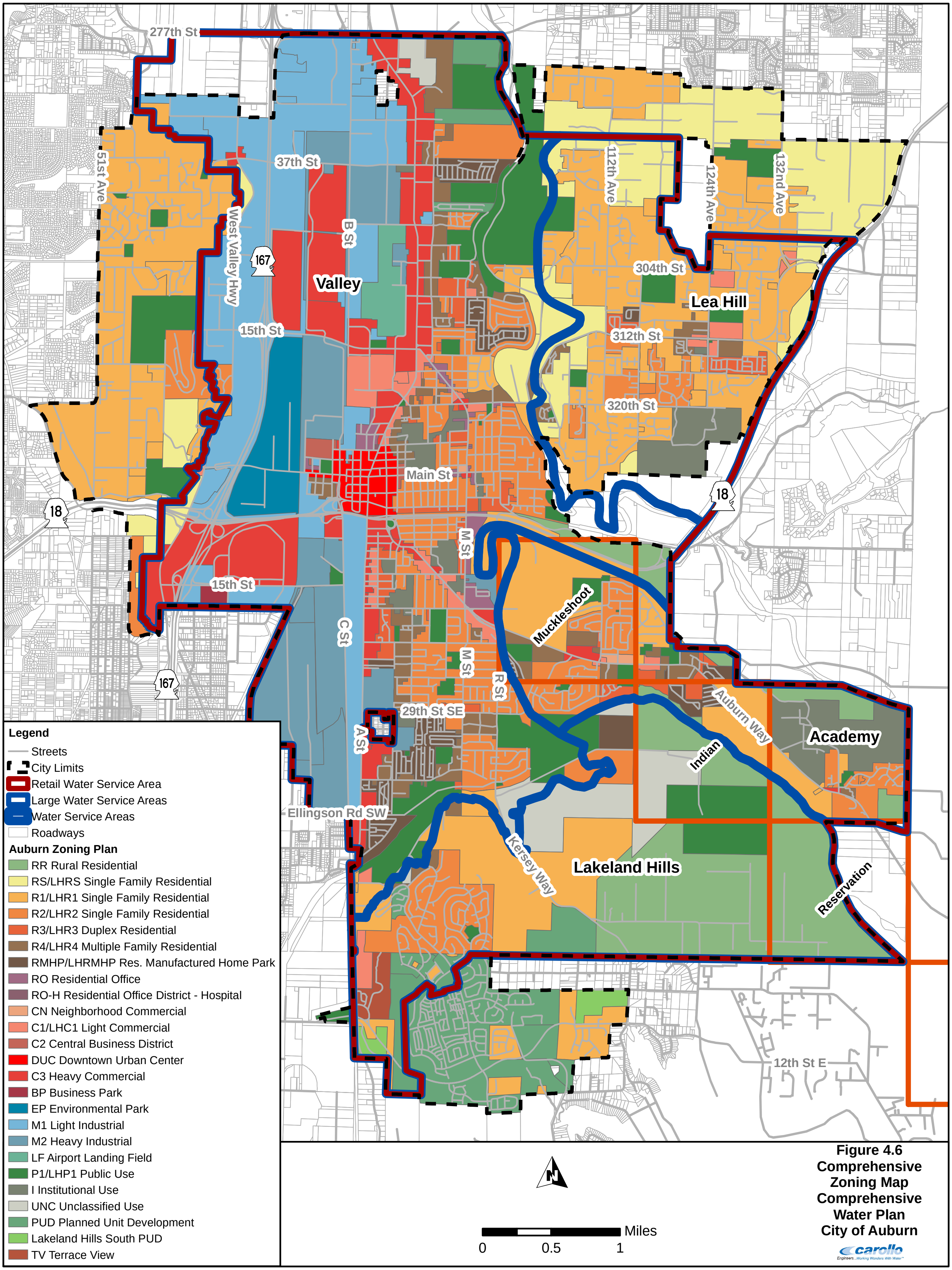



**Figure 4.6**
**Comprehensive Zoning Map**
**Comprehensive Water Plan**
**City of Auburn**

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| Table 4.8 Classification/Customer Projections by Individual Water Service Areas<br>Comprehensive Water Plan<br>City of Auburn | | | | | |
|---|---|---|---|---|---|
| | **2007** | **2008** | **2014** | **2018** | **2028** |
| **Single-Family Population** | | | | | |
| Lea Hill | 8,642 | 8,832 | 9,929 | 11,251 | 13,004 |
| Valley | 19,592 | 20,006 | 17,646 | 18,120 | 19,209 |
| Lakeland | 3,191 | 3,467 | 4,621 | 5,372 | 5,748 |
| Academy | 4,938 | 5,013 | 4,988 | 5,059 | 5,805 |
| **Subtotal** | **36,363** | **37,318** | **37,184** | **39,802** | **43,766** |
| **Multifamily Population** | | | | | |
| Lea Hill | 2,089 | 2,109 | 2,369 | 3,058 | 3,888 |
| Valley | 8,102 | 8,245 | 16,338 | 17,551 | 19,208 |
| Lakeland | 1,548 | 1,670 | 1,838 | 1,905 | 1,962 |
| Academy | 1,371 | 1,405 | 2,126 | 2,443 | 2,451 |
| **Subtotal** | **13,110** | **13,429** | **22,671** | **24,957** | **27,509** |
| **Commercial Employment** | | | | | |
| Lea Hill | 221 | 217 | 296 | 346 | 473 |
| Valley | 14,345 | 13,327 | 17,295 | 19,228 | 23,217 |
| Lakeland | 94 | 89 | 102 | 119 | 160 |
| Academy | 862 | 1,325 | 2,678 | 3,105 | 4,168 |
| **Subtotal** | **15,522** | **14,958** | **20,371** | **22,798** | **28,018** |
| **Manufacturing and Industry Employment** | | | | | |
| Lea Hill | 32 | 30 | 24 | 27 | 53 |
| Valley | 14,558 | 15,069 | 17,750 | 18,538 | 19,989 |
| Lakeland | 80 | 73 | 62 | 62 | 63 |
| Academy | 87 | 91 | 119 | 130 | 148 |
| **Subtotal** | **14,757** | **15,263** | **17,955** | **18,757** | **20,253** |
| **Total Population** | | | | | |
| Lea Hill | 10,731 | 10,941 | 12,298 | 14,309 | 16,892 |
| Valley | 27,693 | 28,251 | 33,984 | 35,671 | 38,417 |
| Lakeland | 4,739 | 5,137 | 6,459 | 7,277 | 7,710 |
| Academy | 6,309 | 6,418 | 7,114 | 7,500 | 8,256 |
| **Total** | **49,472** | **50,747** | **59,855** | **64,757** | **71,275** |

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

| | 2008 | 2014 | 2018 | 2028 | Annual Average |
|---|---|---|---|---|---|
| **Single-Family Population** | | | | | |
| Lea Hill | 2% | 12% | 13% | 16% | 2.0% |
| Valley | 2% | -12% | 3% | 6% | -0.2% |
| Lakeland | 9% | 33% | 16% | 7% | 2.6% |
| Academy | 2% | 0% | 1% | 15% | 0.7% |
| **Subtotal** | **3%** | **0%** | **7%** | **10%** | **0.8%** |
| **Multifamily Population** | | | | | |
| Lea Hill | 1% | 12% | 29% | 27% | 3.1% |
| Valley | 2% | 98% | 7% | 9% | 4.3% |
| Lakeland | 8% | 10% | 4% | 3% | 0.8% |
| Academy | 2% | 51% | 15% | 0% | 2.8% |
| **Subtotal** | **2%** | **69%** | **10%** | **10%** | **3.7%** |
| **Commercial Employment** | | | | | |
| Lea Hill | -2% | 36% | 17% | 37% | 4.0% |
| Valley | -7% | 30% | 11% | 21% | 2.8% |
| Lakeland | -5% | 15% | 17% | 34% | 3.0% |
| Academy | 54% | 102% | 16% | 34% | 5.9% |
| **Subtotal** | **-4%** | **36%** | **12%** | **23%** | **3.2%** |
| **Manufacturing and Industry Employment** | | | | | |
| Lea Hill | -6% | -20% | 13% | 96% | 2.9% |
| Valley | 4% | 18% | 4% | 8% | 1.4% |
| Lakeland | -8% | -15% | 0% | 2% | -0.7% |
| Academy | 5% | 31% | 9% | 14% | 2.5% |
| **Subtotal** | **3%** | **18%** | **4%** | **8%** | **1.4%** |
| **Total Population** | | | | | |
| Lea Hill | 2% | 12% | 16% | 18% | 2.2% |
| Valley | 2% | 20% | 5% | 8% | 1.5% |
| Lakeland | 8% | 26% | 13% | 6% | 2.1% |
| Academy | 2% | 11% | 5% | 10% | 1.3% |
| **Total** | **3%** | **18%** | **8%** | **10%** | **1.7%** |

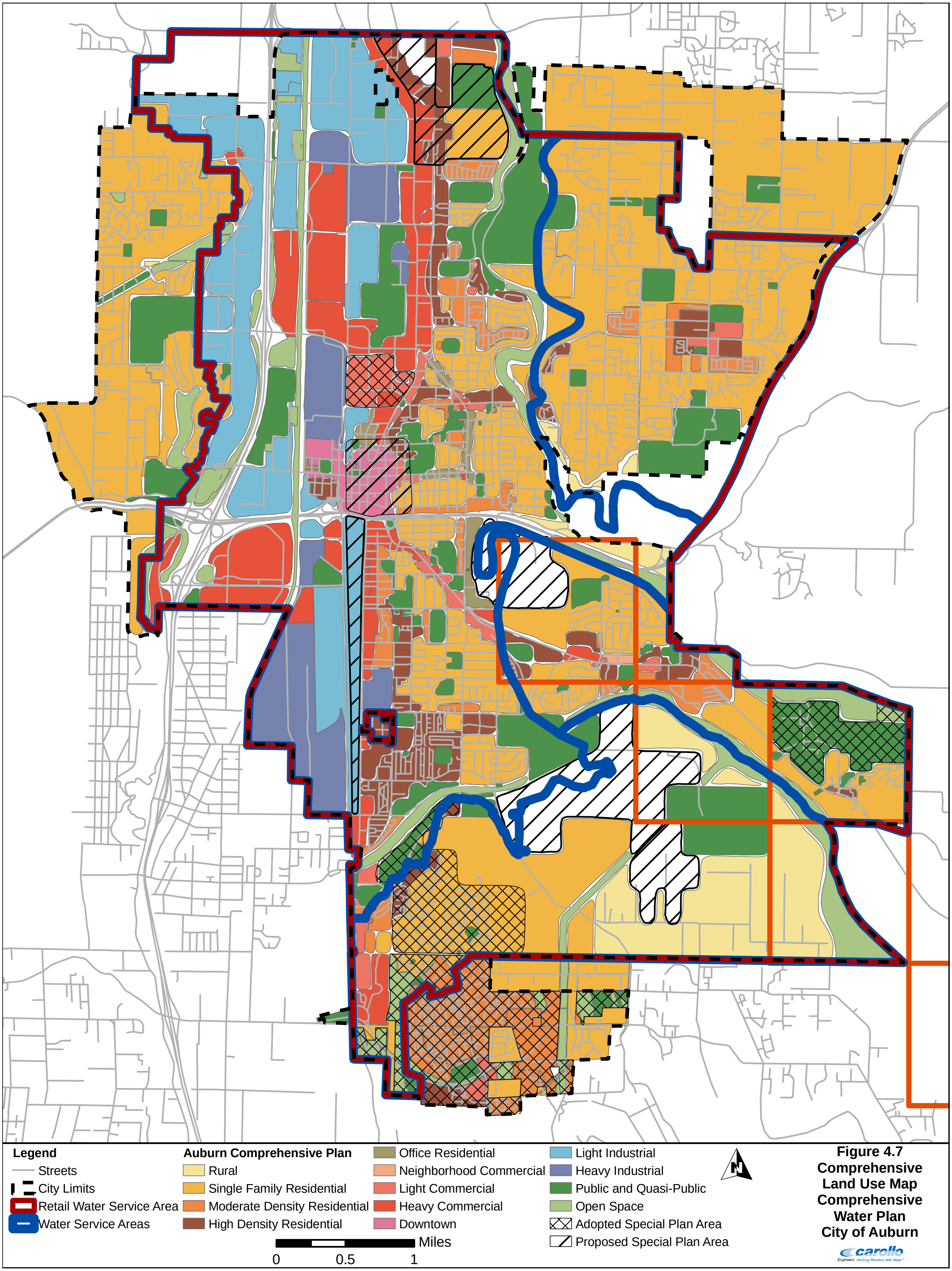



Figure 4.7
Comprehensive Land Use Map
Comprehensive Water Plan
City of Auburn
carollo

This Comprehensive Water Plan includes analysis based on future population estimates. The population estimates provided in this document will be reevaluated during the 2011 Growth Management Act seven-year update of the City's Comprehensive (Land Use) Plan. The re-evaluation will determine if new projected population estimates allocated by King County for the twenty year planning period of 2011 - 2031 will affect the assumptions and analysis of this Comprehensive Water Plan.

## 4.8 PROJECTED NUMBER OF CONNECTIONS

Customer connections by each service area were provided for 2007 only and are shown in Table 4.10. These connections are projected for the planning period and are then used in determining the ERU, ADD, and MDD projections for the service areas.

**Table 4.10 2007 Customer Connections by Service Area
Comprehensive Water Plan
City of Auburn**

| | Academy | Lakeland | Lea Hill | Valley | Totals |
|---|---|---|---|---|---|
| Single-Family | 1,280 | 1,072 | 3,127 | 5,003 | 10,482 |
| Multifamily | 101 | 51 | 66 | 739 | 957 |
| Commercial | 42 | 1 | 8 | 1,035 | 1,086 |
| Mfg/Industry | 0 | 0 | 0 | 39 | 39 |
| Schools | 7 | 1 | 7 | 24 | 39 |
| City Accts | 2 | 3 | 0 | 23 | 28 |
| Irrigation | 11 | 16 | 33 | 256 | 316 |
| **Total** | **1,443** | **1,144** | **3,241** | **7,119** | **12,947** |

Growth rates from Table 4.9 were applied to Table 4.10 to project the customer connections. 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. The sum of manufacturing/industry and commercial growth rates were applied to the irrigation account projections.

### 4.8.1 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.

Table 4.11 shows the projected growth in accounts for the Lea Hill service area. The Lea Hill service area is projected to have the highest growth rate of all the service areas, with a projected 52percent increase from 2007 to 2028. 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 significant potential for additional growth.

**Table 4.11 Projected Number of Accounts for the Lea Hill Service Area**
**Comprehensive Water Plan**
**City of Auburn**

| | 2007 | 2008 | 2014 | 2018 | 2028 |
|---|---|---|---|---|---|
| Single-Family | 3,127 | 3,196 | 3,593 | 4,071 | 4,706 |
| Multifamily | 66 | 67 | 75 | 97 | 123 |
| Commercial | 8 | 8 | 11 | 13 | 17 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 7 | 7 | 8 | 9 | 11 |
| City Accts | 0 | 0 | 0 | 0 | 0 |
| Irrigation | 33 | 32 | 42 | 49 | 69 |
| **Total** | **3,241** | **3,310** | **3,729** | **4,239** | **4,926** |

### 4.8.2 Valley Service Area

The Valley service area contains a significant amount of developable land designated as multifamily and commercial. Shown in Table 4.12, the multifamily connections in this area are projected to grow 137 percent from 2007 to 2028 and commercial connections are projected to grow 62 percent. There is significant growth projected in multifamily and commercial connections from 2008 to 2014, and a significant reduction in growth projected for single-family connections. These growth projections are based on the City's anticipation of growth trends and the redevelopment of Auburn's Regional Growth Center that encompasses Downtown.

### 4.8.3 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 and development is not anticipated in the near future. The area includes the master planned area (Lakeland Hills North) and the Kersey III developments, which are the main source of growth for the service area. The growth in connections from 2007 to 2028 is projected at 35 percent and is almost entirely residential growth, shown in Table 4.13.

| **Table 4.12** | **Projected Number of Accounts for the Valley Service Area<br>Comprehensive Water Plan<br>City of Auburn** | | | | |
|---|---|---|---|---|---|
| | **2007** | **2008** | **2014** | **2018** | **2028** |
| Single-family | 5,003 | 5,109 | 4,506 | 4,627 | 4,905 |
| Multifamily | 739 | 752 | 1,490 | 1,601 | 1,752 |
| Commercial | 1,035 | 962 | 1,248 | 1,387 | 1,675 |
| Mfg/Industry | 39 | 40 | 48 | 50 | 54 |
| Schools | 24 | 24 | 29 | 31 | 33 |
| City Accts | 23 | 23 | 28 | 30 | 32 |
| Irrigation | 256 | 252 | 310 | 335 | 383 |
| **Total** | **7,119** | **7,162** | **7,659** | **8,061** | **8,834** |

| **Table 4.13** | **Projected Number of Accounts for the Lakeland Hills Area<br>Comprehensive Water Plan<br>City of Auburn** | | | | |
|---|---|---|---|---|---|
| | **2007** | **2008** | **2014** | **2018** | **2028** |
| Single-family | 1,072 | 1,165 | 1,552 | 1,805 | 1,931 |
| Multifamily | 51 | 55 | 61 | 63 | 65 |
| Commercial | 1 | 1 | 1 | 1 | 2 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 1 | 1 | 1 | 2 | 2 |
| City Accts | 3 | 3 | 4 | 5 | 5 |
| Irrigation | 16 | 15 | 15 | 17 | 21 |
| **Total** | **1,144** | **1,240** | **1,634** | **1,893** | **2,026** |

### 4.8.4 Academy Service Area

The Academy service area is a relatively well-developed portion of the City. It is expected to grow at a steady rate. The total growth of water service connections for the area will be approximately 35 percent for 2007 to 2028, but it is worth noting that commercial growth is projected at a rate of 383 percent within the planning period. This is shown in Table 4.14.

| **Table 4.14** | **Projected Number of Accounts for the Academy Area<br>Comprehensive Water Plan<br>City of Auburn** | | | | |
|---|---|---|---|---|---|
| | **2007** | **2008** | **2014** | **2018** | **2028** |
| Single-family | 1,280 | 1,299 | 1,293 | 1,311 | 1,505 |
| Multifamily | 101 | 104 | 157 | 180 | 181 |
| Commercial | 42 | 65 | 130 | 151 | 203 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 7 | 7 | 8 | 8 | 9 |
| City Accts | 2 | 2 | 2 | 2 | 3 |
| Irrigation | 11 | 16 | 32 | 38 | 50 |
| **Total** | **1,443** | **1,493** | **1,622** | **1,690** | **1,951** |

## 4.9 PROJECTED WATER DEMAND

Projecting future water demand is one of the key elements of the comprehensive water system planning process. Identification of system improvements such as supply, pumping, storage, and piping requirements are all related to demand projections.

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 4.15 shows the projected ERUs for the City's individual service areas over the planning period and for the anticipated ultimate demand. It does not include distribution leakage or wholesale customer demand.

The ultimate demand estimates are based on the existing zoning, land use and the residential holding capacity associated with each zone which is 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 2006). A 25 percent reduction factor was used for the Valley service area due to the more urban nature of its area. This computation provides for the ultimate number of single-family and multifamily housing units within the Water Service Area. The ultimate residential growth (number of connections) was then used to escalate non-residential water uses from the projections for year 2028 to estimate the ultimate water demand.

Based on the ultimate build-out calculations with the current zoning, the Valley multifamily accounts will reach capacity before the end of the planning period at approximately 2013, which is conflicting with the growth projections provided by the City. Therefore, it is assumed that zoning will be shifted or densities will increase to provide for this growth and the ultimate multifamily accounts will be achieved by 2028. The growth projections for the Valley service area suggest that between 2008 and 2014 the multifamily population will increase from 8,245 to 16,338, which is almost a 100 percent increase (shown in Table 4.8), while the single-family accounts have a 12 percent decrease from 5,109 to 4,506

**Table 4.15 Existing and Projected ERUs for each Service Area**
**Comprehensive Water Plan**
**City of Auburn**

| | 2008 | 2014 | 2018 | 2028 | Ultimate |
|---|---|---|---|---|---|
| **Lea Hill** | | | | | |
| Single-Family | 3,196 | 3,593 | 4,071 | 4,706 | 7,379 |
| Multifamily | 478 | 537 | 693 | 881 | 1,162 |
| Commercial | 40 | 55 | 64 | 88 | 132 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 178 | 200 | 232 | 274 | 411 |
| City Accts | 0 | 0 | 0 | 0 | 0 |
| Irrigation | 251 | 325 | 379 | 534 | 801 |
| **Total** | **4,142** | **4,709** | **5,439** | **6,483** | **9,885** |
| **Valley** | | | | | |
| Single-Family | 5,109 | 4,506 | 4,627 | 4,905 | 8,170 |
| Multifamily | 5,395 | 10,691 | 11,485 | 12,569 | 12,569 |
| Commercial | 4,933 | 6,402 | 7,118 | 8,594 | 8,594 |
| Mfg/Industry | 3,533 | 4,162 | 4,347 | 4,687 | 4,687 |
| Schools | 609 | 732 | 769 | 828 | 828 |
| City Accts | 72 | 87 | 91 | 98 | 98 |
| Irrigation | 1,957 | 2,416 | 2,603 | 2,978 | 2,978 |
| **Total** | **21,610** | **28,997** | **31,040** | **34,661** | **37,925** |
| **Lakeland** | | | | | |
| Single-Family | 1,165 | 1,552 | 1,805 | 1,931 | 4,436 |
| Multifamily | 395 | 434 | 450 | 464 | 739 |
| Commercial | 5 | 6 | 7 | 9 | 32 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 27 | 34 | 38 | 40 | 146 |
| City Accts | 10 | 13 | 14 | 15 | 54 |
| Irrigation | 117 | 118 | 130 | 161 | 578 |
| **Total** | **1,718** | **2,157** | **2,444** | **2,620** | **5,984** |
| **Academy** | | | | | |
| Single-Family | 1,299 | 1,293 | 1,311 | 1,505 | 3,283 |
| Multifamily | 743 | 1,124 | 1,291 | 1,295 | 1,471 |
| Commercial | 331 | 669 | 776 | 1,042 | 1,667 |
| Mfg/Industry | 0 | 0 | 0 | 0 | 0 |
| Schools | 177 | 196 | 207 | 228 | 364 |
| City Accts | 6 | 7 | 7 | 8 | 13 |
| Irrigation | 128 | 252 | 292 | 390 | 623 |
| **Total** | **2,684** | **3,542** | **3,885** | **4,467** | **7,421** |
| **Total** | | | | | |
| Single-Family | 10,769 | 10,944 | 11,815 | 13,047 | 23,268 |
| Multifamily | 7,011 | 12,786 | 13,920 | 15,210 | 15,940 |
| Commercial | 5,310 | 7,132 | 7,965 | 9,733 | 10,425 |
| Mfg/Industry | 3,533 | 4,162 | 4,347 | 4,687 | 4,687 |
| Schools | 990 | 1,162 | 1,246 | 1,370 | 1,749 |
| City Accts | 89 | 107 | 113 | 122 | 166 |
| Irrigation | 2,453 | 3,111 | 3,404 | 4,062 | 4,980 |
| **Total** | **30,154** | **39,405** | **42,809** | **48,230** | **61,215** |

Note:
A multifamily connection serves approximately 9 housing units.

(shown in Table 4.12). Also, during the same time period, the commercial accounts are projected to grow by 30 percent.

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 polices. As a result, as planning polices 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.

It should also be noted that the values for the ultimate build-out are comparable to the 2001 comprehensive plan values. The difference is that the 2008 values take into account a reduction factor while the 2001 comprehensive plan uses the gross area. The reduction factor provides a more accurate representation of the actual land area potential for build-out. Another difference is that the only land area included into the 2008 analysis was land within the current water service area, while the 2001 plan took into account Potential Annexation Areas, which is outside of the current water service area.

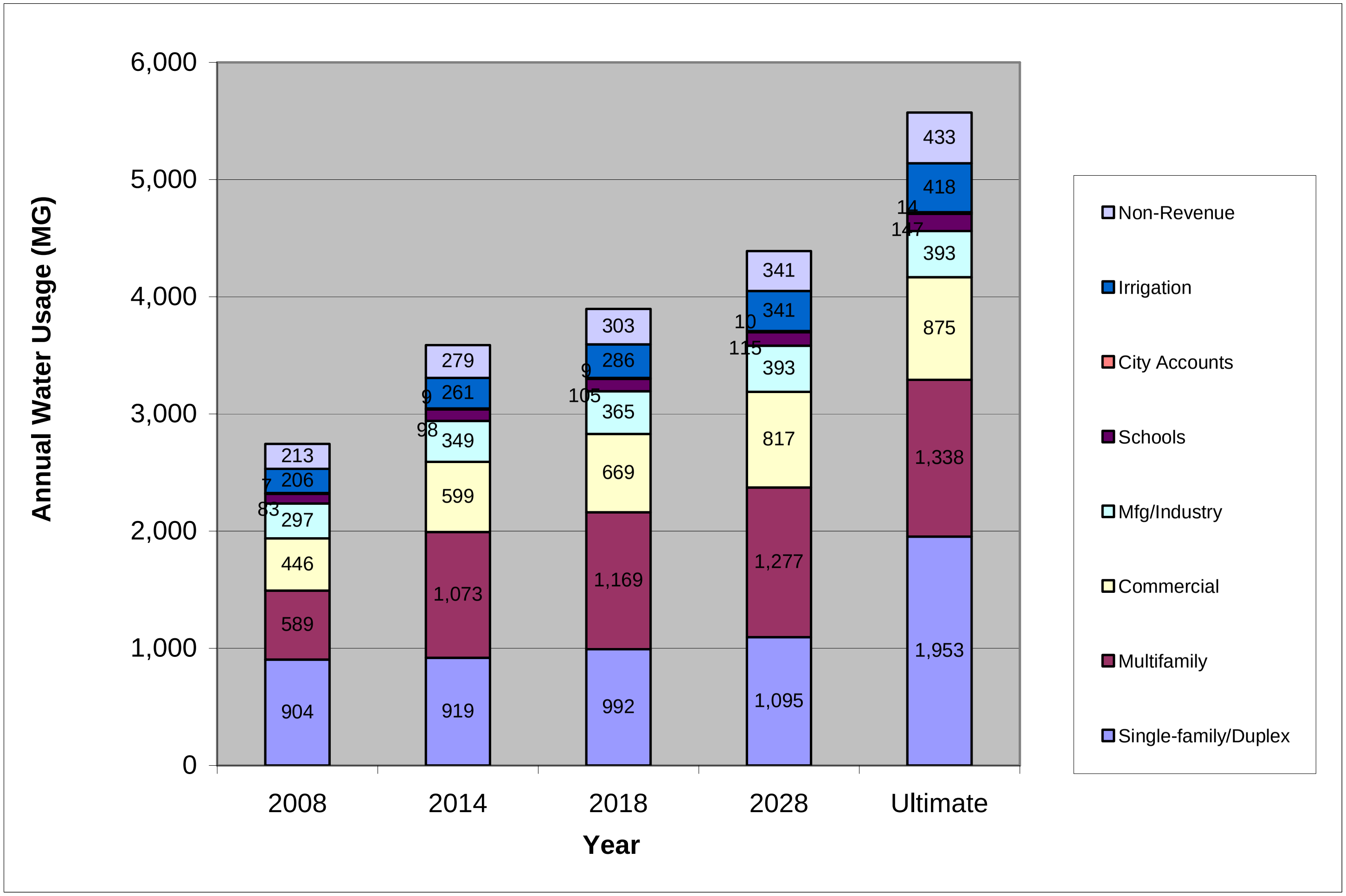
The ADD for each service area was based on multiplying the projected ERUs in their corresponding service area by the planning value of 230 gpd per ERU. The projected MDD is simply the projected ADD multiplied by the MDD/ADD factor of 1.8, as discussed previously. The City has decided to forecast distribution leakage as 7.8 percent of the total water system demand. The total projected annual ADD and MDD along with wholesale demands are summarized in Table 4.16. The projected ADD and MDD for each customer class by individual water service area are shown in Appendix F. In 2008, the retail customers for the entire water system is projected to have an ADD of 7.52 mgd. The 2028 retail ADD demand is projected at 12.03, which is a 60 percent increase from 2008. The ADD for the sum of wholesale customers and retail customers in 2008 is 12.98 mgd and in 2028 it is 17.55 mgd, which is an increase of 35 percent. Figure 4.8 depicts the projected annual total demands by customers. This figure shows the amount of total water consumed by one customer class compared to other customer classes throughout the projected years. Due to the increase in multifamily population from 2008 to 2014, their total usage increases from 588.5 million gallons (MG) to 1073.4 MG as shown in Figure 4.8.

Figure 4.9 represents three accumulative MDD demands - retail customers, firm wholesale, and interruptible wholesale. Firm wholesale includes the retail customers. The interruptible wholesale includes retail customers and firm wholesale. This variation is to show the level of obligation to provide to the customers. Due to the firm wholesale contract with Algona, they can be considered retail customers. The interruptible wholesale contracts can be terminated anytime and therefore the level of obligation to provide water is not as sure and therefore represented differently. As mentioned previously, Algona has a firm wholesale agreement that expires at the end of 2014. The demands are projected to 2028 based on the assumption that the contract will be renewed and will continue after 2014. The agreement with CWD and WD#111 does not have an expiration date and therefore is projected through 2028.

The ADD and MDD projections were utilized in the system and supply analysis. The deficiencies identified will serve as the basis for the Capital Improvements Plan.

**Table 4.16 Summarized ADD, MDD and ERUs for Each Individual Service Area with Wholesale Included**
**Comprehensive Water Plan**
**City of Auburn**

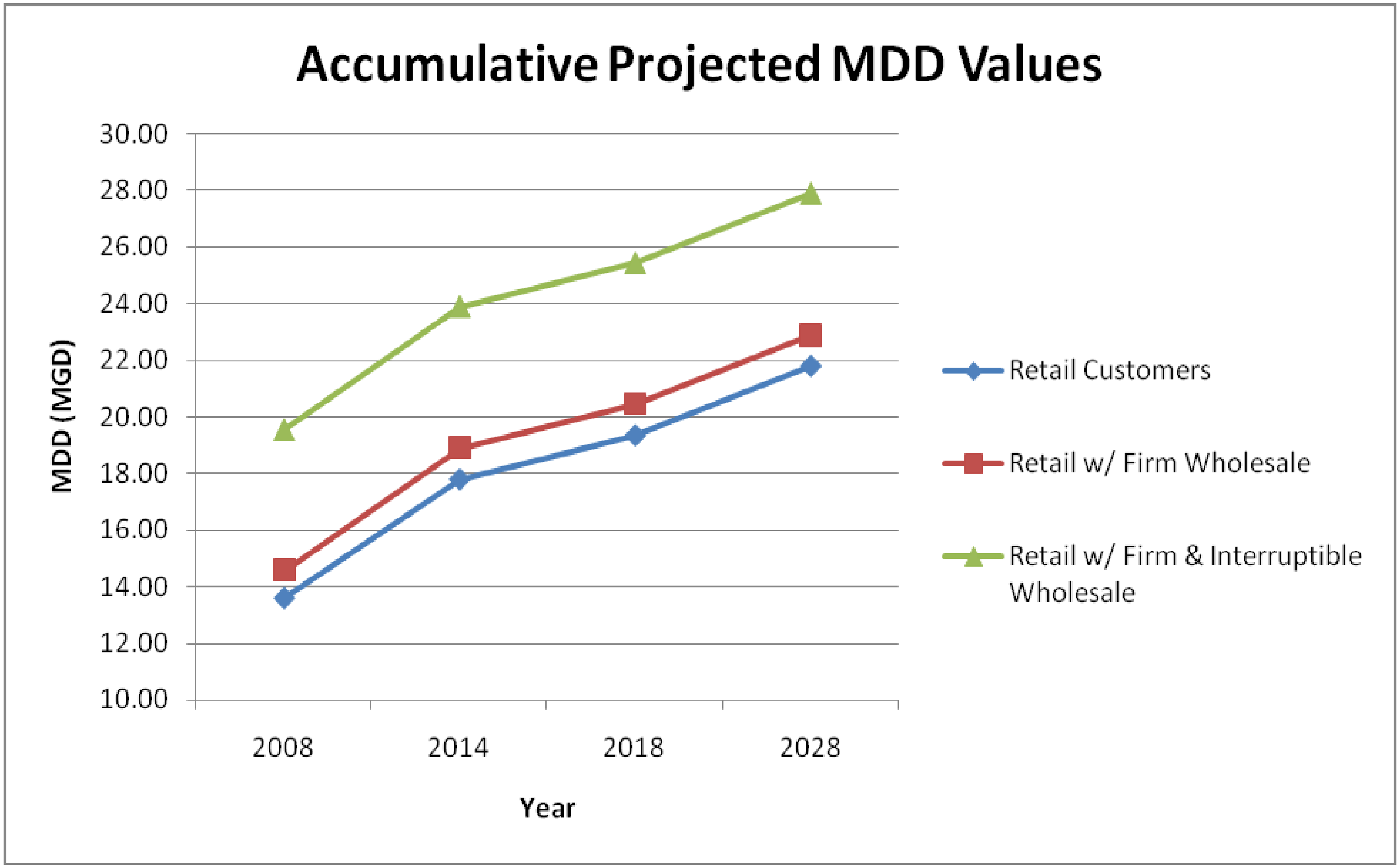
| Area | 2008 | 2014 | 2018 | 2028 | Ultimate |
|---|---|---|---|---|---|
| **Valley** | | | | | |
| Average Day Demand, mgd | 5.39 | 7.23 | 7.74 | 8.64 | 9.46 |
| Maximum Day Demand, mgd | 9.76 | 13.09 | 14.02 | 15.65 | 17.12 |
| Equivalent Residential Units | 21,610 | 28,997 | 31,040 | 34,661 | 37,925 |
| **Academy** | | | | | |
| Average Day Demand, mgd | 0.67 | 0.88 | 0.97 | 1.11 | 1.85 |
| Maximum Day Demand, mgd | 1.21 | 1.60 | 1.75 | 2.02 | 3.35 |
| Equivalent Residential Units | 2,684 | 3,542 | 3,885 | 4,467 | 7,421 |
| **Lea Hill** | | | | | |
| Average Day Demand, mgd | 1.03 | 1.17 | 1.36 | 1.62 | 2.47 |
| Maximum Day Demand, mgd | 1.87 | 2.13 | 2.46 | 2.93 | 4.46 |
| Equivalent Residential Units | 4,142 | 4,709 | 5,439 | 6,483 | 9,885 |
| **Lakeland** | | | | | |
| Average Day Demand, mgd | 0.43 | 0.54 | 0.61 | 0.65 | 1.49 |
| Maximum Day Demand, mgd | 0.78 | 0.97 | 1.10 | 1.18 | 2.70 |
| Equivalent Residential Units | 1,718 | 2,157 | 2,444 | 2,620 | 5,984 |
| **Total Retail Customers** | | | | | |
| Average Day Demand, mgd | **7.52** | **9.83** | **10.68** | **12.03** | **15.27** |
| Maximum Day Demand, mgd | **13.62** | **17.79** | **19.33** | **21.78** | **27.64** |
| Equivalent Residential Units | **30,154** | **39,405** | **42,809** | **48,230** | **61,215** |
| **Retail With Firm Wholesale (Algona)** | | | | | |
| Average Day Demand, mgd | 7.98 | 10.35 | 11.20 | 12.55 | 15.79 |
| Maximum Day Demand, mgd | 14.56 | 18.91 | 20.44 | 22.89 | 28.75 |
| **Retail With Firm & Interruptible Wholesale (CWD & WD 111)** | | | | | |
| Average Day Demand, mgd | 12.98 | 15.35 | 16.20 | 17.55 | 20.79 |
| Maximum Day Demand, mgd | 19.56 | 23.91 | 25.44 | 27.89 | 33.75 |




# PROJECTED ANNUAL TOTAL DEMANDS BY CUSTOMER CLASS

FIGURE 4.8

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*




**ACCUMULATIVE PROJECTED MDD VALUES**

FIGURE 4.9

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

# 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 below. Figure 5.2 presents an overall hydraulic profile of the system and its various elements.

This Chapter reviews all of the facilities incorporating the water supply system. A brief summary of each facility is provided below, followed by a review of system components evaluated against the established policies and criteria standards (discussed in Chapter 3) and the City’s Design and Construction Standards, Appendix G. For this evaluation, facilities and equipment were visually inspected during a site visit, as described in Appendix H. For further asset management analysis and conditions inventory, it is recommended that the City continue this facility evaluation in more depth.

## 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.

### 5.2.1 Existing System

#### 5.2.1.1 <u>Valley Service Area</u>

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.

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, Academy, and Lea Hill Service Areas comes from the two Spring Sources and a Valley Well Field as described in Chapter 6.

The Valley Service Area has two large reservoirs (Reservoirs 1 and 2) and two treatment sites (West Hills Springs Chlorination Facility & Fulmer Field Corrosion Control 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 hydraulic grade line (HGL) of 242 feet. Ground elevations in the area vary from 45 to 160 feet. Wells 1, 3A, 3B, and West Hill Spring directly serve the 242 Valley Zone. Wells 2, 6, and 7 are treated at the Fulmer Field Treatment Facility and are pumped to the 242 Valley 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 and Well 4 are treated at the Howard Road Treatment Facility and then re-pumped to the 288 pressure zone. The Valley service area also contains one small boosted zone at the Game Farm Park.

#### 5.2.1.2 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 system was constructed in the mid-1960s and serves both a recently annexed area of the City and an unincorporated area in King County. Water is supplied to serve the area from the Valley 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 inter-tie 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 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 60 to 505 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.

#### 5.2.1.3 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.

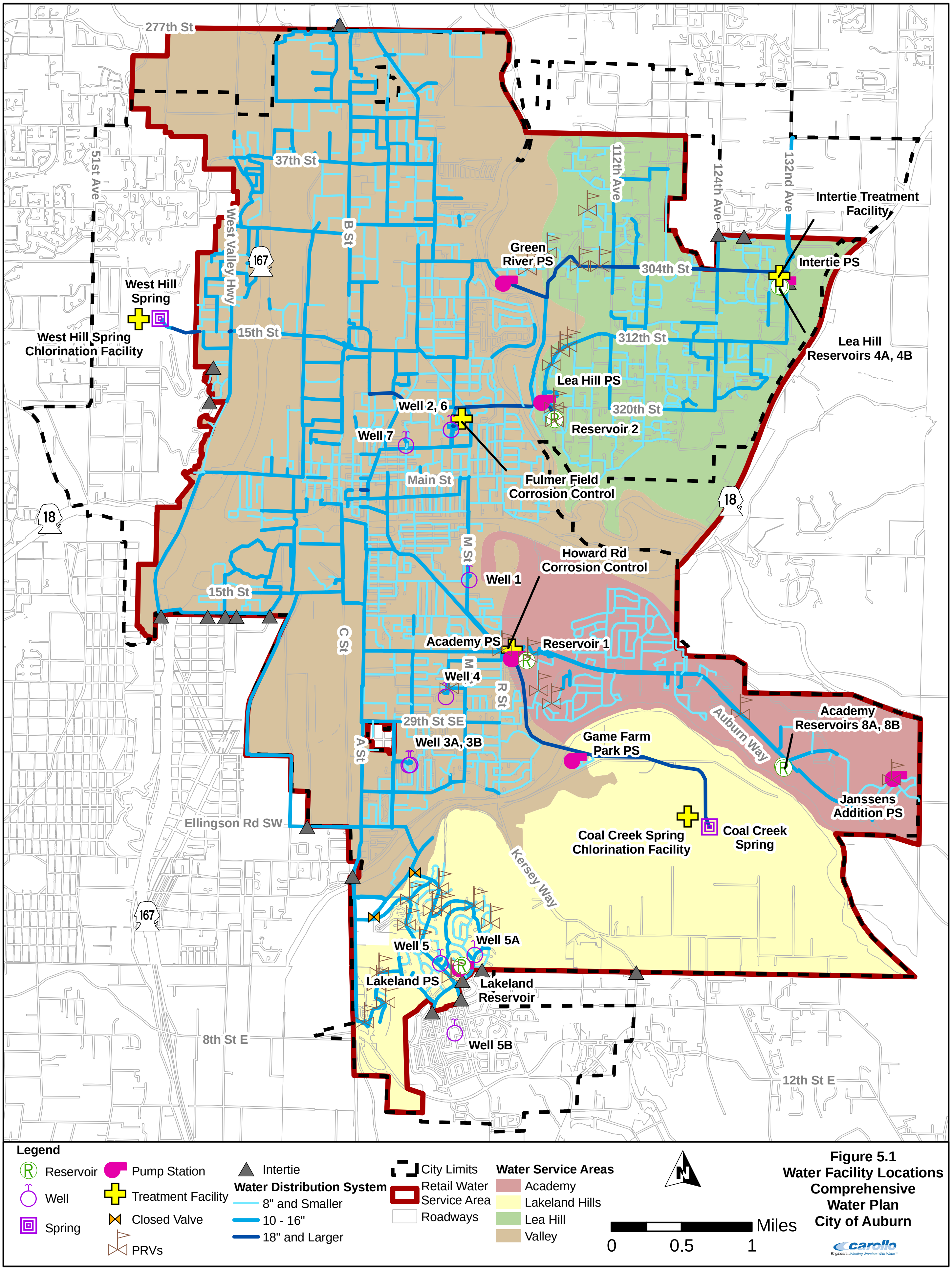



**Figure 5.1**
**Water Facility Locations**
**Comprehensive Water Plan**
**City of Auburn**

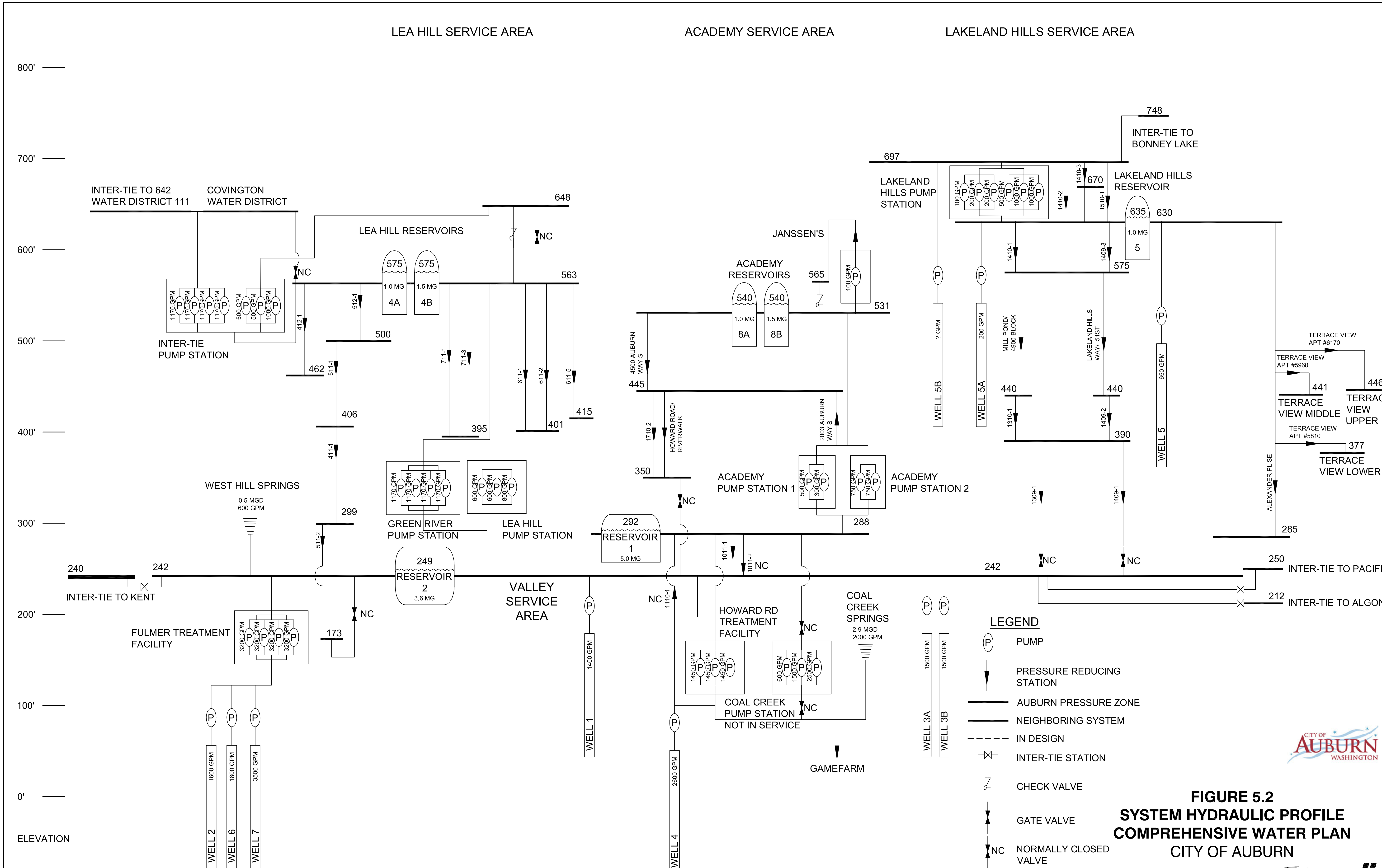



FIGURE 5.2
SYSTEM HYDRAULIC PROFILE
COMPREHENSIVE WATER PLAN
CITY OF AUBURN

carollo
Engineers...Working Wonders With Water ™

C:\pw_working\projectwise\jsmith\dms38348\Figure 5.2 Hydraulic Profile 7-23-09 07:44am JSmith XREFS: AuburnBusinessLogo_Color_sm;

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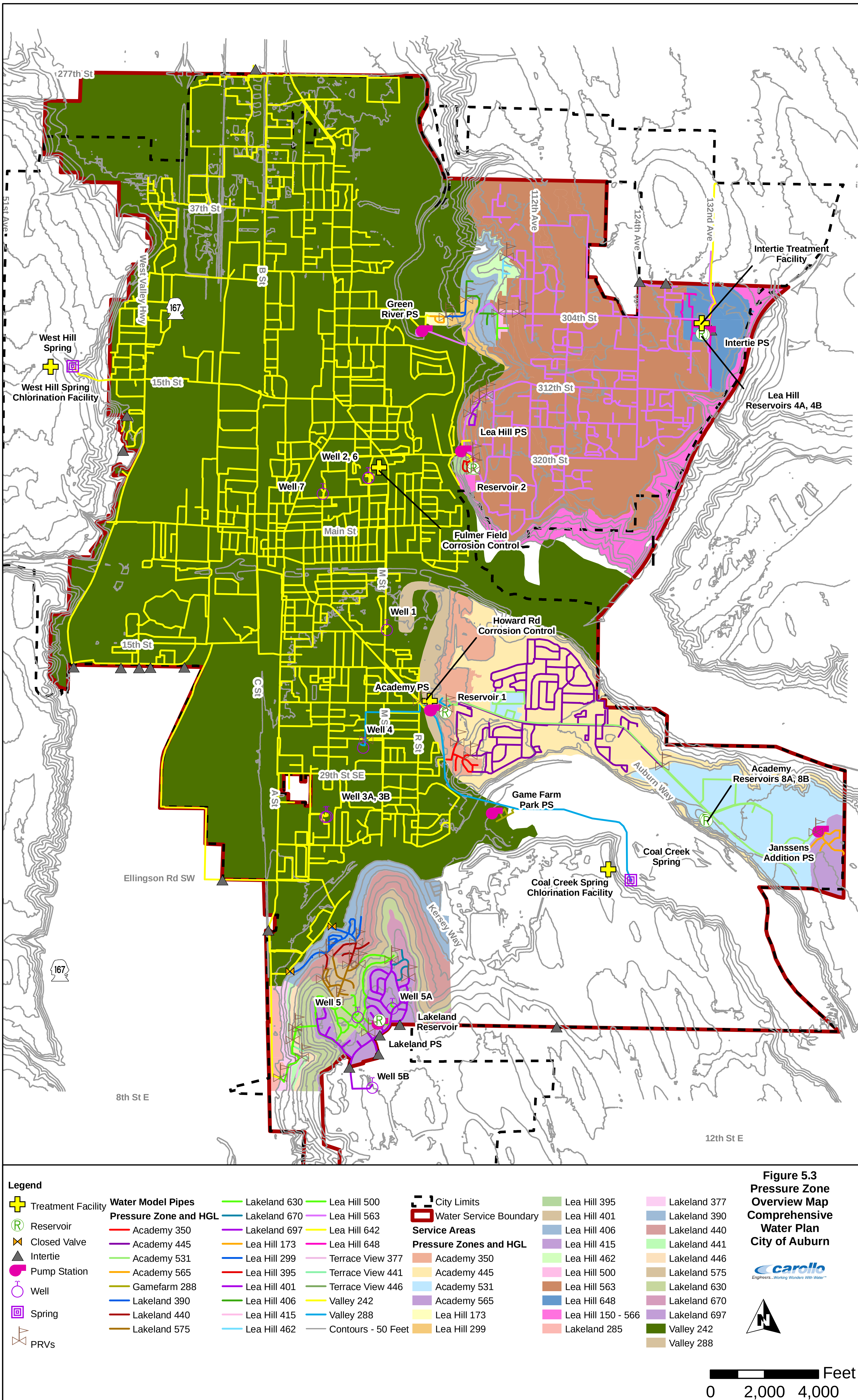



Figure 5.3
Pressure Zone Overview Map
Comprehensive Water Plan
City of Auburn

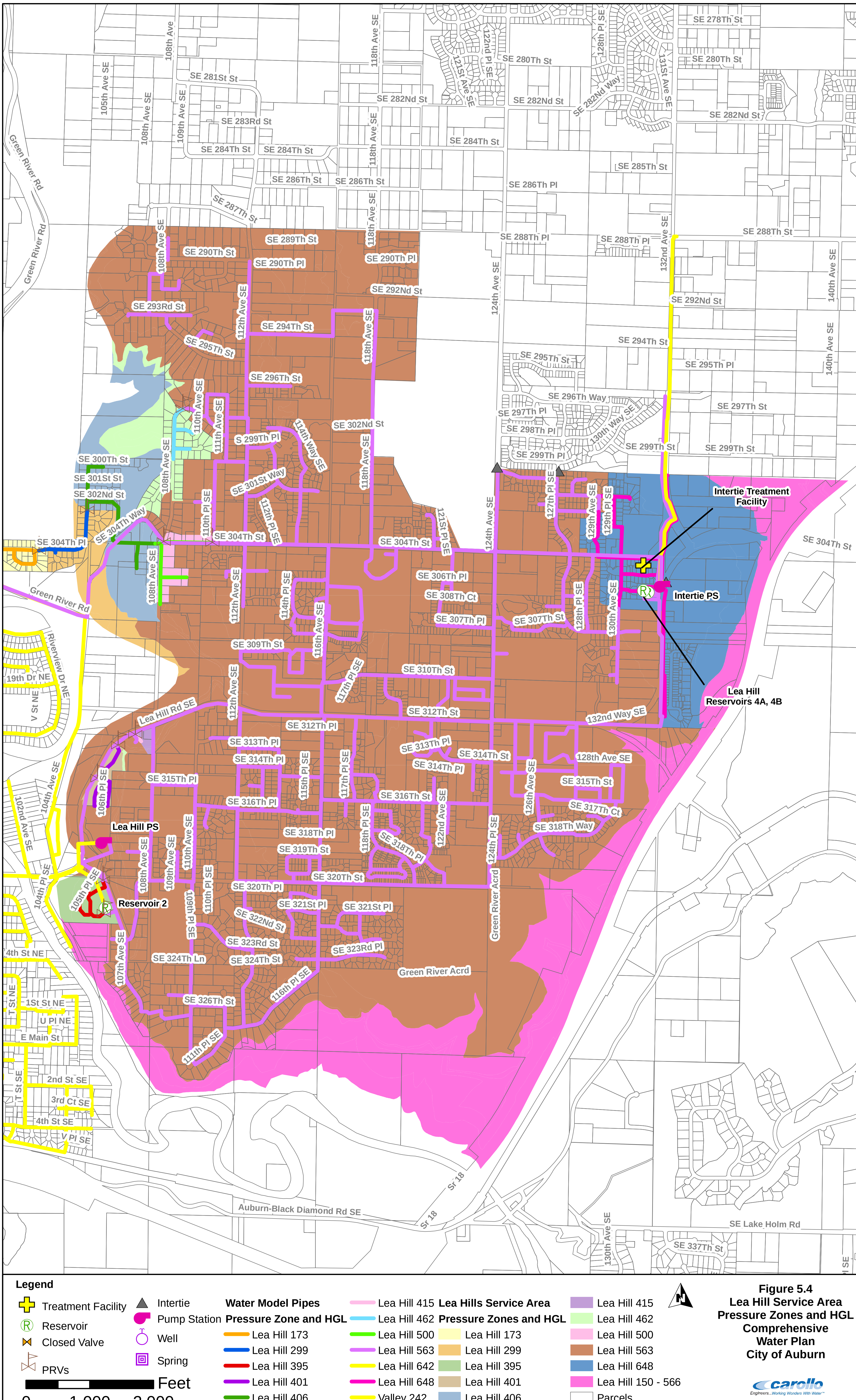



Figure 5.4
Lea Hill Service Area
Pressure Zones and HGL
Comprehensive
Water Plan
City of Auburn

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. Pressure zones in this area 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 zone vary from 160 to 468 feet. The service area includes three 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 currently served by the Janssen's Addition Pump Station.

#### 5.2.1.4 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. The Lakeland Hills system is currently operated independently of the rest of the City system. Wells 5 and 5A supply water to the area and storage is provided from the Lakeland Hills Reservoir (5). Water can flow from the Lakeland Hills Service Area into the Valley Service Area during a large fire demand. There are currently no facilities to boost water from the Valley Service Area to the Lakeland Hills Service Area.

The Lakeland Hills Service Area has several pressure zones as seen on Figure 5.2. The pressure zones are shown in Figure 5.6. The 630 Lakeland Hills Zone can be served from Reservoir 5 or from the 670 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 project is under way to install a pump station (Terrace View) at the base of the service area near East Valley Highway SE connecting the Valley Service Area with the 630 Lakeland Hills zone.

### 5.2.2 Service Area Analysis

#### 5.2.2.1 Valley Service Area

No revisions to the Valley Service Area are recommended at this time.

#### 5.2.2.2 Lea Hill Service Area

The Lea Hill Service Area could have improved delivery pressures with the creation of a new 490-pressure zone in the southwest area below the 563 zone. With increased system demands in the future, the Lea Hill boosted zone should be expanded to serve a larger area around the tanks, particularly some of the hydrants. Both the recommended expanded boosted zone, and proposed 490-zone are shown in Figure 5.7.

#### 5.2.2.3 Academy Service Area

The City has recently completed a pressure rezone project to minimize the pressure zones in the Academy Service Area. A new Academy Booster Pump Station is anticipated to replace the existing undersized Janssen's Addition Pump Station and serve additional boosted zones in the Academy Service Area.

#### 5.2.2.4 Lakeland Hills Service Area

High pressures exist near the bottom of the 575 and 390 zones in the Lakeland Hills Service Area. Each of these zones span a pressure range greater than the target delivery pressure range: the 575 zone has a 58 psi range, and the 390 zone has a 64 psi range. The high pressures can be reduced through adjusting existing PRV's and shifting some customers between pressure zones using existing valves.

A project is underway to install a new pump station to supply water from the Valley Service Area to the Lakeland Hills Service Area; the new Terrace View Pump Station will be located along East Valley Highway.

Additionally, the existing boosted zone could be slightly expanded by changing the closed valves in the western part of the system to increase pressures for some customers on Elizabeth Loop SE.

## 5.3 PRESSURE REDUCING STATIONS

### 5.3.1 Existing System

The City operates several pressure reducing 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 5.1. The locations of PRVs and their connection to other system components can be seen in Figures 5.1 through 5.6.

#### 5.3.1.1 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 Coal Creek Springs Pump Station 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.

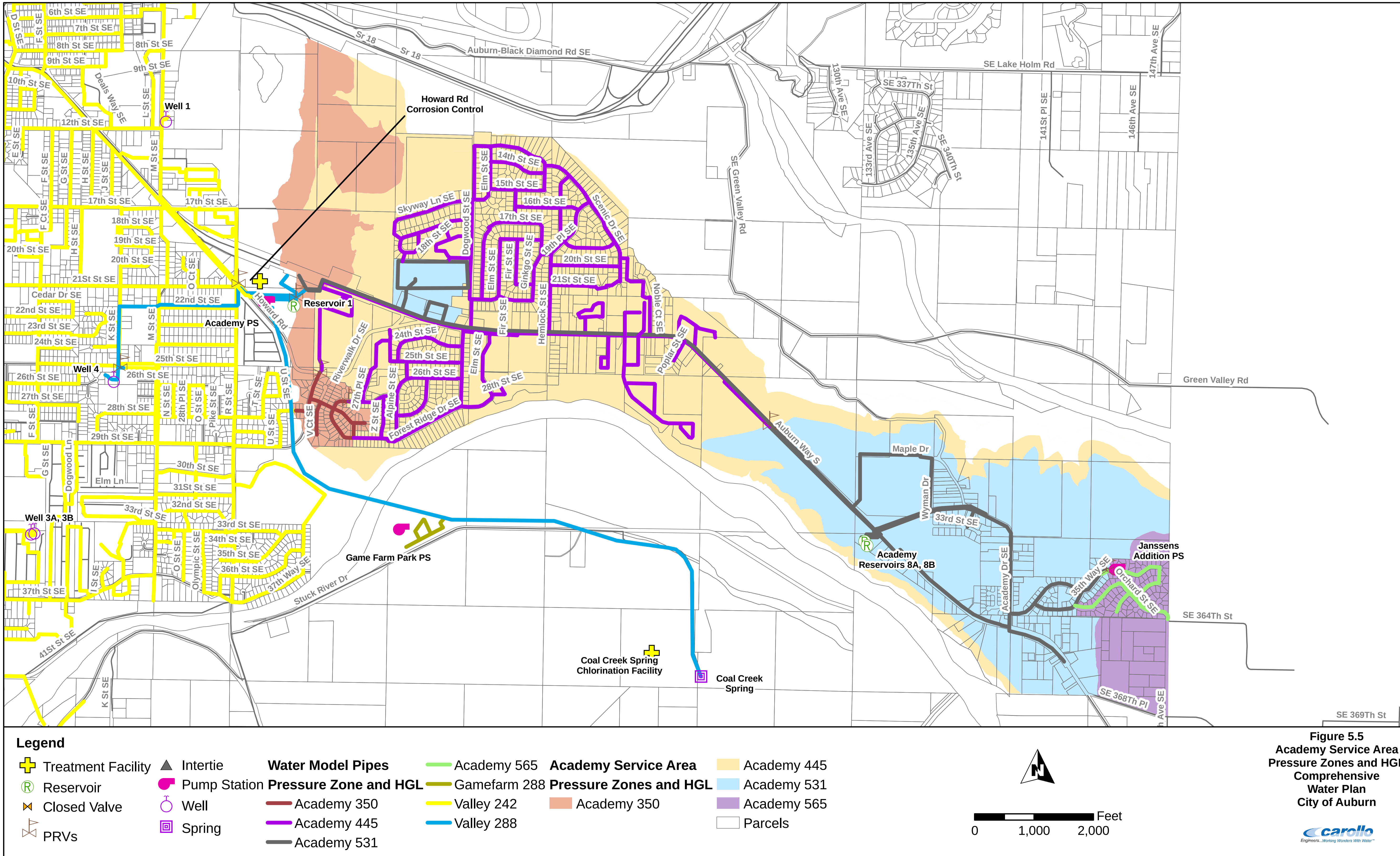



**Figure 5.5**
**Academy Service Area Pressure Zones and HGL**
**Comprehensive Water Plan**
**City of Auburn**

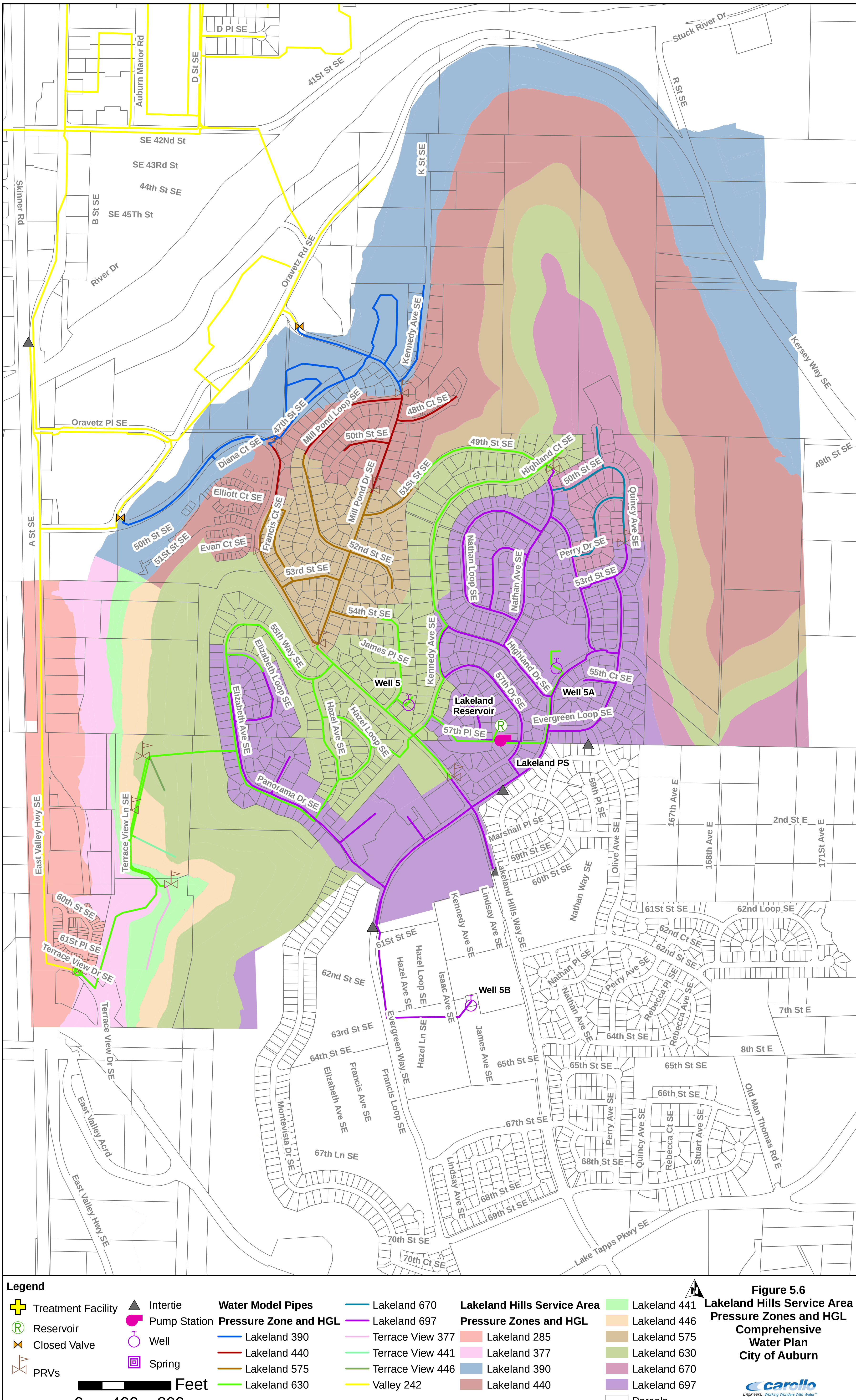
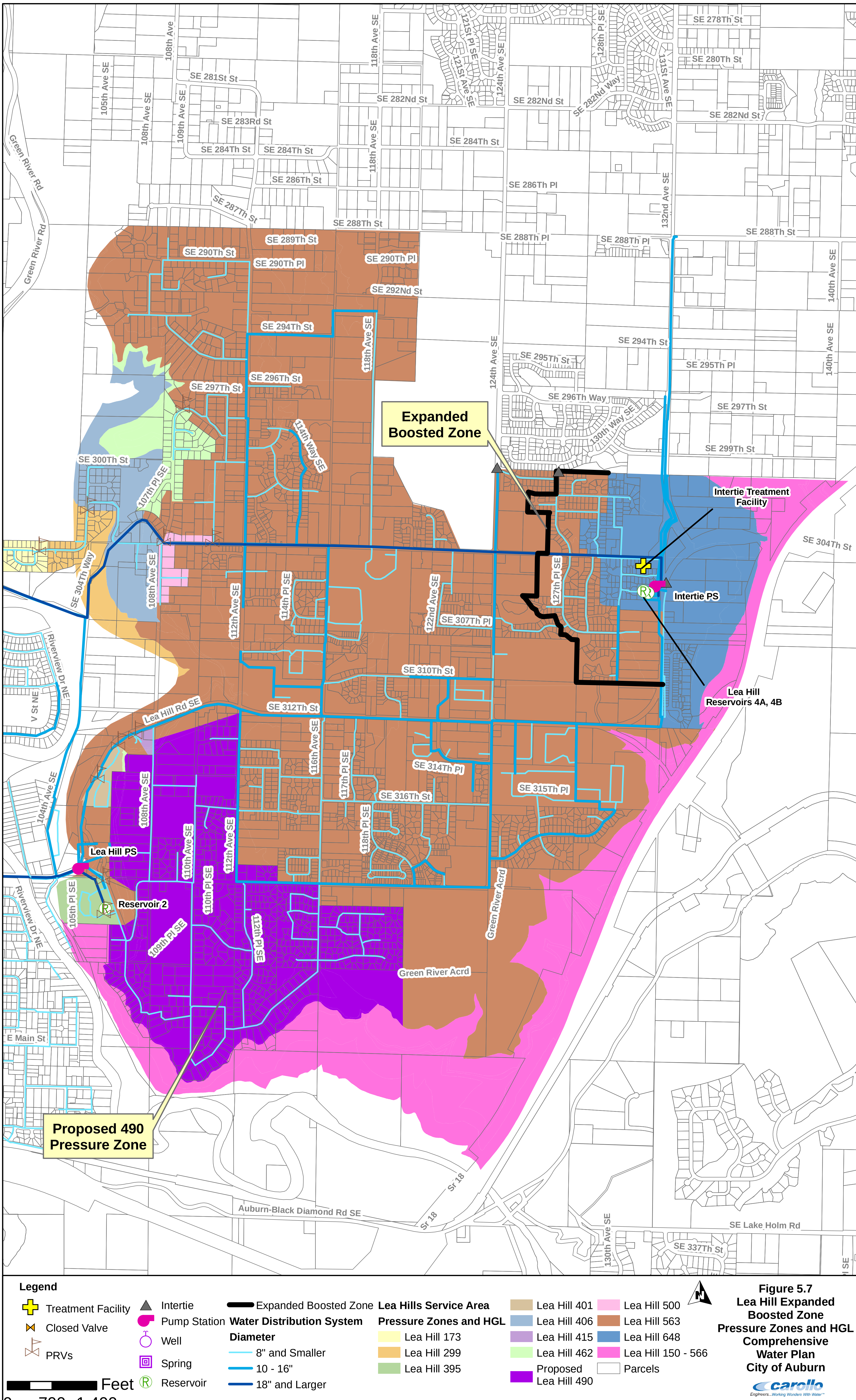



Figure 5.6
Lakeland Hills Service Area
Pressure Zones and HGL
Comprehensive
Water Plan
City of Auburn



Expanded Boosted Zone
Proposed 490 Pressure Zone
Intertie Treatment Facility
Intertie PS
Lea Hill Reservoirs 4A, 4B
Lea Hill PS
Reservoir 2
Legend
Treatment Facility
Closed Valve
PRVs
Intertie
Pump Station
Well
Spring
Reservoir
Expanded Boosted Zone
Water Distribution System Diameter
8" and Smaller
10 - 16"
18" and Larger
Lea Hills Service Area Pressure Zones and HGL
Lea Hill 173
Lea Hill 299
Lea Hill 395
Lea Hill 401
Lea Hill 406
Lea Hill 415
Lea Hill 462
Proposed Lea Hill 490
Lea Hill 500
Lea Hill 563
Lea Hill 648
Lea Hill 150 - 566
Parcels
0 700 1,400 Feet
Figure 5.7
Lea Hill Expanded Boosted Zone Pressure Zones and HGL
Comprehensive Water Plan
City of Auburn
carollo

#### 5.3.1.2 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 station considered to be in the Valley Service Area connects the 288 pressure zone (served by Reservoir 1) to the Valley 242 pressure zone.

#### 5.3.1.3 Lea Hill Service Area Pressure Reducing Stations

The Lea Hill Service Area includes ten PRV stations providing service to eight sub-zones of lower elevation. Two of these sub-zones include parallel PRV stations to provide redundancy (zones 395 HGL and 401 HGL). In the boosted pressure zone, some customers are served directly from the transmission pipeline supplying the Lea Hill Reservoirs. PRVs are installed on some of these service connections to reduce pressure to a suitable range.

#### 5.3.1.4 Academy Service Area Pressure Reducing Stations

As seen in Figure 5.5, the Academy Service Area contains three PRV stations to the 445 and 350 sub-zones. Sub-zone 350 is served by parallel PRVs, providing redundancy.

#### 5.3.1.5 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 630 zone, which can be served from Reservoir 5 or from the 697 zone via two PRVs. Below this 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 zone; these valves are normally closed. Additionally, PRV stations serve the Terrace View development area from the transmission/distribution line in the 630 zone.

The Lakeland Hills Booster Pump Station pumps to a boosted 697 zone from the 630 zone. A 670 sub-zone lies between these two zones. PRVs are installed between the boosted zone and the tank zone, but these typically do not operate as the Lakeland Hills Booster Pump Station pressure is regulated.

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| ***Valley*** | | | | | | | |
| Howard Rd CCF | | 16-90G-01ABKC | 16" | | 82 | 61 | 245 |
| Howard Rd CCF | | 8-90G-01ABKC | 8" | (bypass) | Off | Off | |
| Well 4/25th & K St SE | | | 10" | | Off | Off | 245 |
| Well 4/25th & K St SE | | | 4" | | Off | Off | |
| ***Lea Hill*** | | | | | | | |
| 105th Pl SE/SE 320th Pl Amberview Apts N | 711-1 | 8-90G-01AB | 8" | | 140 | 65 | 395 |
| 105th Pl SE/SE 320th Pl Amberview Apts S | 711-2 | 8-90G-01AB | 8" | | 140 | 60 | 395 |
| 105th Pl SE/SE 320th Pl Amberview Apts S | 711-3 | 2-90G-01 | | 2" | 140 | 65 | |
| Lea Hill Rd Carriage Square Apts Lower | 611-1 | 8-90G-01AB | 8" | | 160 | 65 | 390 |
| 106th Pl SE/Lea Hill Rd Carriage Square Apts Middle | 611-2 | 2-90G-01AS | 2" | | 140 | 70 | |
| 106th Pl SE/Lea Hill Rd Carriage Square Apts Middle | 611-3 | 8-90G-01AB | | 8" | 140 | 65 | |
| 107th Pl SE/Lea Hill Rd Carriage Square Apts Upper | 611-6 | 1 1/2-50-01B | 1.5" | | 140 | 74 | 380 |
| 107th Pl SE/Lea Hill Rd Carriage Square Apts Upper | 611-4 | 2-90G-01AS | | 2" | 140 | 65 | |

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| 107th Pl SE/Lea Hill Rd Carriage Square Apts Upper | 611-5 | 6-90G-01AB | | 6” | 140 | 60 | |
| 110th Pl SE/SE 304th St | 512-1 | 8-90G-01AB | 8" | 6” | 82 | 50 | 500 |
| 108th Ave SE/SE 304th St | 511-1 | 6-90G-01AB | 6" | | 70 | 45 | 400 |
| 109th Ave SE/SE 298th St | 412-1 | 4-90G-01AB | 4" | | 85 | 45 | 464 |
| 104th Ave SE/SE 302nd St Cobble Creek Upper | 411-1 | 1 1/2-50G-01 | | 1.5" | 94 | 60 | |
| 104th Ave SE/SE 302nd St Cobble Creek Upper | 411-2 | 2-90G-01AS | 2" | | 94 | 60 | |
| 104th Ave SE/SE 302nd St Cobble Creek Upper | 411-3 | 8-90G-01AB | | 8" | 94 | 55 | 315 |
| 103rd Ct SE/SE 304th Pl Cobble Creek Lower | 411-6 | 1 1/2-50-01B | | 1.5" | 46 | 56 | |
| 103rd Ct SE/SE 304th Pl Cobble Creek Lower | 411-4 | 2-90G-01AS | | 2" | 86 | 46 | |
| 103rd Ct SE/SE 304th Pl Cobble Creek Lower | 411-5 | 6-90G-01AB | 6" | | 86 | 40 | 238 |
| ***Academy*** | | | | | | | |
| 27th St SE Riverwalk Development | 1710-3 | 1/2-50-01 | 1.5" | | 90 | 75 | 420 |
| 27th St SE Riverwalk Development | 1710-1 | 2-90G-01AB | | 2" | 90 | 60 | |
| 27th St SE Riverwalk Development | 1710-2 | 6-90G-01ABCS | | 6" | 90 | 50 | |

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| Howard Rd/Riverwalk | New | 2-90G-01-YBS | 2" | | 109 | 60 | 420 |
| Howard Rd/Riverwalk | New | 2-50A-01-YB | | 2" | 109 | ARV | |
| Howard Rd/Riverwalk | New | 6-90G-01-YBS | | 6" | 109 | 55 | |
| 2003 Auburn Way South | New | 3-90G-01-YBS | 3" | | 138 | 85 | 445 |
| 2003 Auburn Way South | New | 3-50A-01-YB | | 3" | 130 | ARV | |
| 2003 Auburn Way South | New | 10-90G-01-YBS | | 8" | 138 | 75 | |
| 4500 Auburn Way South | New | 3-90-01-YBS | 3" | | 87 | 65 | 445 |
| 4500 Auburn Way South | New | 3-50A-01-YB | | 3" | 95 | ARV | |
| 4500 Auburn Way South | New | 10-90-01-YBS | | 8" | 95 | 56 | |
| Janssen’s Addition/6100 Blk Lemon Tree Ln | | 2-90-01As | 2" | | 65 | 50 | 564 |
| ***Lakeland Hills*** | | | | | | | |
| Terrace View Apt #6170 Lower | New | 3-50A-01-YB | 3" | | 174 | ARV | 377 |
| Terrace View Apt #6170 Lower | New | 3-90G-01-YBS | | 3" | 174 | 65 | |
| Terrace View Apt #6170 Lower | New | 10-90G-01-YBS | | 10" | 174 | 60 | |
| Terrace View Apt #5960 Middle | New | 3-50A-01-YB | 3" | | 160 | ARV | 441 |

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| Terrace View Apt #5960 Middle | New | 3-90G-01-YBS | | 3" | 160 | 78 | |
| Terrace View Apt #5960 Middle | New | 10-90G-01-YBS | | 10" | 160 | 72 | |
| Terrace View Apt #5810 Upper | New | 3-50A-01-YB | 3" | | 138 | ARV | 446 |
| Terrace View Apt #5810 Upper | New | 3-90G-01-YBS | | 3" | 138 | 52 | |
| Terrace View Apt #5810 Upper | New | 10-90G-01-YBS | | 10" | 138 | 47 | |
| Alexander Pl SE/Terrace View Dr SE | Temp | 3-100-01-54E | 3" | | 200 | ARV | |
| Alexander Pl SE/Terrace View Dr SE | Temp | 3-90G-01BCSY | | 3" | 230 | 80 | |
| Alexander Pl SE/Terrace View Dr SE | Temp | 10-90G-01BCSY | | 10" | 230 | 70 | |
| Mill Pond Dr/Orvetz Rd | 1309-1 | 2 1/2-50-01 | 2.5" | | 65 | 0 | 253 |
| Mill Pond Dr/Orvetz Rd | 1309-2 | 3-90G-01AS | | 3" | 105 | 60 | |
| Mill Pond Dr/Orvetz Rd | 1309-3 | 10-90G-01AB | | 10" | 105 | 55 | |
| Lakeland Hills Way/Oravetz Rd | 1409-1 | 2-90G-01AS | 2" | | 110 | ARV | 253 |
| Lakeland Hills Way/Oravetz Rd | 1409-2 | 4-90G-01AB | | 4" | 110 | 50 | |
| Lakeland Hills Way/Oravetz Rd | 1409-3 | 8-90G-01-AB | | 8" | 110 | 40 | |
| 47th/Lakeland Hills Way | 1409-2 | 1 1/2-90-01AS | 1.5" | | 65 | ARV | 390 |

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| 47th/Lakeland Hills Way | 1409-4 | 1 1/2-90-01AS | | 1.5" | 140 | 72 | |
| 47th/Lakeland Hills Way | 1409-5 | 4-90-01ABS | | 4" | 140 | 66 | |
| 47th/Lakeland Hills Way | 1409-6 | 8-90-01-AB | | 8" | 140 | 56 | |
| Mill Pond Lp/Mill Pond Dr | 1310-1 | 2 1/2-50-01 | 2.5" | | 130 | ARV | 390 |
| Mill Pond Lp/Mill Pond Dr | 1310-1 | 3-90-01AS | | 3" | 130 | 60 | |
| Mill Pond Lp/Mill Pond Dr | 1310-1 | 10-90-01AB | | 10" | 130 | 55 | |
| Mill Pond Dr/4900 Blk | Not provided | | 3" | | 103 | ARV | 440 |
| Mill Pond Dr/4900 Blk | | | | 3" | 103 | 60 | |
| Mill Pond Dr/4900 Blk | | | | 10" | 103 | 50 | |
| Lakeland Hills Way/Lakeland Hills Lp Upper 51st | Not provided | | 3" | | 75 | ARV | 440 |
| Lakeland Hills Way/Lakeland Hills Lp Upper 51st | | | 3" | | 95 | 75 | |
| Lakeland Hills Way/Lakeland Hills Lp Upper 51st | | | 10" | | 95 | 70 | |
| Lakeland Hills Way/Mill Pond Dr | | 2 1/2-50-01 | 2.5" | | 60 | ARV | 575 |
| Lakeland Hills Way/Mill Pond Dr | 1409-8 | 3-90-01AS | | 3" | 85 | 60 | |
| Lakeland Hills Way/Mill Pond Dr | 1409-9 | 10-90-01AB | | 10" | 85 | 55 | |
| 51st St. SE/East of Mill Pond Lp | 1410 | 1 1/2-90-01AS | 1.5" | | 90 | ARV | 600 |

**Table 5.1 Pressure Reducing Valve Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Location Description | Valve # | Connection | Valve Size | | Inlet Pressure, PSI | Outlet Pressure, PSI | HGL |
|---|---|---|---|---|---|---|---|
| | | | Primary | Secondary | | | |
| 51st St. SE/East of Mill Pond Lp | 1410-1 | 1 1/2-90-01AS | | 1.5" | 80 | 70 | |
| 51st St. SE/East of Mill Pond Lp | 1410-2 | 4-90-01ABS | | 4" | 120 | 70 | |
| 51st St. SE/East of Mill Pond Lp | 1410-3 | 8-90-01AB | | 8" | 120 | 60 | |
| Nathan Ave/Highland Dr | 1410 | 1 1/2-50-01 | 1.5" | | | | 631 |
| Nathan Ave/Highland Dr | 1410-4 | 1 1/2-90-01AS | | 1.5" | 125 | 72 | |
| Nathan Ave/Highland Dr | 1410-5 | 4-90-01ABS | | 4" | 125 | 67 | |
| Nathan Ave/Highland Dr | 1410-6 | 8-90-01AB | | 8" | 125 | 62 | |
| Quincy Ave | 1410 | 1 1/2-50G01 | 1.5" | | 55 | ARV | 675 |
| Quincy Ave | 1410 | 1 1/2-90-01AS | | 1.5" | 75 | 63 | |
| Quincy Ave | 1410-8 | 4-90-0AB | | 4" | 75 | 58 | |
| Quincy Ave | 1410-9 | 8-90-01AB | | 8" | 75 | 55 | |
| Lakeland Hills Way/Evergreen | 1510-1 | 1 1/2-50-01 | 1.5" | | 75 | ARV | 718 |
| Lakeland Hills Way/Evergreen | 1510-1 | 1-90-01AS | | 1.5" | 75 | 62 | |
| Lakeland Hills Way/Evergreen | 1510-1 | 4-90-01ABS | | 4" | 75 | 57 | |
| Lakeland Hills Way/Evergreen | 1510-1 | 8-90-01AB | | 8" | 75 | 52 | |

Notes:
ARV = automatic reducing valve.

### 5.3.2 PRV System Analysis

#### 5.3.2.1 Valley Service Area

Pressure-reducing valves in the Valley Service Area provide adequate pressure distribution and no modifications are recommended at this time.

#### 5.3.2.2 Lea Hill Service Area

Three PRVs in the Lea Hill Service Area are recommended for upgrading or replacement to meet safety standards for ladder access and confined space entry, as their vaults are very small. These PRVs are located in the vicinity of SE 304th Street and 108th Avenue SE. A new 490 pressure zone and expanded booster zone may require additional PRVs when installed.

#### 5.3.2.3 Academy Service Area

In the Academy Service Area, the small PRV from the 531 zone to the 445 zone could be adjusted to a slightly lower pressure in the northern section of the pressure zone. In addition to service improvements, the PRV on 35th Way SE in Janssen's Addition should be upgraded or replaced to meet safety standards for ladder access and confined space entry. This PRV is extremely small to access and is located in the middle of the street requiring traffic control in half of the roadway during maintenance.

#### 5.3.2.4 Lakeland Hills Service Area

As discussed in the Analysis of the Lakeland Hills Service Area, new pressure zones are recommended for the lower end of the 575 and 390 zones. The PRV at 51st and Lakeland Hills Way SE should be reduced to 60 psi. Valve 4299 should be opened and valve 5063 should be closed to move the customers at the lower end of Francis CT SE from the 575 to the 390 pressure zone. Similarly, valve 2167 on Mill Pond Loop SE should be opened and the valve at Mill pond Drive SE and 52 St SE should be closed to move all of Mill Pond Loop SE from the 575 to the 390 pressure zone.

Additionally, the existing 697 boosted zone should be slightly expanded. Valve 3554 at the north intersection of Elizabeth Ave SE and Elizabeth Loop SE should be closed, and valve 3556 in the middle of Elizabeth Loop SE should be opened to move all of the customers on Elizabeth Loop SE to the 697 boosted pressure zone.

## 5.4 WATER SUPPLY FACILITIES

The City of Auburn uses a combination of springs and wells to supply the system. The City's water supplies are summarized in Table 5.2. Each facility is described below. Further review of capacity of these sources is discussed in Chapter 6.

| Table 5.2 Existing Water Supply Facilities<br>Comprehensive Water Plan<br>City of Auburn | | |
|---|---|---|
| **Well / Spring** | **Capacity, gpm(1)** | **Date Constructed** |
| Coal Creek | 2,000 | 1964, 1998(2) |
| West Hill | 600 | 1960 |
| 1 | 0 | 1960 |
| 2 | 1,600 | 2000 |
| 3A | 0 | 1983 |
| 3B | 0 | 1984 |
| 4 | 2,600 | 1985 |
| 5 | 650 | 1983 |
| 5A | 180 | 1990 |
| 5B | 0 | 2005 |
| 6 | 1,800 | 2000 |
| 7 | 2,000 | 1997 |

Notes:
(1) Data provided by the City.
(2) Initial facility including the south and middle collectors were constructed in 1964 while the north collector was constructed in 1998.

## 5.4.1 Existing System

### 5.4.1.1 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 third 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 the possibility that a future pump station could increase the flow from the line.

Each of the collectors is connected to an overflow structure and is metered 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 in Section 5.8.

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

#### 5.4.1.2 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.

#### 5.4.1.3 Well 1

Well 1 is located on M Street SE near 12th Street SE. Constructed in 1960, the well includes a masonry building and is equipped with a three-stage, centrifugal, turbine pump with a capacity of 2,100 gpm, driven by a 150-HP motor. Although the building and pump are now nearly 50-years old, routine maintenance and replacements occurred as needed. The pump is normally controlled by the water level in Reservoir 2, but can be controlled by Reservoir 1 as well.

In 1998, the well output began to fall as a result of what appeared to be decreasing water levels. The pumping rate of the well was reduced from 2,100 gpm to 1,600 gpm. In the fall of 1998, the pump was removed from the well, and a video inspection of the well was completed. The video revealed no apparent problems with well construction. Subsequently, the pump was reinstalled; however water levels in the well continued to decline. The well was shut down. The cause of the water level decline in Well 1 is not yet known, and as a result, further investigations are planned. Replacement of the well may be needed to meet future water supply demands

Chlorination is not normally done at Well 1. However, piping and equipment are available to allow portable chlorination equipment to be installed if required. On-site emergency power generation is not provided at Well 1; however, the facility is equipped with a manual transfer switch that allows the City to use a mobile generator set to operate the system when necessary.

#### 5.4.1.4 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 a new 2-stage 2400-gpm pump powered by a 125-HP motor (Well 2) and a 3,500 gpm, two-stage, vertical-turbine pump driven by a 200-HP motor (Well 6). Under the City's corrosion control strategy, Well 2 and 6 pump to the Fulmer Field Corrosion Control Treatment Facility, an air-stripping tower, located near Wells 2 and 6.

Since, the Fulmer Field Corrosion Control Treatment 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 Treatment Facility. Chlorination and emergency power for both Wells 2 and 6 are housed in the Fulmer Field Corrosion Control Facility.

#### 5.4.1.5 Wells 3A & 3B

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

#### 5.4.1.6 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 2,800-gpm, four-stage, centrifugal, turbine pump driven by a 300-HP motor. The well and equipment are housed in a masonry building. Well 4 may pump directly to Reservoir 1 or 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. Gaseous chlorination is provided at this well.

#### 5.4.1.7 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 Reservoir. 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 was selected to deliver 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.

#### 5.4.1.8 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 Reservoir. The well is equipped with a ten-stage submersible turbine pump, driven by a 60-HP motor. The pump has a capacity of 250 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.

#### 5.4.1.9 Well 5B

Well 5B was constructed in 2005 and consists of a 600 gpm pump. The pumped water then proceeds through 4 Altec 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 were interrupted.

As soon as Well 5B came on line the City discovered that the aquifer was not recovering. Well 5B was operated intermittently in 2005 and 2006 but was not operated since 2006.

#### 5.4.1.10 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 Corrosion Control Treatment Facility. The treated water is re-pumped into the valley distribution system and Reservoir 2. If necessary, Well 7 can pump untreated directly to the Valley distribution system. Well 7 has elevated levels of manganese and is only operated in the summer when additional capacity is needed.

#### 5.4.1.11 Braunwood Well

The Braunwood well serves a small satellite water system located south of the White River and east of Kersey Way. The City acquired the well in 1989. The well is located off 47th Street SE. The well is housed in a concrete block building with a wood roof and is equipped with a submersible 25-gpm pump, a hydro-pneumatic pressure system, and an emergency generator system that was added in 1998.

#### 5.4.1.12 Algona Well

In 1996, the City acquired 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 is demolished, but the well casing is still standing.

### 5.4.2 Supply Facilities Analysis

Due to the decline in production of several supply facilities, the City will need to perform hydrogeologic investigations of the existing wells. An annual well inspection and redevelopment program is recommended. Additionally, several systems are in need of back-up power and improved chlorination facilities. The following provides a summary of noted deficiencies and recommendations for each source.

#### 5.4.2.1 Coal Creek Springs

In general, the Coal Creek Springs collection system facility is in good condition, however the City is planning some additional cross connection security improvements to enhance operation. Improvements include new watertight manhole lids for the middle collector and installation of a new 24-inch overflow pipe for the South Collector that will discharge at the chlorination station overflow rather than at the pond. The City has noted a drop in capacity of the Spring since the max day reading of 3,500 gpm in 2001.

#### 5.4.2.2 West Hill Springs

The West Hills Spring system is in good condition. However, the watershed surrounding the spring is not completely fenced and further security improvements are planned.

#### 5.4.2.3 Well 1

The City is planning further investigation of the production loss of Well 1. A potential solution for reestablishing well production would be to relocate and re-drill Well 1. The improvements could include re-drilling a replacement well to the production aquifer and construction of a new masonry building, production pump and associated piping. At this time the City should consider installation of a permanent chlorination facility with on-site generation or hypochlorite.

#### 5.4.2.4 Wells 2 & 6

The two well pumps at Wells 2 & 6 are relatively new and in good condition. By the end of the planning period, the pumps will be almost 30 years old. Once the pumps are 20 years old, it is recommended that the City test electrical and hydraulic systems of the motors every 5 years to ensure proper function.

The City is currently having problems with the Well 2 screens and impellers as they recently removed 2.5 yards of sand from the Well 2 clear well. The City believes that the aquifer is collapsing around the screen. Further investigation may be needed by the City's hydrogeological consultant to understand this problem. The City has noted a drop in production from Wells 2 and 6 since the max day reading of 2,400 gpm for Well 2 in 2003 and 3,500 gpm for Well 6 in 2002.

#### 5.4.2.5 Wells 3A & 3B

Recommended treatment improvements for these wells are discussed in Section 5.7. Both Wells 3A and 3B are in good condition. This site has the capacity for multiple service options including a continued use of the existing facility with treatment or a new facility and re-drilled wells.

#### 5.4.2.6 Well 4

Well 4 is not provided with an on-site engine-generator, nor is it equipped for operation from a portable engine-generator. The well should be modified to provide an on site generator system with an automatic transfer switch to allow operation of Well 4 during a power failure. Because the pump is currently 23 years old, testing the motor, electrical and hydraulics of the well pump is recommended to ensure adequate function. When the Well 4 facility is upgraded, evaluating alternative chlorination practices is recommended to improve safety, such as on-site generation or hypochlorite. The City has noted a slight drop in production from Well 4 since the max day reading of 2,800 gpm in 2003.

#### 5.4.2.7 Well 5

Well 5 design does not meet the standards of other City wells. Though it remains functional, moderate corrosion was evident on the mechanical parts within the well facility. Any modifications or enhancements would require a new well house. Upgrading Well 5 to meet City standards is recommended, including providing full back-up power and on-site chlorination. Further investigation will be needed to understand how these improvements can be incorporated onto the existing site. The City has noted a drop in production from Well 5 since the max day reading of 730 gpm in 2002. A hydrogeologic evaluation should be performed to evaluate the aquifer drawdown.

#### 5.4.2.8 Well 5A

The Well 5A facility is in good condition. Testing the motor, electrical and hydraulics of the well pump is recommended to ensure adequate function. Additionally, the City should evaluate alternatives to improve the security of the Well 5A site.

Well 5A production appears to have dropped since the max day reading of 240 gpm in 2002. Additionally, the City has noticed that the aquifer is not recharging quickly around October. Further investigation may be needed by the City's hydrogeological consultant to understand this problem within the Lakeland Hills service area.

#### 5.4.2.9 Well 5B

The Well 5B facility is in good condition. The City has noted problems making hypochlorite and has noticed leaks in their instrumentation panel. However, the larger issue is with the aquifer regeneneration. A hydrogeologic evaluation should be performed to evaluate the aquifer drawdown.

#### 5.4.2.10 Well 7

Recommended treatment improvements for these wells are discussed in Section 5.7. Aside from the high manganese issues, Well 7 is in good condition. However, backup power facilities should be considered.

#### 5.4.2.11 Algona Well

The City is evaluating how to best use this supply in the future.

## 5.5 PUMP STATIONS

The City of Auburn 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 5.3, and locations are shown in Figure 5.1. As stated in Chapter 3, City pump stations are expected to meet the MDD with the largest pump out of service. The criteria also recommends an installed or portable generator. Table 5.3 also presents the firm pump station capacity assuming the largest pump is out of service.

### 5.5.1 Existing System

#### 5.5.1.1 Academy Pump Stations 1 and 2

The City maintains two pump stations that pump water from Reservoir 1 into the Academy Hill Pressure zone. Both of the Academy Pump Stations are located on the Reservoir 1 site.

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 (Pump 1 and 2). The station consists of a masonry block building, two can-type pumps, a piping system and control.

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.

#### 5.5.1.2 Green River Pump Station

The Green River Pump Station boosts water from the Valley Pressure Zone into the Lea Hill 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 which 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. Auburn 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.

**Table 5.3 Existing Booster Pump Stations**
**Comprehensive Water Plan**
**City of Auburn**

| Booster Station | Location | Source | Supplies | Firm Capacity (mgd) | Pump Number | Pump Capacity (gpm) | Hp | Constructed/ Installed | Standby Power |
|---|---|---|---|---|---|---|---|---|---|
| Academy Pump Station 1 | 2004 Auburn Way South | Reservoir 1 | Academy Zone | 0.43 | | | | 1960 | Yes |
| | | | | | 1 | 500 | 50 | 1960 | |
| | | | | | 2 | 300 | 30 | 1960 | |
| Academy Pump Station 2 | 2004 Auburn Way South | Reservoir 1 | Academy Zone | 1.08 | | | | 1980 | Yes |
| | | | | | 3 | 750 | 75 | 1980 | |
| | | | | | 4 | 750 | 75 | 1980 | |
| Green River Pump Station | 29621 Green River Road S.E. | Valley Zone | Lea Hill Zone | 5.04 | | | | 1999 | No |
| | | | | | 1 | 1,170 | 150 | 1999 | |
| | | | | | 2 | 1,170 | 150 | 1999 | |
| | | | | | 3 | 1,170 | 150 | 1999 | |
| | | | | | 4 | 1,170 | 150 | 1999 | |
| Game Farm Park Pump Station | 2401 Stuck River Drive | Coal Creek Springs | Game Farm Park | 0.07 | | | | 1988 | No |
| | | | | | 1 | 50 | 5 | 1992 | |
| | | | | | 2 | 1,000 | 50 | 1993 | |
| Janssen's Addition Pump Station | 3600 block Lemon Tree Lane | Academy Zone | Janssen's Addition Sub-Zone | 0.0 | | | | 1989 | No |
| | | | | | 1 | 100 | 7.5 | 1989 | |
| Intertie Pump Station | 30502 132nd Avenue S.E. | Lea Hill Zone | Wholesale | 5.05 | | | | 1999 | No |
| | | | | | 1 | 1,170 | 60 | 1999 | |
| | | | | | 2 | 1,170 | 60 | 1999 | |
| | | | | | 3 | 1,170 | 60 | 1999 | |
| | | | | | 4 | 1,170 | 60 | 1999 | |
| | | | Lea Hill Boosted | 1.44 | | | | 1999 | |
| | | | | | 1 | 500 | | 2005 | |
| | | | | | 2 | 500 | | 2005 | |

**Table 5.3 Existing Booster Pump Stations**
**Comprehensive Water Plan**
**City of Auburn**

| Booster Station | Location | Source | Supplies | Firm Capacity (mgd) | Pump Number | Pump Capacity (gpm) | Hp | Constructed/ Installed | Standby Power |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 3 | 1,000 | | 2005 | |
| Lea Hill Pump Station | 10406 Lea Hill Road S.E. | Valley Zone | Lea Hill Zone | 1.73 | | | | 1965 | Yes |
| | | | | | 1 | 600 | 75 | 1982 | |
| | | | | | 2 | 600 | 75 | 1982 | |
| | | | | | 3 | 800 | 100 | 1982 | |
| Lakeland Hills Pump Station | 1118 57th Place S.E. | Lakeland Hills 4 | Lakeland Hills 5 | 2.88 | | | | 1990 | Portable |
| | | | | | 1 | 100 | 10 | 1990 | |
| | | | | | 2 | 200 | 15 | 1990 | |
| | | | | | 3 | 200 | 15 | 1990 | |
| | | | | | 4 | 500 | 30 | 1990 | |
| | | | | | 5 | 1,000 | 50 | 1990 | |
| | | | | | 6 | 1,000 | 50 | 1999 | |

#### 5.5.1.3 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 Stuck 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.

#### 5.5.1.4 Janssen’s Addition Pump Station

The Janssen's Addition Pump Station boosts water from the Academy Pressure Zone to serve a small residential area with elevations above 450 feet within the Academy Service Area. The Booster Pump Station includes a single 100-gpm pump and operates with a HGL of 565 feet. The station runs continuously (and is not controlled at M&O) to supply water for domestic use. A by-pass valve arrangement is provided to prevent over-pressuring the system. Fire protection is provided through a check valve arrangement installed in a line parallel to the pump station, which opens during low-pressure conditions such as a fire.

The Janssen's Addition Booster Pump Station, located in an underground concrete vault, was constructed in 1989. The site is not secured and does not allow for expansion or adaptation for a higher level of reliability as the area develops. Additionally, since the pumps are stored underground, access for maintenance is difficult.

#### 5.5.1.5 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 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 Auburn 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.

#### 5.5.1.6 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 pumps are currently 26 years old.

The Lea Hill Pump Station is located adjacent to Lea Hill Road and includes a block building which houses pumps, controls, and necessary piping. A 250 kW diesel engine generator is housed in a separate enclosure at the site and is capable of running all three pumps. The engine generator is equipped with an automatic transfer switch to automatically provide power when utility power fails. Fuel for the engine generator set is stored in a 1,000-gallon aboveground fuel tank that was installed in 1998.

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.

#### 5.5.1.7 Lakeland Hills Pump Station

The Lakeland Hills Pump Station pumps water from the Lakeland Hills Reservoir, to the Lakeland Hills Service Area. The Lakeland Hills Pump Station was completed in 1990 and was upgraded in 1998. The facility is constructed of a metal building that contains a triplex package pressure booster system and three additional pumps that provide higher fire flows.

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. Remote operation of the larger pumps is possible from the Control Center. Emergency power is provided through a dedicated portable engine generator set that is kept on-site and an automatic transfer switch assembly.

### 5.5.2 Pump Station Analysis

#### 5.5.2.1 Academy Pump Stations 1 & 2

Both the building and the pumps in the Academy Pump Stations are in good condition and operational. However, Pumps 1 and 2 are already 48 years old. Pumps 3 and 4 are currently 28 years old. The motors, electrical equipment and hydraulics for each of the pumps should be tested to ensure adequate function. Additionally, the pump station capacity will need to be expanded to accommodate future demands. Replacing the pumps and expanding the pump station is recommended.

#### 5.5.2.2 Green River Pump Station

Constructed in 1999, the Green River Pump Station facility is in good condition. Pumps 1 and 2 are reported to have moderate leaking problems. As part of the City's on going maintenance program, pump seals should be checked and repacked. To meet reliability criteria for storage in the Lea Hill Service Area, back-up power is recommended for this pump station. Additionally, it is recommended that the City consider installing chlorination equipment since the City has experienced difficulty maintaining the desired chlorine residual in the north end of the Lea Hill service area near the dead-end mains.

#### 5.5.2.3 Game Farm Park Pump Station

The Game Farm Park Pump Station building is in good condition, although not secured. Modest corrosion and leakage in the piping is evident. Additionally, the Pump Station is considered a confined space, which makes access for maintenance difficult. The location and piping arrangement at the pump station has at times resulted in loss of suction. The pumps are currently 16 years old and will reach the end of their useful life within the planning period of this plan. Evaluating the current operation strategy for the park is recommended, including replacing the pumps and facility with one that is more accessible.

#### 5.5.2.4 Janssen's Addition Pump Station

The Janssen's Addition pump station does not have any fire pumps; instead the Academy Reservoirs are used to supply fire protection via a bypass check valve at the Janssen's Addition Pump Station. Results from the hydraulic model show that this operation strategy does not meet the 1500-gpm fire requirement in the Janssen's Addition area. A new pump station will be required to replace the Janssen's Addition Pump Station in order to provide adequate pressure and fire flow to the Janssen's Addition area.

#### 5.5.2.5 Intertie/Lea Hill Booster Pump Station

As part of the City's ongoing asset management program, the motors, electrical and hydraulics for each of the Intertie Pump Station pumps should be tested when the pumps are approximately 20 year old. In order to expand the Lea Hill boosted zone as recommended in Section 5.2, the Lea Hill Booster Pump Station will require additional capacity. To meet the 1,500-gpm fire flow with sufficient firm pumping capacity while also serving normal demands in the zone, an additional 1,000-gpm pump should be added to the pump station.

#### 5.5.2.6 Lea Hill Pump Station

The current site configuration and the size of this facility prevent expansion of the current site. For this reason, the existing facility is recommended for full replacement. Due to potential security issues associated with the site, including its close proximity to the roadway, it is recommended that the City evaluate alternative sites for the pump station.

#### 5.5.2.7 Lakeland Hills Pump Station

The Lakeland Hills Booster Pump Station is generally in good condition and the site is secured. The impellers for the larger pumps (4 though 6) have been shaved down, decreasing the pump's capacity. It is probable that the nameplate was not replaced when the impellers were shaved. If this is true, conducting a pump test to confirm the capacity of these pumps is recommended. All the pumps except for one were installed in 1990 and will be 20 years old in 2010. At this time, the motors, electrical equipment and hydraulics for each of the pumps should be tested to ensure that they are functioning adequately.

The Lakeland Hills Booster Pump Station is in need of new larger pumps, a back-up generator, and an expanded building. The new pumps are required for providing redundancy during peak demands with fire flow. The current reliable capacity with one pump out of service is 1,500 gpm. The station could be upgraded with new pumps or replaced in a new location, pending further analysis by the City.

Additionally, the hydraulic model predicts that the Peak Hour Demand in the area will reach 550 gpm in the boosted zone in 2014, and over 700 gpm in 2028, exceeding the existing skid package capacity. It is recommended that the pump station be upgraded to both meet PHD with the skid pump package, and have fire flow availability.

## 5.6 STORAGE FACILITIES

The City of Auburn currently maintains a total of 14.7 million gallons (MG) of water storage in seven 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 5.4.

### 5.6.1 Existing System

#### 5.6.1.1 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 184.6 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 Treatment Facility, Reservoir 1 can be filled by water from the City' s Well 4.

**Table 5.4 Existing Storage Facilities**
**Comprehensive Water Plan**
**City of Auburn**

| Reservoir Name | Location | Service Area | Volume (MG) | Height (ft) | Volume per Foot | Overflow Elevation | Year Const |
|---|---|---|---|---|---|---|---|
| Reservoir 1 | 2004 Auburn Way S. | Valley | 5.0 | 25 | 200,000 | 292.5 | 1975 |
| Reservoir 2 | 32115 105th Place S. | Valley | 3.6 | 29.72 | 120,100 | 249.2 | 1975 |
| Reservoir 8A | 5002 Auburn Way S. | Academy | 1.2 | 72 | 16,325 | 540.5 | 1973 |
| Reservoir 8B | 5002 Auburn Way S. | Academy | 1.5 | 72 | 21,125 | 540.5 | 1980 |
| Reservoir 4A | 30502 132nd Ave S. | Lea Hill | 1.0 | 77 | 12,425 | 575.5 | 1965 |
| Reservoir 4B | 30502 132nd Ave S. | Lea Hill | 1.4 | 77 | 19,750 | 575.5 | 1983 |
| Reservoir 5 | 1118 57th Place SE | Lakeland Hills | 1.0 | 60 | 19,650 | 635.0 | 1981 |
| **Total Storage Volume** | | | **14.7** | | | | |

#### 5.6.1.2 Reservoir 2

Reservoir 2, located on the northeast side of the Valley Service Area, 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 water from West Hill Springs or any of the City's Valley well-field wells, and from Reservoir 1, through Control Valve 1.

#### 5.6.1.3 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 540.0 feet. The smaller reservoir, Academy Reservoir 8A, has a diameter of 60 feet and a total storage volume of 1.2 MG and was constructed in 1973. Academy Reservoir 8B has a diameter of 52.9 feet and a total storage volume of 1.5 MG and was constructed in 1973. Water is pumped to the Academy Reservoirs from City Reservoir 1 by the Academy Pump Stations.

#### 5.6.1.4 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 City Water Service Area. The reservoirs, designated Reservoir 4A and Reservoir 4B, have capacities of 1 MG and 1.4 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 56 feet. Water is supplied to the Lea Hill reservoirs from the City's Valley Pressure Zone through the Lea Hill Pump Station.

#### 5.6.1.5 Lakeland Hills Reservoir

A single reservoir, designated Reservoir 5, provides 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 feet. Constructed in 1981, Reservoir 5 is located near the top of the Lakeland Hills development. Wells 5 and 5A supply the reservoir.

### 5.6.2 Storage Requirements

The City of Auburn reservoir storage requirements are based on the water system configuration, seasonal and daily variation in water-use patterns, and the reliability of various water system components.

Water storage volumes are comprised of five categories including Operational Storage, Equalizing Storage, Emergency Storage, Fire Flow Storage, and Dead Storage. These components of storage are shown schematically in Figure 5.8. The five components of distribution-system reservoir storage are defined below.

#### 5.6.2.1 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 dependant 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 2 to 3 feet is typically provided.

#### 5.6.2.2 Equalizing Storage

Equalizing storage volume is the total volume needed to satisfy the Peak Hourly Demand (PHD) that exceeds the capacity of the supply system. The State of Washington Administrative Code (WAC) 246-290-253 requires that Equalizing storage be provided to provide peak demands and WAC 246-290-230 (5) states:

> New public water systems or additions to existing systems shall be designed with the capacity to deliver the design PHD quantity of water at 30 psi (210 kPa) under PHD flow conditions measured at all existing and proposed service water meters or along property lines adjacent to mains if no meter exists, and under the condition where all equalizing storage has been depleted.

Equalizing volume requirements are greatest on the day of MDD and are typically calculated based on a percentage of the MDD. Equalizing requirements of 25 percent of MDD (see criteria in Chapter 3) are used to compute equalizing storage requirements.

The equalizing storage volume should be within the normal operating storage volume of the reservoir. The operating storage volume of a reservoir is the volume of water contained between the normal high water level and low operating water level for the reservoir.

#### 5.6.2.3 Emergency Storage

Emergency storage volumes 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, as discussed in Chapter 3. The computation of emergency storage requirements includes consideration of reasonable system disruptions that can be expected to occur within normal planning contingencies as discussed previously. Other major system emergencies, such as those created by an earthquake, are covered under emergency system operation planning.

The Water System Design Manual (August 2001, DOH) suggests that emergency storage be equal to two days of ADD with the largest source out of service. Additionally, the Water System Design Manual (August 2001, DOH) recommends that, at a minimum, the emergency storage not be less than 200 gal/ERU.

In lieu of applying the DOH recommendations, Chapter 3 states that:

> The City should provide either sufficient water to meet two days of the maximum day demands with the largest supply facility or pump in each service area out of service or sufficient water to meet two days of MDD using only reliable sources and reliable pump stations in each service area. The emergency storage volume will be calculated as the more conservative of the two criteria.

The City feels that this criteria is more conservative than the DOH recommendation of providing two days of ADD with the largest source out of service and that this analysis will better account for the unique aspects of the City's water system than applying a constant 200 gal/ERU for the emergency storage volume.

#### 5.6.2.4 Fire Storage

Since a fire can occur at any time during the day, the fire storage is required by the WAC (246-290-235). The City of Auburn provides fire storage in addition to emergency storage described above. WAC 246-290-230 (6) states that:

> If fire flow is to be provided, the distribution system shall also provide MDD plus the required fire flow at a pressure of at least 20 psi (140 kPa) at all points throughout the distribution system, and under the condition where the designed volume of fire suppression and equalizing storage has been depleted.

Fire flow demand is the quantity of water required for fire fighting as defined by applicable water system criteria and fire codes. Fighting fires often places the largest demands on a water system because a high volume of water must be supplied over a short time. Such demands require each component of the system to operate at its optimal condition. Consequently, the Washington State Insurance Service Office (ISO) recommends that water systems be designed to convey fire flows during a period of MDD with one major facility out of service.

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, while 2,500 gpm is required for a duration of 3 hours for all non-residential units except City Parks and open areas. The current maximum fire demand for each major service area is shown in Table 5.5

**Table 5.5 Maximum Fire Flows**
**Comprehensive Water Plan**
**City of Auburn**

| Service Area | Flow gpm | Duration hours | Quantity mg | Location |
|---|---|---|---|---|
| Valley | 4,000 | 4 | 0.96 | Various |
| 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 |

#### 5.6.2.5 Dead Storage Volume

Dead storage volume is the volume at the bottom of the storage tank that cannot be used because it is physically too low to be withdrawn from the tank or, if withdrawn from the tank, would result in distribution system water pressures below the acceptable criteria of 20 psi during a fire. Storage volume is considered dead if it is located below the outlet pipe and cannot be used because of system hydraulic limitations, or it cannot be used because of water quality problems associated with the volume in this lowest portion of the tank. The dead volume calculations for each reservoir are summarized in Table 5.6.

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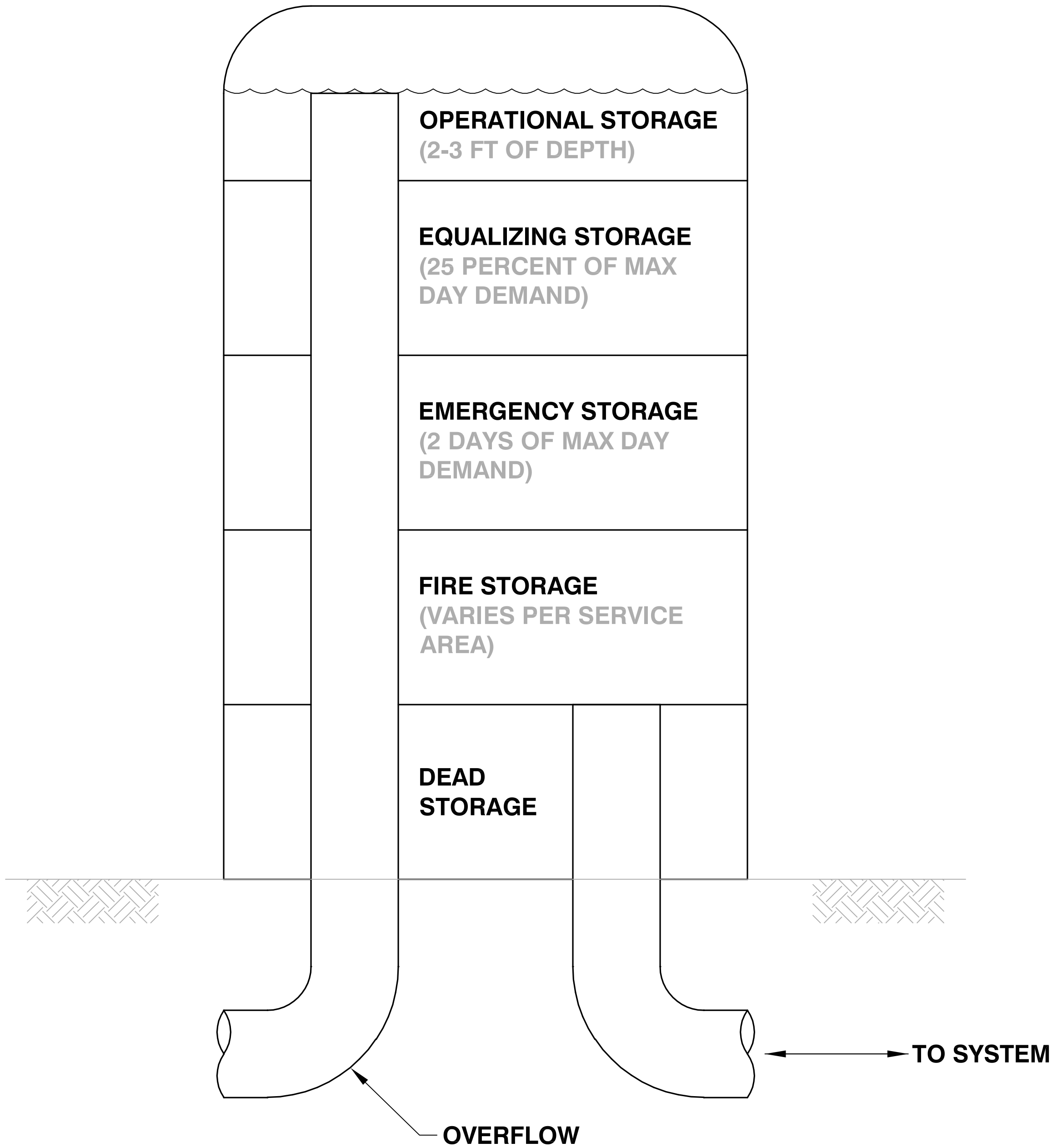


**FIGURE 5.8**
**STORAGE RESERVOIR COMPONENTS**
**COMPREHENSIVE WATER PLAN**
CITY OF AUBURN

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For the Lakeland Hill Reservoir 5, the pumps for the boosted zone can drain the reservoirs down to the elevation of the outlet. In the case of a fire, the high elevation houses, normally served by the reservoir, would be served by the boosted zone essentially eliminating the dead volume in these reservoirs. For the Lea Hill and Academy systems there are no PRVs connecting the boosted zones to the reservoir zones and thus the boosted zone cannot serve the reservoir zone during high flow events. However, the pumps serving the boosted zones can partially drain the dead volume, and thus the dead volume for the Lea Hill and Academy Reservoirs is actually slightly less than stated in Table 5.6. However, to be conservative, this reduction was ignored in this analysis.

**Table 5.6 Reservoir Dead Volume**
**Comprehensive Water Plan**
**City of Auburn**

| Reservoir | Base Elevation, ft | Maximum elevation within zone, ft | Required Tank Elevation(1), ft | Outlet Elevation, ft | Dead Volume, MG |
|---|---|---|---|---|---|
| Valley 1 | 267.50 | NA | NA | 268.50 | 0.20 |
| Valley 2 | 219.42 | 158.00 | 204.00 | 220.42 | 0.12 |
| Academy 8A + 8B | 468.00 | 444.00(2) | 490.00 | 468.00 | 0.83 |
| Lea Hill 4A + 4B | 498.00 | 468.00 | 514.00 | 499.00 | 0.50 |
| Lakeland 5 | 575.00 | 555.00 | 577.00(3) | 575.75(4) | 0.03 |

Notes:
(1) Assumes a minimum static pressure of 20 psi.
(2) Assumes fire flow delivered to the Janssen's Addition area.
(3) 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.
(4) Installation of a planned mixing unit in the future will raise the outlet elevation.

### 5.6.3 Storage Analysis per Service Area

The four service areas were evaluated as separate systems to ensure each are provided with the required usable operational, equalizing, fire, and standby storage volumes. Required emergency storage for each service area is dependent on the supply to the service area. If a system has multiple supplies, storage criteria only require that the demands must be met while the largest supply is out-of-service. However, if a service area is served by a single supply, then demands must be met by storage until the supply can be returned to service. A description of the supply requirements used to evaluate each service area is described below.

#### 5.6.3.1 Valley Service Area

Storage for the Valley Service Area is contained within Reservoir 1 and 2, which have a combined available storage volume of 8.26 MG (8.58 MG less the total dead volume of 0.32 mg). Storage for the Valley Service Area must be sufficient to meet the demands within the service area as projected in Chapter 4. In addition, since the Academy and Lea Hill Service Areas are supplied from the Valley Service Area, the water available to offset the storage requirements for the Valley Service Area must be reduced by the MDD required by both Academy and Lea Hill as detailed in Table 5.7.

With the existing reliable sources and reservoirs, the Valley currently does not have sufficient storage. However, the service area will need 12.97 MG of additional storage by the year 2014, and 21.17 MG of additional storage by the year 2028. These storage needs can be met by a combination of rehabilitating Well 1 and Coal Creek Springs, adding backup power to Wells 4 and 7, constructing a new 2.0-MG Valley Reservoir, and purchasing additional water.

#### 5.6.3.2 Lea Hill Service Area

There is currently 1.89 MG of available storage provided in the two Lea Hill Reservoirs (2.39 MG total storage less 0.50 MG of dead volume). Storage for the Lea Hill Service Area must be sufficient to meet the demands for the service area, as projected in Chapter 4. The projected Lea Hill demands and storage requirements are shown in Table 5.8.

Based on the current available sources, the Lea Hill service area will run out of storage between the years 2008 and 2014, and by the year 2028 will need a total of 2.28 MG of storage. However, if backup power were to be added to the Green River Pump Station, no additional storage would be needed by the year 2028.

**Table 5.7 Valley Storage Analysis (Existing)**
**Comprehensive Water Plan**
**City of Auburn**

| | 2008 | 2014 | 2028 |
|---|---|---|---|
| Projected MDD, mgd | 9.76 | 13.09 | 15.65 |
| Available Sources, mgd | | | |
| Coal Creek Springs | 2.88 | 2.88 | 2.88 |
| West Hill Springs | 0.86 | 0.86 | 0.86 |
| Well 1(1) | 0.00 | 0.00 | 0.00 |
| Well 2 | 2.30 | 2.30 | 2.30 |
| Well 3A | 0.00 | 0.00 | 0.00 |
| Well 3B | 0.00 | 0.00 | 0.00 |
| Well 4(1) | 3.74 | 3.74 | 3.74 |
| Well 6 | 2.59 | 2.59 | 2.59 |
| Well 7(1) | 2.88 | 2.88 | 2.88 |
| Total Source Capacity | 15.26 | 15.26 | 15.26 |
| Reliable Source Capacity(2) | 8.64 | 8.64 | 8.64 |
| Redundant Source Capacity(3) | 11.52 | 11.52 | 11.52 |
| **Controlling Source Capacity** | **8.64** | **8.64** | **8.64** |
| Offsite MDD, mgd | | | |
| Academy Service Area | 1.21 | 1.60 | 2.02 |
| Lea Hill Service Area | 1.87 | 2.13 | 2.93 |
| **Total Offsite Demands** | **3.08** | **3.73** | **4.95** |
| Total Available Redundant Source Capacity, mgd | 5.56 | 4.91 | 3.69 |
| Required Storage, MG | | | |
| Operational | 0.64 | 0.64 | 0.64 |
| Equalizing | 2.44 | 3.27 | 3.91 |
| Emergency | 8.40 | 16.36 | 23.92 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **12.44** | **21.23** | **29.43** |
| Existing Storage, MG | | | |
| Reservoir 1 | 4.80 | 4.80 | 4.80 |
| Reservoir 2 | 3.45 | 3.45 | 3.45 |
| **Total** | **8.26** | **8.26** | **8.26** |
| **Excess (Deficit) Existing Storage, mg** | **(4.18)** | **(12.97)** | **(21.17)** |

Notes:
(1) These wells do not have back-up power.
(2) Reliable capacity is reduced due to lack of back-up power to Wells 1, 4, and 7.
(3) Redundant capacity is capacity with largest source out of service (Well 4).

| **Table 5.8 Lea Hill Storage Analysis (Existing)<br>Comprehensive Water Plan<br>City of Auburn** | | | |
|---|---|---|---|
| | **2008** | **2014** | **2028** |
| Projected MDD, mgd | 1.87 | 2.13 | 2.93 |
| Available Sources, mgd | | | |
| Green River Pump Station(1) | 5.04 | 5.04 | 5.04 |
| Lea Hill Pump Station | 1.73 | 1.73 | 1.73 |
| **Firm Source Capacity** | **6.77** | **6.77** | **6.77** |
| **Reliable Source Capacity** | **1.73** | **1.73** | **1.73** |
| Required Storage, MG | | | |
| Operational | 0.06 | 0.08 | 0.08 |
| Equalizing | 0.47 | 0.53 | 0.73 |
| Emergency | 0.28 | 0.80 | 2.40 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **1.77** | **2.37** | **4.17** |
| Existing Storage, MG | | | |
| Reservoir 4A | 0.76 | 0.76 | 0.76 |
| Reservoir 4B | 1.13 | 1.13 | 1.13 |
| **Total** | **1.89** | **1.89** | **1.89** |
| **Excess (Deficit) Existing Storage, mg** | **0.12** | **(0.48)** | **(2.28)** |

Notes:
(1) The Green River Pump Station does not have back-up power, and is therefore not a reliable source.

#### 5.6.3.3 Academy Service Area

There is currently 1.89 MG of available storage provided in the two Academy Reservoirs (2.73 MG total storage less 0.84 MG of dead volume). Storage for the Academy Service Area must be sufficient to meet the demands for the service area as projected in Chapter 4. The projected Academy demands and storage requirements are shown in Table 5.9.

Based on the current available sources, the Academy service area will run out of storage between the years 2014 and 2028 and will need an additional 0.66 mg of storage by the year 2028. However, if the capacity of the Academy Pump Stations were increased, no additional storage would be required.

#### 5.6.3.4 Lakeland Hills Service Area

The Lakeland Hills Reservoir currently has 0.97 MG of available storage (1.0 MG total storage less 0.03 MG of dead storage).

| Table 5.9 Academy Storage Analysis (Existing)<br>Comprehensive Water Plan<br>City of Auburn | | | |
|---|---|---|---|
| | **2008** | **2014** | **2028** |
| Projected MDD, mgd | 1.21 | 1.60 | 2.02 |
| Available Sources, mgd | | | |
| Academy Pump Station 1 | 0.43 | 0.43 | 0.43 |
| Academy Pump Station 2 | 1.08 | 1.08 | 1.08 |
| **Firm Source Capacity** | **1.51** | **1.51** | **1.51** |
| **Reliable Firm Source Capacity** | **1.51** | **1.51** | **1.51** |
| Required Storage, MG | | | |
| Operational | 0.08 | 0.08 | 0.08 |
| Equalizing | 0.30 | 0.40 | 0.51 |
| Emergency | 0.00 | 0.18 | 1.02 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **1.34** | **1.61** | **2.56** |
| Existing Storage, MG | | | |
| Reservoir 8A | 0.83 | 0.83 | 0.83 |
| Reservoir 8B | 1.06 | 1.06 | 1.06 |
| **Total** | **1.89** | **1.89** | **1.89** |
| **Excess (Deficit) Existing Storage, mg** | **0.55** | **0.28** | **(0.66)** |

Storage for the Lakeland Hills Service Area must be sufficient to meet demands for the service area, as projected in Chapter 4. The projected Lakeland Hills demand and storage requirements are shown in Table 5.10.

Reservoir redundancy is not a criterion of the City. However, where an area is served by a single reservoir, like the Lakeland Hills Service Area, supply capacity needs to be sufficient to meet PHD and fire demand during the duration that the reservoir is out-of-service. Table 5.11 summarizes the capacity requirements for the Lakeland Hills Service Area.

To meet the current PHD and fire demand, a total of 5.89 mgd of source capacity is required. This is 4.69 mgd in excess of the 1.20 mgd available from Wells 5 and 5A. An additional source, pump station, or an emergency intertie is required in the near future to pump the 4.69 mgd deficit. However, if an additional reservoir were provided for the Lakeland Hills system, the sources would not be required to pump the PHD and fire demand. Given the cost of providing up to 5.41 mgd of pumping capacity by the year 2028, it will likely be more cost effective to provide a redundant reservoir for the Lakeland Hills service area.

Based on the current available sources and reservoirs, the Lakeland Hills service area is currently deficient in storage and will need an additional 1.76 MG of storage by 2028.

| **Table 5.10** | **Lakeland Hills Storage Analysis (Existing)<br>Comprehensive Water Plan<br>City of Auburn** | | |
|---|---|---|---|
| | **2008** | **2014** | **2028** |
| Projected MDD, mgd | 0.78 | 0.97 | 1.18 |
| Available Sources, mgd | | | |
| Well 5[(1)] | 0.94 | 0.94 | 0.94 |
| Well 5A | 0.26 | 0.26 | 0.26 |
| **Total Source Capacity** | **1.20** | **1.20** | **1.20** |
| **Reliable/Redundant Source Capacity** | **0.26** | **0.26** | **0.26** |
| Required Storage, MG | | | |
| Operational | 0.03 | 0.03 | 0.03 |
| Equalizing | 0.20 | 0.24 | 0.30 |
| Emergency | 1.04 | 1.42 | 1.84 |
| Fire flow | 0.56 | 0.56 | 0.56 |
| **Total Required Storage** | **1.83** | **2.26** | **2.73** |
| Existing Storage, Reservoir 5, MG | 0.97 | 0.97 | 0.97 |
| **Excess (Deficit) Existing Storage, MG** | **(0.86)** | **(1.29)** | **(1.76)** |

Notes:

(1) Well 5 does not have back-up power and is therefore not a reliable source.

| **Table 5.11** | **Lakeland Hills Source Capacity Requirements<br>Comprehensive Water Plan<br>City of Auburn** | | |
|---|---|---|---|
| | **2008** | **2014** | **2028** |
| Projected Demands, mgd | | | |
| PHD[(1)] | 1.39 | 1.73 | 2.10 |
| Fire Demand | 4.50 | 4.50 | 4.50 |
| **Total** | **5.89** | **6.23** | **6.60** |
| Available Sources, mgd | | | |
| Well 5[(2)] | 0.94 | 0.94 | 0.94 |
| Well 5A | 0.26 | 0.26 | 0.26 |
| Total Source Capacity | 1.20 | 1.20 | 1.20 |
| **Excess (Deficit) Source Capacity, mgd** | **(4.69)** | **(5.03)** | **(5.41)** |

Notes:

(1) Since only one reservoir is provided for the Lakeland Wills service area, the available sources need to be able to supply the PHD and fire demand.

(2) Well 5 does not have back-up power and is therefore not a reliable source.

### 5.6.4 Summary of Current Storage Analysis

The analysis of storage indicates that each of the service areas has sufficient storage for current conditions except for the Lakeland Hills and valley service areas, which are currently deficient. Additionally, all of the service areas will run out of storage within the next twenty years.

### 5.6.5 Future Conditions

To meet the future storage requirements, the following projects are recommended prior to the year 2014:

- Rehabilitate Well 1,
- Add backup power to Wells 4 and 7,
- Purchase water for the Valley Service Area,
- Add backup power to the Green River Pump Station,
- Construct new Lakeland Hills Reservoir, and
- Construct Terrace View Pump Station.

Additionally, the following projects are recommended to be in place by the year 2028:

- Rehabilitate Coal Creek Springs,
- Replace the pumps in Academy Pump Station 1, and
- Construct new Valley Service Area Reservoir.

As shown in Tables 5.12 through 5.15, the storage requirements for each service area can be met through the year 2028 if these projects are implemented.

**Table 5.12 Valley Storage Analysis (Future)**
**Comprehensive Water Plan**
**City of Auburn**

| | 2008 | 2014 | 2028 |
|---|---|---|---|
| Projected MDD, mgd | 9.76 | 13.09 | 15.65 |
| Available Sources, mgd | | | |
| **Coal Creek Springs** | 2.88 | 2.88 | **5.98** |
| West Hill Springs | 0.86 | 0.86 | 0.86 |
| **Well 1** | 0.00 | **3.20** | **3.20** |
| Well 2 | 2.30 | 2.30 | 2.30 |
| Well 3A | 0.00 | 0.00 | 0.00 |
| Well 3B | 0.00 | 0.00 | 0.00 |
| **Well 4** | 3.74 | 3.74 | 3.74 |
| Well 6 | 2.59 | 2.59 | 2.59 |
| **Well 7** | 2.88 | 2.88 | 2.88 |
| **Buy Water** | | **2.70** | **2.70** |
| **Total Source Capacity** | **15.26** | **21.14** | **24.24** |
| **Redundant Source Capacity** | **8.64** | **17.42** | **18.26** |
| Off Site MDD, mgd | | | |
| Academy Service Area | 1.21 | 1.60 | 2.02 |
| Lea Hill Service Area | 1.87 | 2.13 | 2.93 |
| **Total Off Site Demands** | **3.08** | **3.73** | **4.95** |
| Total Available Redundant Source Capacity, mgd | 5.56 | 13.69 | 13.31 |
| Required Storage, MG | | | |
| Operational | 0.64 | 0.64 | 0.64 |
| Equalizing | 2.44 | 3.27 | 3.91 |
| Emergency | 8.40 | 0.00 | 4.67 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **12.44** | **4.87** | **10.19** |
| Existing Storage, MG | | | |
| Reservoir 1 | 4.80 | 4.80 | 4.80 |
| Reservoir 2 | 3.45 | 3.45 | 3.45 |
| **New Valley Reservoir** | 0 | 0 | **2.00** |
| **Total (MG)** | **8.26** | **8.26** | **8.26** |
| **Excess (Deficit) Existing Storage, MG** | **(4.18)** | **3.39** | **0.07** |

**Table 5.13 Academy Storage Analysis (Future)**
**Comprehensive Water Plan**
**City of Auburn**

| | **2008** | **2014** | **2028** |
|---|---|---|---|
| Projected MDD, mgd | 1.21 | 1.60 | 2.02 |
| Available Sources, mgd | | | |
| **Academy Pump Station 1** | 0.43 | 0.43 | **1.08** |
| Academy Pump Station 2 | 1.08 | 1.08 | 1.08 |
| **Firm Source Capacity** | **1.51** | **1.51** | **2.16** |
| **Reliable Firm Source Capacity** | **1.51** | **1.51** | **2.16** |
| Required Storage, MG | | | |
| Operational | 0.08 | 0.08 | 0.08 |
| Equalizing | 0.30 | 0.40 | 0.51 |
| Emergency | 0.00 | 0.18 | 0.00 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **1.34** | **1.61** | **1.54** |
| Existing Storage, MG | | | |
| Reservoir 8A | 0.83 | 0.83 | 0.83 |
| Reservoir 8B | 1.06 | 1.06 | 1.06 |
| **Total** | **1.89** | **1.89** | **1.89** |
| **Excess (Deficit) Existing Storage, MG** | **0.55** | **0.28** | **0.35** |

**Table 5.14 Lea Hill Storage Analysis (Future)**
**Comprehensive Water Plan**
**City of Auburn**

| | **2008** | **2014** | **2028** |
|---|---|---|---|
| Projected MDD, mgd | 1.87 | 2.13 | 2.93 |
| Available Sources, mgd | | | |
| **Green River Pump Station** | 5.04 | **5.04** | **5.04** |
| Lea Hill Pump Station | 1.73 | 1.73 | 1.73 |
| **Firm Source Capacity** | **6.77** | **6.77** | **6.77** |
| **Reliable Source Capacity** | **1.73** | **6.77** | **6.77** |
| Required Storage, MG | | | |
| Operational | 0.06 | 0.08 | 0.08 |
| Equalizing | 0.47 | 0.53 | 0.73 |
| Emergency | 0.28 | 0.00 | 0.00 |
| Fire flow | 0.96 | 0.96 | 0.96 |
| **Total Required Storage** | **1.77** | **1.57** | **1.77** |
| Existing Storage, MG | | | |
| Reservoir 4A | 0.76 | 0.76 | 0.76 |
| Reservoir 4B | 1.13 | 1.13 | 1.13 |
| **Total** | **1.89** | **1.89** | **1.89** |
| **Excess (Deficit) Existing Storage, MG** | **0.12** | **0.32** | **0.12** |

| Table 5.15 Lakeland Hills Storage Analysis (Future)<br>Comprehensive Water Plan<br>City of Auburn | | | |
|---|---|---|---|
| | **2008** | **2014** | **2028** |
| Projected MDD, mgd | 0.78 | 0.97 | 1.18 |
| Available Sources, mgd | | | |
| Well 5 | 0.94 | 0.94 | 0.94 |
| Well 5A | 0.26 | 0.26 | 0.26 |
| **Terrace View Pump Station (firm)** | | **1.44** | **1.44** |
| **Total Source Capacity** | **1.20** | **2.64** | **2.64** |
| **Reliable Source Capacity** | **0.26** | **1.70** | **1.70** |
| Required Storage, MG | | | |
| Operational | 0.03 | 0.03 | 0.03 |
| Equalizing | 0.20 | 0.24 | 0.30 |
| Emergency | 1.04 | 0.00 | 0.00 |
| Fire flow | 0.56 | 0.56 | 0.56 |
| **Total Required Storage** | **1.83** | **0.84** | **0.89** |
| Existing Storage, MG | | | |
| Reservoir 5 | 0.97 | 0.97 | 0.97 |
| **New Lakeland Reservoir** | | **0.97** | **0.97** |
| **Total Available Storage** | **0.97** | **1.93** | **1.93** |
| **Excess (Deficit) Existing Storage, MG** | **(0.86)** | **1.10** | **1.04** |

## 5.7 WATER TREATMENT

Water treatment in the City of Auburn includes chlorination, corrosion control and metals removal. All wells, except Well 5, are equipped with some level of treatment, as discussed in Section 5.4 and described further as follows.

### 5.7.1 Existing System

#### 5.7.1.1 Coal Creek Springs Chlorination

One of the primary facilities for chlorination is the Coal Creek Springs chlorination station. 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 in the Maintenance and Operation Facility. A chlorine residual analyzer is provided, providing high and low alarms to the Operations Center.

#### 5.7.1.2 West Hill Springs Chlorination

West Hill Springs is another source of continuous chlorination. At West Hill Springs, water continuously flows from the collection boxes to the on-site chlorination station, housed in a concrete block building. Chlorination at West Hill Springs, along with chlorination of Well 7, provides the majority of the chlorine residual in the north end of the Valley Service Area and in the Lea Hill Service Area.

Control is manual based on the average flow from the springs and the desired chlorine dosage. 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 Well 1

Supply from Well 1 is not normally chlorinated. However, piping and equipment are available to allow portable chlorination equipment to be installed if required.

#### 5.7.1.4 Wells 2 & 6

Pumped water from Wells 2 & 6 is treated and chlorinated at the Fulmer Field Corrosion Control Treatment Facility.

#### 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 is equipped with gaseous chlorination facilities that are operated whenever the well is in service. Chlorination injection is controlled with the well pump and is either on or off.

#### 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.

#### 5.7.1.9 Well 5B

Pumped water from Well 5B proceeds through four Altec media filters to remove iron and manganese prior to disinfection.

#### 5.7.1.10 <u>Well 7</u>

Pumped water from Well 7 is either treated at the Fulmer Field Facility or is chlorinated and directly pumped to the system. The chlorination system uses hypochlorite solution as a chlorine source. Due to high levels of Manganese, this well is used seasonally during high system demands.

#### 5.7.1.11 <u>Fulmer Field Corrosion Control Treatment Facility</u>

The Fulmer Field Corrosion Control Treatment Facility was constructed in 2004 and is located adjacent to the Fulmer Field City Park and Wells 2 and 6. The Fulmer Field Treatment 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 towers. The pH of the water from the wells is then adjusted by air-stripping in three 33,000 gallon air-stripping towers. Three 10,000 CFM blowers provide air. As the carbon dioxide is stripped from the water, the pH increases, which reduces the solubility of copper, allowing the water to be in compliance with the Lead and Copper rule. The treated water is then stored in the clearwell and re-boosted through four 3,200-gpm booster pumps back 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.

Also included is 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.

#### 5.7.1.12 <u>Howard Road Corrosion Control Treatment Facility</u>

The Howard Road Corrosion Control Treatment Facility was constructed in 2004 and is located near the existing Coal Creek Springs Pump Station. This Treatment Facility is housed in a masonry building and treats the water from Coal Creek Springs and Well 4. Chlorine is introduced into the system prior to the towers. The pH of the water from the wells is then adjusted by air-stripping in two 33,000 gallon air-stripping towers. Two 9,300 CFM blowers provide air. As the carbon dioxide is stripped from the water, the pH increases, which reduces the solubility of copper, allowing the water to be in compliance with the Lead and Copper rule. The treated water is then stored in the clearwell and re-boosted through three 2,100 gpm booster pumps into Reservoir 1. Also included is a 600 kW electric generator with a diesel fule capacity of 1,000 gallons.

#### 5.7.1.13 <u>Intertie Pump Station</u>

The Intertie Pump Station is equipped with a hypochlorite chlorination station.

### 5.7.2 Water Treatment Analysis

#### 5.7.2.1 <u>General Water Quality Improvements</u>

Recommended water quality improvements include converting the current chlorination systems to hypochlorite, at the West Hill Springs, Coal Creek Springs, and Well 4. Hypochlorite systems are a safer way to operate disinfection facilities.

#### 5.7.2.2 Well 7 Treatment

Manganese treatment is recommended for Well 7 to allow this well to be used year-round and to ensure better water quality.

#### 5.7.2.3 Wells 3A/3B Treatment

Manganese treatment is recommended to allow Wells 3A and 3B to be used.

## 5.8 DISTRIBUTION SYSTEM

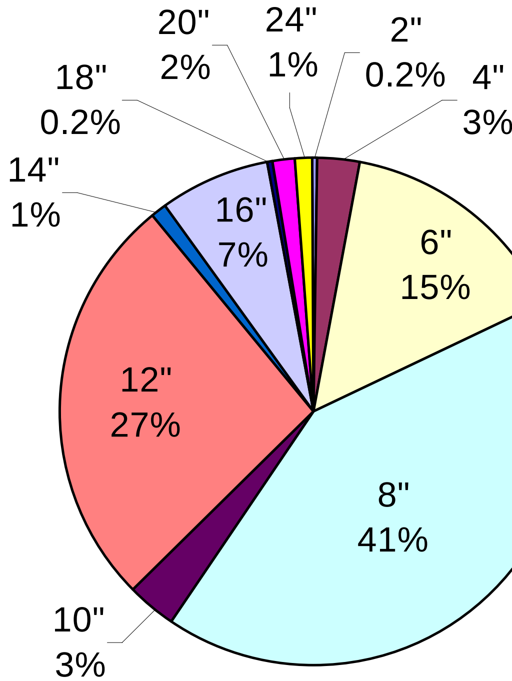
### 5.8.1 Existing System

The City 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 information used for reviewing and analyzing the distribution system is based on a combination of limited 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 watermain size, type or 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. Table 5.16 and Figure 5.9 provide a summary of the pipe sizes and materials within the Auburn system.

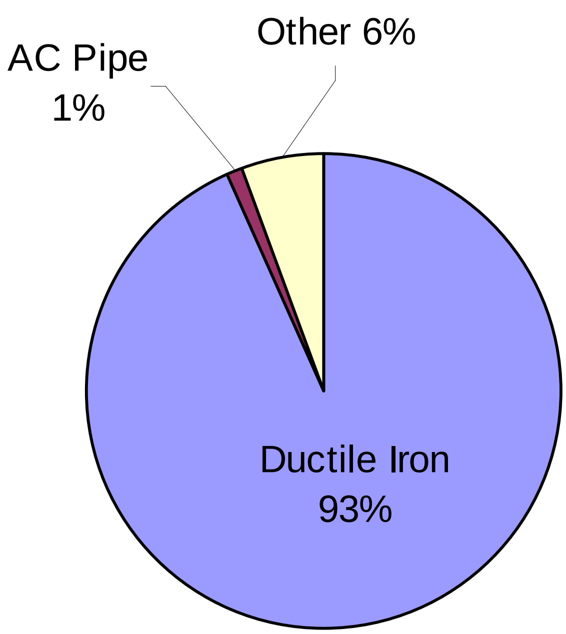
Some areas within the City system have distribution piping made of old cast iron with lead joint connections. The majority of this pipe is 4 to 6-inch diameter and typically has a shallow bury (2 to 3-feet of cover).

**Table 5.16 Summary of System Pipes**
**Comprehensive Water Plan**
**City of Auburn**

| Service Area | Material | Size | | | Total |
|---|---|---|---|---|---|
| | | < 6" | 8" - 12" | > 14" | |
| **Valley** | | | | | |
| | Ductile Iron | 126,362 | 566,117 | 141,044 | **800,654** |
| | AC | 6,297 | 3,784 | - | **10,081** |
| | Other | 49,749 | 10,403 | - | **60,152** |
| | **Total** | **182,408** | **580,304** | **141,044** | **870,887** |
| **Lea Hill** | | | | | |
| | Ductile Iron | 10,605 | 166,198 | 19,547 | **196,350** |
| | AC | 3,710 | 1,355 | - | **5,065** |
| | Other | 9,597 | 2,279 | - | **11,876** |
| | **Total** | **23,912** | **169,832** | **19,547** | **213,291** |
| **Academy** | | | | | |
| | Ductile Iron | 27,279 | 86,380 | 11,576 | **125,235** |
| | AC | - | - | - | **-** |
| | Other | 792 | - | - | **792** |
| | **Total** | **28,071** | **86,380** | **11,576** | **126,027** |
| **Lakeland Hills** | | | | | |
| | Ductile Iron | 1,368 | 84,389 | 1,746 | **87,503** |
| | AC | - | - | - | **-** |
| | Other | - | - | - | **-** |
| | **Total** | **1,368** | **84,389** | **1,746** | **87,503** |




**Distribution Pipe Size**




**Distribution Pipe Materials**

**DISTRIBUTION SYSTEM BREAKDOWN**

FIGURE 5.9

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

carollo

### 5.8.2 Distribution System Analysis

Several pipes were identified as deficient due to age, material, or size. Some areas of the distribution system have duplicate pipes. Asbestos-cement, old cast iron pipes, and pipes under 6-inches that serve fire hydrants are all recommended for replacement. Table 5.17 and Figure 5.10 present the locations of these pipes. Given the level of accuracy of the mapping data, any proposed future water system improvements should confirm existing conditions by reviewing construction record drawings and performing any necessary field verification of facilities to ensure the information is accurate.

Additional pipes identified in the Hydraulic Analysis as requiring an increase in size are presented in Chapter 9.

#### 5.8.2.1 Asbestos-Cement Pipe

49th Street SE, 85th Avenue S, Auburn Way N

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 had dissolved years ago. The following deficiencies were identified for these pipes:

- Other than a connection at 49th Street NE and B Street NW and a recent connection at the south end of 85th Avenue South, these mains were not looped into the existing City grid. These aged and undersized watermains are difficult to locate and should be replaced in the near future.
- Those portions of the AC watermain that parallel the existing 12-inch watermains on 49th Street NE and Auburn Way North are inadequate for fire protection and could easily be abandoned by transferring any water services tapped on the 6-inch AC watermain to the 12-inch DI watermains. Abandonment of the AC watermains in this area is recommended.
- Those portions of AC main along 49th Street NE and 85th Avenue South where it is the only method of service should be replaced with DI pipe sized to meet the fire flow requirement of the area. Replacement of the AC watermains in this area with DI pipe is recommended.
- The remaining portion of AC pipe on D Street NE and 49th Street NE east of D Street NE is likely to be abandoned and replaced with new water mains for new development once the drive-in theatre is removed.

**Table 5.17 Pipe Improvements Projects - AC, Aged & Undersized Pipes**
**Comprehensive Water Plan**
**City of Auburn**

| Project Location | Pipe Length | Existing Pipe Diameter (in) | Proposed Pipe Diameter (in) |
|---|---|---|---|
| **ASBESTOS-CEMENT PIPE** | | | |
| Along 108th Ave SE, from 293rd St to 295th St | 223 | 8 | 10 |
| Along 298th St. SE, from 112th Ave SE to 111th Ave SE | 271 | 6 | 8 |
| Along 298th St. SE, from 110th Ave SE to 109th Ave SE | 359 | 6 | 8 |
| Along 11th St SE, from H St SE to I St SE | 413 | 4 | 8 |
| Along 12th St NE, from Auburn Ave NE to I St NE | 802 | 6 | 8 |
| Along 298th St. SE, from 110th Ave SE to 111th Ave SE | 470 | 4 | 8 |
| Along 85th Ave S, from Auburn Way N to 284th St | 1388 | 6 | 8 |
| Along 49th St N, from D St. NE to B St. NE | 1658 | 8 | 10 |
| NE from 15th St SW near C St. SW | 2127 | 8 | 10 |
| Along 108th Ave SE, from 298th St. SE to 299th St. SE | 820 | 6 | 8 |
| Along 112th Ave SE, from 290th St. SE to 294th St. SE | 1132 | 8 | 10 |
| Along Auburn Way N, from 49th St. NE to 43rd St. NE | 2180 | 6 | 8 |
| **AGED & UNDERSIZED PIPES** | | | |
| Along 319th St SE, from 109th Ave SE to 119' west | 119 | 4 | 8 |
| Extending from V St SE and 5th St SE to 132' south | 150 | 8 | 10 |
| Along 2nd St SE, from N St SE to O St SE | 144 | 4 | 8 |
| Along 118th Ave SE, from 316th St SE to 318th St SE | 570 | 6 | 8 |
| Along 5th St NE from N Division St to A St NE | 199 | 8 | 10 |
| Along1st St NE, from U St NE to V St NE | 199 | 4 | 8 |
| Along 2nd St SE, from Pike St SE to O St SE | 260 | 4 | 8 |
| Along 2nd St NE, from C St NE to D St NE | 233 | 6 | 8 |
| Along 29th St SE, from T St SE to U St SE | 243 | 8 | 10 |
| Along 3rd St NE, from C St NE to D St NE | 261 | 6 | 8 |
| Along R St SE, from E Main St to 3rd St SE | 485 | 8 | 10 |
| Along 9th St SE from B St SE to 270' West | 270 | 4 | 8 |
| Along U St NE from 19th Dr NE to 2oth St NE | 286 | 6 | 8 |

**Table 5.17 Pipe Improvements Projects - AC, Aged & Undersized Pipes**
**Comprehensive Water Plan**
**City of Auburn**

| Project Location | Pipe Length | Existing Pipe Diameter (in) | Proposed Pipe Diameter (in) |
|---|---|---|---|
| Along 3rd St NE, from K St NE to M St NE | 575 | 4 | 8 |
| Along S St SE, from 28th St Se to 27th St SE | 303 | 6 | 8 |
| Parallel to A St SE, from 8th St SE to 13th St SE | 1442 | 6 | 8 |
| Perpendicular to A St SE, between 7th and 8th St SE | 348 | 6 | 8 |
| Along Division St, from Main St to 2nd St SE | 602 | 4 | 8 |
| Along 11th St SE, from B St SE to 350' west | 351 | 6 | 8 |
| Perpendicular to I St NE, between 14th St NE and 15th St NE | 378 | 2 | 8 |
| Along A St NW, from Main St to 3rd St NE | 1014 | 6 | 8 |
| Along N Division St, from 5th St NE to 7th St NE | 386 | 6 | 8 |
| Along 7th St NE from A St NE to B St NE | 390 | 6 | 8 |
| Along N St SE, from 3rd St SE to 2nd St SE | 409 | 4 | 8 |
| Along 10th St SE from B St SE to A St SE | 461 | 4 | 8 |
| Along 316th St SE, from 118th St SE to 119th St SE | 412 | 6 | 8 |
| Along private drive between 318th St SE and 319th St SE | 447 | 4 | 8 |
| Along O St SE, from 2nd St SE to 3rd St SE | 471 | 6 | 8 |
| Along R St NE, from 19th Dr NE to 20th St NE | 497 | 6 | 8 |
| Along U St NE, from E Main St to 2nd St NE | 479 | 6 | 8 |
| Loop around 17th Drive SE | 792 | 4 | 8 |
| Along 28th St SE, from R St SE to M St Se | 1260 | 6 | 8 |
| Along N St NE, from 6th St EN to 511' north | 511 | 4 | 8 |
| Along Riverview Dr NE, from E Main St to 3rd St NE | 871 | 6 | 8 |
| Along 28th Pl SE, from 26th St SE to 28th St SE | 515 | 6 | 8 |
| Along N St SE, from 26th St SE to 28th St SE | 519 | 6 | 8 |
| Along Pike St SE from 37th St SE to 38th St SE | 519 | 6 | 8 |
| Along 26th St SE, from M St SE to O St SE | 785 | 6 | 8 |
| Along 109th Ave SE, from 318th St SE to 320th St SE | 540 | 6 | 8 |
| Along M St from 25St SE to 29th ST SE | 1309 | 6 | 8 |

**Table 5.17 Pipe Improvements Projects - AC, Aged & Undersized Pipes**
**Comprehensive Water Plan**
**City of Auburn**

| Project Location | Pipe Length | Existing Pipe Diameter (in) | Proposed Pipe Diameter (in) |
|---|---|---|---|
| Along L St SE, from 3rd St SE to 4th St SE | 551 | 6 | 8 |
| Along 14th St SE, from B St SE to C St SE | 554 | 4 | 8 |
| Along O St SE, from 26th St SE to 28th St SE | 563 | 8 | 10 |
| Along O St NE, from E Main St to 2nd St NE | 582 | 8 | 10 |
| Perpendicular to Auburn Way, parallel to 10th St NE | 599 | 2 | 8 |
| Along E St SE, from E Main St to 3rd St NE | 864 | 8 | 10 |
| Along T St SE, from E Main St to 4th St SE | 1204 | 6 | 8 |
| Along V St SE, from 2nd St SE to 4th St SE | 646 | 6 | 8 |
| Along J St SE, from E Main St to 4th St SE | 1209 | 8 | 10 |
| Along N St NE, from E Main St to 2nd St NE | 631 | 8 | 10 |
| Along 25th St SE, from D St SE to F St SE | 632 | 6 | 8 |
| Along 22nd St SE from M St SE to R St SE | 1276 | 6 | 8 |
| Along 31st St SE, from M St SE to R ST SE | 1269 | 6 | 8 |
| Along 4th St SE, from R St SE to V St SE | 1268 | 6 | 8 |
| Along 24th St SE, from M St SE to R St SE | 1264 | 6 | 8 |
| Along 315th St, from 108th Ave SE to 110th Ave SE | 663 | 6 | 8 |
| Along 3rd St SE, from M St SE to R St SE | 1280 | 6 | 8 |
| Along 34th St SE, along Pike St SE, and along 35th St SE | 674 | 4 | 8 |
| Along 24th ST NE, from I St NE to M St NE | 1386 | 6 | 8 |
| Along 23rd St SE, from M St SE to R St SE | 1262 | 6 | 8 |
| Along Pike St NE, from 19th Dr NE to 22nd St NE | 1266 | 6 | 8 |
| Along E Main St, from R St to Riverview Dr | 1496 | 8 | 10 |
| Along Pike St NE, from E Main St to 4th St NE | 1295 | 6 | 8 |
| Along 317th St SE, from 118th St SE to 119th St SE, and around 317th Pl SE | 707 | 6 | 8 |
| Along 21st St NE, from Pike St NE to Riverview Dr NE | 1400 | 6 | 8 |
| Along 25th St SE, from K St SE to R St SE | 1894 | 6 | 8 |
| Along 323rd Pl SE, from 116th Ave SE to 1,319' east | 1319 | 6 | 8 |

**Table 5.17 Pipe Improvements Projects - AC, Aged & Undersized Pipes**
**Comprehensive Water Plan**
**City of Auburn**

| Project Location | Pipe Length | Existing Pipe Diameter (in) | Proposed Pipe Diameter (in) |
|---|---|---|---|
| Along R Pl SE, from R St SE to 29th St SE | 735 | 6 | 8 |
| Along Pike St SE, from E Main St to 3rd St SE | 750 | 8 | 10 |
| Along 19th Dr NE, from Pike St NE to Riverview Dr NE | 1478 | 6 | 8 |
| Along 318th St SE, from 118th St SE to 121st St SE | 798 | 6 | 8 |
| Along 10th St NE, from Auburn Ave NE to I St NE | 842 | 6 | 8 |
| Along 20th St NE, from U St NE to R St NE | 981 | 6 | 8 |
| Along E St NE, from 23rd St NE to 26th St NE | 866 | 6 | 8 |
| Along M St SE, from 21st St SE to 24th St Se | 965 | 6 | 8 |
| Along K St NE, from E Main St to 4th St NE | 1155 | 6 | 8 |
| Along 17th St NE from I St NE to M St NE | 1185 | 6 | 8 |
| Parallel to Auburn Black Diamond Rd SE, from R St SE to 1302' east | 1302 | 2 | 8 |
| Along 112th Pl SE from 116th Pl SE to 320th St SE | 2280 | 8 | 10 |
| Along H St NE, from 8th St NE to 4th St NE | 1423 | 6 | 8 |
| Along 118th St SE, along 319th St SE, and along 120th St SE to 318th St SE | 1466 | 6 | 8 |
| Along 108th Ave SE, from 320th St SE to 312th St SE | 2370 | 6 | 8 |
| Along Auburn Way N, from 28th St NE to 40th St NE | 3839 | 8 | 10 |
| Near Auburn Way S on R St | 1403 | 8 | 8 |
| Near Auburn Way S on M St | 887 | 8 | 8 |
| Near Les Gove park | 6,127 | 2 - 6 | 2 - 6 |
| **WATERMAIN SIZE RESTRICTION PIPES** | | | |
| Along K St from Fulmer Clearwell north to 8th St and south to 4th St | 700 | 12 | 12 |
| Along K from Fulmer Clearwell north to 8th and south to 4th | 710 | 12 | 20 |
| From Lakeland PS to Evergreen way | 334 | 8 | 12 |
| From 8th & R St to Reservoir 2 | 755 | 20 | 18 |

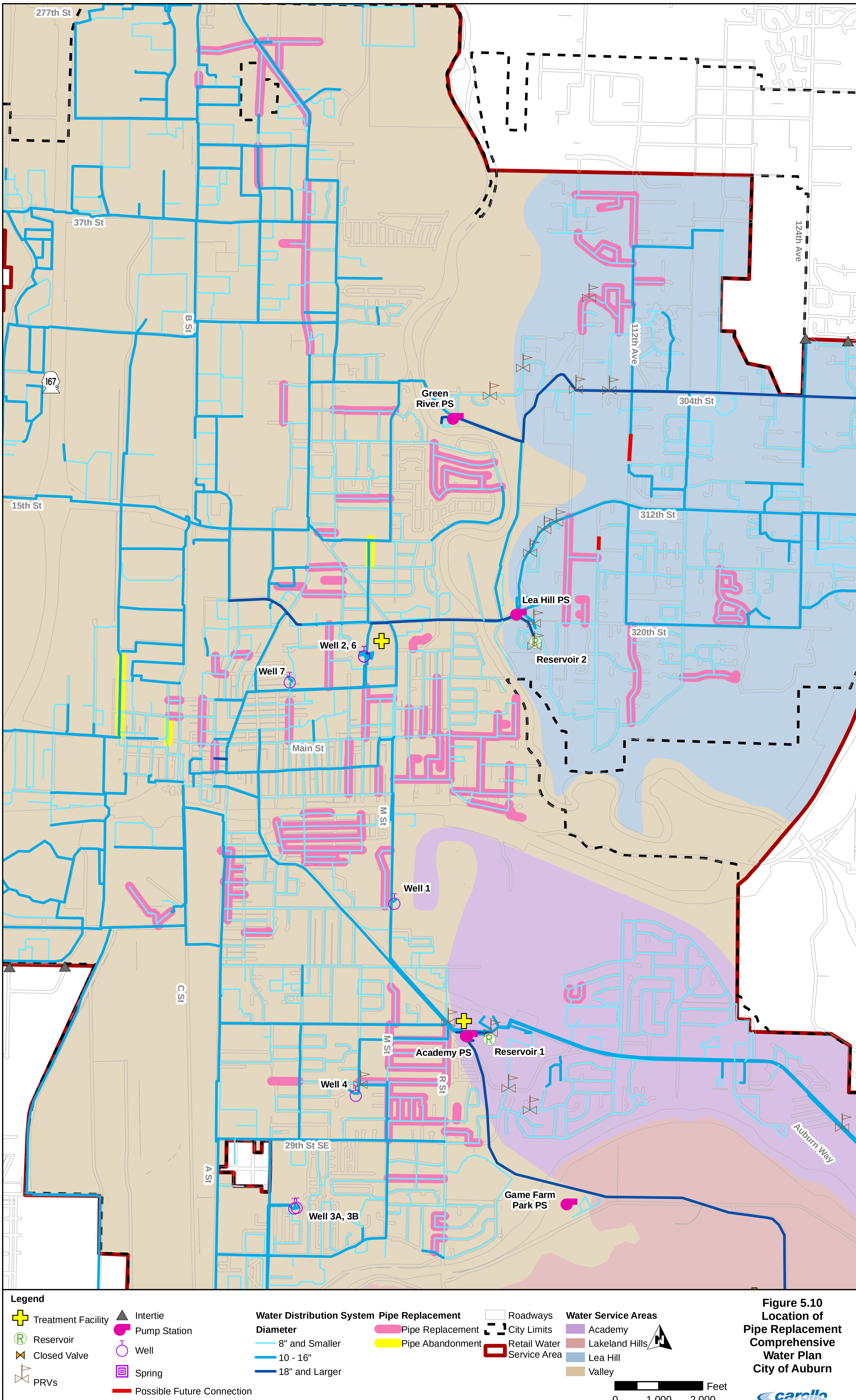



**Figure 5.10**
**Location of Pipe Replacement**
**Comprehensive Water Plan**
**City of Auburn**

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, undersize, and very fragile. It is recommended that the City replace the identified pipes and the AC watermain supplying the PRV station for the Cobble Creek Development located on 108th Avenue SE and approximately SE 300th Street.

15th Street SW Maintenance Shop

An eight-inch AC watermain extends north from 15th Street SW through an easement at the bus barn and City maintenance shop and connects to a metered waterline at the Ice House with a normally closed valve. The following deficiencies and recommendations were identified for these pipes:

- Replace the 8-inch AC watermain with DI watermain and connect to the 8-inch DI dead-end main at the City maintenance shop. This would improve water quality and fire flow for the area. That portion of AC main west of the City maintenance shop is used as a bypass when testing the meter on 15th Street SW.
- Upgrade the Ice House meter and vault on 15th Street SW with a bypass to allow this AC main abandonment.

#### 5.8.2.2 Aged and Undersized Watermains

The majority of the old cast iron piping in the distribution system is 4 to 6-inch diameter with solid barrel 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 solid barrel 4-1/4-inch fire hydrants. Table 5.17 provides a summary of the locations of these pipes. Additional projects may be identified once mapping verification has been accomplished. To reduce maintenance, it is also recommended that the City replace section of aged cast iron (CI) watermain (located on S Street SE north of 4th Street SE) that has broken twice in two years.

Some areas in the City that provide domestic service to commercial buildings are still served by 2-inch galvanized pipe. Portions of this pipe have been abandoned over time as new development has occurred.

The City will be replacing several aging waterlines in the area northwest of Les Gove Park. Replacing the existing lines will improve fire flow and reduce maintenance needs and water losses. The City is also planning on replacing a water line in SE R Street concurrent with a sanitary sewer replacement project planned near Auburn Way South.

#### 5.8.2.3 Possible Watermain Size Restrictions

Large diameter watermains have been installed in a few major arterials to provide fire flow to commercial areas that are limited by smaller pipes. The record drawings in these areas should be researched and field verified to determine if watermain replacement is needed. Four locations for these pipes were identified, and are listed on Table 5.17.

#### 5.8.2.4 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.

### 5.8.3 Priority of Watermain Replacement

The recommended replacement of watermains is as follows:

1. AC watermains.
2. Aged and undersized watermains.
3. Undersized watermains.
4. Abandonment of duplicate watermains.

### 5.8.4 Existing Operational Conditions

In recent years the Water Division has been experiencing an increasing number of black or brown water calls from its customers in the northeastern part of the water system. In order to temporarily control these black water situations initiated by water taken from fire hydrants, water permit withdrawal locations were placed at strategic locations throughout the City until future main cleaning was accomplished.

Significant progress has been made in long-range distribution system maintenance projects. Once the application for irrigation deduct meters was eliminated, all existing irrigation deduct meters had to be retrofitted to meet the current policy (Deduct meters are sill allowed in manufacturing applications).

All of the large meters (3 inch and larger) are tested annually. However, a good number of these meters required repairs once or twice a year. Assuming that the vaults were in the same condition, the water maintenance crews initiated the replacement of the higher maintenance requiring meters and vaults. A more detailed description of these activities is outlined below.

#### 5.8.4.1 Manganese Buildup

High concentrations of manganese coat the pipe interiors in the central and northern areas of the distribution system. Whenever there is an increase in velocity or disruption in service, a wide area of customers experience black water conditions for several hours while the watermains are being flushed. The area most affected is east of Auburn Way.

Secondary to the black water conditions is the high number of meter stops or curb stops that become inoperable. The manganese appears to have an impact on brass fittings causing them to seize and break when operated (the average replacement frequency of meter stops has been approximately three to four per month). Some of the larger fittings can be operated carefully by applying vibration and tension.

It is recommended that the meter stop is only operated by the Water Division Staff and not by customers. Customer notification and education on valve operation requirements can be advertised through customer billing and/or the newsletter.

#### 5.8.4.2 Deduct Meters/Retrofits

The City changed its policy for deduct meters in 2005/2006 making all new applications for irrigation a separate water service. Following that change, the Water Division staff was directed to retrofit all existing irrigation deduct meter installations to the new standard. There were approximately 160 services ranging in size from 3/4 to 4 inch to be retrofitted. Over half of them have been completed.

#### 5.8.4.3 Large Meters and Vault Replacements/Safety Improvements

Several of the existing large meters need upgrading. The degree of upgrade is dependent upon the age of the meter and the vault safety conditions for ladder access and confined space entry. Some meters are very old and are plumbed without a bypass line or flexibility for future replacement. The necessary upgrades range from meter replacements, access ladders, drains, etc. to entire vault replacement. The Water Division has accomplished a portion of this work from the large meter testing list and needs to continue progress. A prioritization of the list by category is recommended to complete the upgrades. This will require City staff to identify priorities and coordinate service outages with the individual property owners / tenants.

#### 5.8.4.4 Main Cleaning

In order to reduce or eliminate the customer complaints of dirty water, it is recommended that a low velocity cleaning method be used to remove the manganese from inside the watermains. Various densities of sponges or pigs are available to scour the pipe interior at a continuous low flow rate.

Unilateral flushing as routine maintenance to maintain water quality is also recommended. Performing unilateral flushing as a cleaning method could potentially cause a widespread dirty water situation that may be hard to control.

The Water Division previously budgeted for personnel and equipment to develop this program in 2008 anticipating that mapping updates would be completed. Development and implementation of this program is highly recommended.

## 5.9 CONTROL SYSTEM

### 5.9.1 Existing 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.

Well 7, the Green River Pump Station, and the Intertie Pump Station all include on-site programmable logic controllers providing the logic, control and monitoring of equipment at the individual facilities. Although some operational signals can be made from the Water Control Center, normal control is at the individual facility in the programmable controller.

### 5.9.2 Control System Analysis

The existing SCADA system is in need of upgrading. The existing system has numerous obsolete components and does not allow for control of the water utility stations. The City conducted a study to evaluate existing conditions and define component and control standards for system improvements.

## 5.10 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 next six years have been outlined in the Sections above and are summarized in Table 5.18.

**Table 5.18 Short-Term Recommended Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Recommended Year |
|---|---|
| **Service Areas** | |
| Lea Hill Service Area Rezone included in the Lea Hill Booster Pump Station Expansion Project. | |
| **PRVs** | |
| No Short-Term Recommendations | |
| **Supply Facilities** | |
| Well 1 Rehabilitation | 2009-2010 |
| Well 5 Upgrade | 2009-2010 |
| Well 4 and Intertie Pump Station Improvements | 2009-2010 |
| Water Supply Purchase | 2010 |
| Intertie Infrastructure | 2011 |
| Well 7 Back-up Power | 2013-2014 |
| Well Inspection and Redevelopment Program | Annually |
| **Pump Stations** | |
| Terrace View Pump Station (New) | 2009 |
| Lakeland Hills Booster Pump Station Improvements | 2009-2010 |
| Green River Pump Station Back-Up Power | 2010 |
| Academy Booster Pump Station (New) | 2010-2012 |
| Academy Pump Station #1 Improvements | 2013-2014 |
| Lea Hill Booster Pump Station Expansion and Boosted Zone Rezone | 2013 - 2014 |
| **Storage** | |
| Lakeland Hills Reservoir (New) | 2010-2011 |
| Lakeland Hills Reservoir Painting | 2012 |
| Annual Reservoir R&R Program | Annually |
| **Distribution System** | |
| Annual Distribution Improvement Program | Annually |
| **Treatment** | |
| No Short-Term Recommendations | |
| **Operations** | |
| Facilities Evaluation Study | 2009 |
| SCADA Upgrades | 2009 |

# WATER RESOURCES

## 6.1 INTRODUCTION

The City of Auburn (City) has an expanding water system. As the City's customers within the retail water service area grows, new groundwater sources need to be developed to meet system water demands. The City is evaluating multiple avenues to secure new water supplies to meet projected increases in demand. The City currently receives its water from two springs and ten wells. 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).

## 6.2 SUPPLY SOURCES

The City relies upon its springs and groundwater wells to meet all of its current supply needs. 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). Additionally the City operates two satellite facilities: the Braunwood Well located in the Hidden Valley Acres development, and the Algona Well 1 located within the City of Algona (Algona). The sources are described in detail in Chapter 5 and locations of the City water supply facilities are shown on Figure 6.1. Copies of the water right certificates for each well are included in Appendix I. Each 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 perforated, concrete pipe placed parallel to the base of the upland. The collection system and the transmission line were reconstructed in 1964 and 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) (9.70 million gallons per day (mgd)) and an annual quantity withdrawal (Qa) of 9,410 ac-ft/year (8.4 mgd). However, the City has indicated that the capacity of Coal Creek springs has reduced in the past few years and is more commonly producing 2,000 gallons per minute (gpm) (2.9 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. 2174049364) filed in 1973 for a Qi and Qa of 625 gpm (0.9 mgd) and 1,010 ac-ft/year (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 capacity of the Spring is actually 600 gpm.

### 6.2.2 Valley Well Field

As noted above, the City operates seven groundwater wells within the City's Valley Well Field. Wells 1, 2, 3A, and 4 are authorized as primary, certificated water rights. Wells 3B, 6, and 7 are authorized as supplemental 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 ac-ft/year (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 ac-ft/year (1.0 mgd). The City has indicated that the capacity of Well 1 was actually 1,400 gpm when the well was in operation. Due to declining water production the Well has not been used since 1998.

#### 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) and a Qa of 3,840 ac-ft/year (3.43 mgd). The City has noted a drop in production from Well 2 in the recent years and has indicated that the current capacity of Well 2 is actually 1,600 gpm.

#### 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.

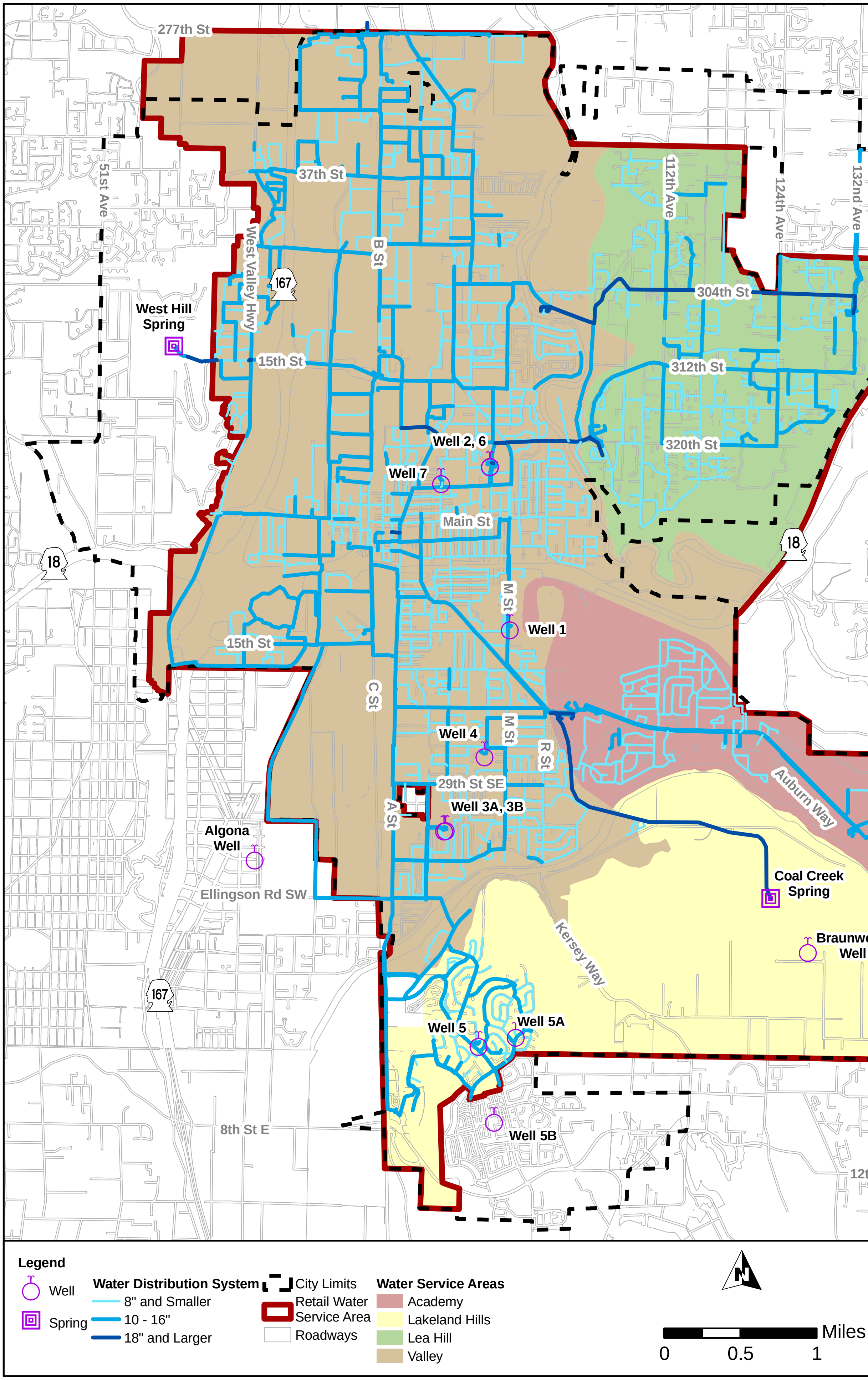



Figure 6.1
Water Facilities
Comprehensive
Water Plan
City of Auburn

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 a supplemental 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 <u>Well 4</u>

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 ac-ft/year (3.21 mgd).

Well 4 has a capacity of 2,800 gpm, however the City has noted a drop in capacity of the well in recent years and now currently pumps 2,600 gpm from the well.

#### 6.2.2.5 <u>Well 6</u>

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 a supplemental 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 and no additional Qa.

Well 6 has a pumping capacity of 3,500 gpm. However, the City has indicated that the capacity of Well 6 is actually 1,800 gpm due to the proximity of Well 2.

#### 6.2.2.6 <u>Well 7</u>

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 a supplemental 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 and no additional Qa.

Well 7 has a capacity of 2,000 gpm. However, due to high manganese concentrations, the well is only operated by the City in the summer when additional capacity is needed.

### 6.2.3 Upland Well Field

The Upland Well Field consists of three existing wells (5, 5A and 5B) and one proposed well (5C). In 2004, Ecology issued a combined water right (Certificate No. G1-23633P) for the Upland Well Field, limiting the combined Qi to 1,000 gpm (1.44 mgd) and the combined Qa to 720 ac-ft/year (0.64 mgd).

#### 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 and has indicated that the current capacity of Well 5 is actually 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 City has noted a drop in capacity of the aquifer and has indicated that the capacity of Well 5A is actually 180 gpm.

#### 6.2.3.3 Well 5B

Well 5B is located on off of 63rd Street SE and was drilled to a depth of 781 feet in November 1991, and is now 746 feet deep after regarding 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 noted that the aquifer was not recovering. Well 5B has not been operated since 2006.

### 6.2.4 Satellite Systems

#### 6.2.4.1 Braunwood

The Braunwood Well is located off 47$^{th}$ Street SE. It 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 Braunwood Well Certificate No. G1-25173C was issued in 1988 to the developer of a small development in the Auburn 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.

#### 6.2.4.2 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.

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 ac-ft/year (0.16 mgd).

## 6.3 WATER RIGHTS

As described in the previous section, the City currently holds seven certificated groundwater rights, three supplemental groundwater rights, one certificated surface (spring) water right, and one claim (spring). 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.

The City's largest single source of supply is its Coal Creek Springs source, which is certificated to provide Qi of 9.70 mgd and a Qa of 8.40 mgd. Coal Creek Springs is located near the Muckleshoot Reservation and the White River and provides water to the Valley Service Area. Also providing water to the Valley service area are the West Hill Springs and the Algona Well.

In addition, the City holds groundwater rights for three wells (Wells 5, 5A and 5B) that are located within the Lakeland Hills Service Area. On November 13, 1995, the City submitted an application to Ecology (application number G1-27679) for the purpose of increasing the permitted rate of Qi for Well 5A by 83 gpm to a total Qi of 250 gpm. The City submitted the application of Qi increase in order to more fully meet its reliability criteria in the Lakeland Hills portion of the service area. In the course of submitting the application, the City made it clear that Well 5A, which operates as supplemental backup to Well 5, will operate only when Well 5 is not in operation or for purposes of periodic exercise to maintain readiness. If both wells are turned on simultaneously, the pumping of both sources would be throttled so as not to exceed the currently permitted combined instantaneous rates for both Wells 5 and 5A. Additionally, on August 1, 1997, the City filed a supplemental right application (application number G1-27829) with Ecology for the purpose of adding an additional point of withdrawal for Well 5B to the existing primary groundwater Well 5 water right. As part of this application, the City was not seeking additional Qi or Qa from this supplemental source and/or from its related primary source, Well 5. In 2004, Ecology issued a superseding certificate of water rights, combining the Upland Wells (current Wells 5, 5A and 5B and a future Well 5C) into one water right with a Qi of 1,000 gpm and a Qa of 720 ac-ft/year. This superseding water right resulted in a net decrease of 167 gpm of Qi for the Upland Wells.

The City currently holds certificated, primary water rights and/or claims with a total Qi of 26.7 mgd and a Qa of 23,300 ac-ft/year (20.8 mgd). This total does not include the Algona water right or the Braunwood water right, which are currently not available to serve the multi-source municipal water system. The addition of the Algona water right increases the City's Qi water right to 19,055 gpm (27.4 mgd) and their Qa water right to 23,475 ac-ft/year (21.0 mgd). A summary of the City's water rights is shown in Table 6.1.

**Table 6.1 Water Rights Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Source | Instantaneous (Qi) | | Annual (Qa) | |
|---|---|---|---|---|
| | gpm | mgd | ac-ft/year | mgd |
| West Hill Springs | 625 | 0.9 | 1,010 | 0.9 |
| Coal Creek Springs | 6,730 | 9.7 | 9,410 | 8.4 |
| Valley Well Field | | | | |
| Well 1 | 2,200 | 3.2 | 1,120 | 1.0 |
| Well 2 | 2,400 | 3.5 | 3,840 | 3.4 |
| Well 3A and 3B | 2,800 | 4.0 | 3,600 | 3.2 |
| Well 4 | 2,800 | 4.0 | 3,600 | 3.2 |
| Well 6(1) | (3,500) | (5.0) | | |
| Well 7(1) | (3,500) | (5.0) | | |
| Total | 10,200(2) | 14.7(2) | 12,160 | 10.7 |
| Upland Well Field (Wells 5, 5A, 5B) | 1,000 | 1.4 | 720 | 0.6 |
| Total | **18,555** | **26.7** | **23,300** | **20.8** |
| Total + Algona(3) | **19,055** | **27.4** | **23,475** | **21.0** |

Notes:
(1) Wells 6 and 7 are supplemental to the Valley Well Field.
(2) The total does not include the Qi water rights for the supplemental Wells 6 and 7.
(3) Based on the wholesale water agreement with the City of Algona (IA3), the City acquired the 500 gpm, 175 ac-ft/year water right for the Algona Well 1.

## 6.4 PENDING WATER RIGHT APPLICATIONS

In 1996, Covington Water District (CWD) and King County Water District #111 (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.

On April 26, 1996, the City submitted to Ecology an application (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 ac-ft/year (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 ac-ft/year (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).

## 6.5 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 of Auburn's water system interties are described in Chapter 2 and summarized below. The City of Auburn has two types of interties: wholesale and emergency interties. The City is also considering potential future interties.

### 6.5.1 Wholesale Interties

The City of Auburn maintains wholesale supply interties with three adjacent water systems:

1. Algona: The most recent agreement between the City and Algona (IA3A, from October 2002) 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. WD#111: 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 5.0 mgd to CWD and WD#111.

3. CWD: See prior note for a detailed description.

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.

### 6.5.2 Emergency Interties

The City has emergency interties with five different entities as summarized below:

1. City of Bonney Lake (Bonney Lake): The City and Bonney Lake have two emergency intertie agreements. One intertie is located on Lakeland Hills Way, south of Evergreen Way SE 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 second emergency intertie creates a two-way emergency supply intertie located in Evergreen Way SE.
2. 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.
3. City of Pacific (Pacific): The City also supplies water to Pacific on an emergency basis through a 4-inch meter located off Ellingson Road near Pacific Avenue.
4. Lakehaven Utility District (LUD): LUD and the City have a 6-inch intertie located at Abby Drive and Knickerbocker Drive 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.
5. WD#111: WD#111 and the City have two emergency 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. These interties are for emergency use only and are two-way.

### 6.5.3 Potential Interties

The City has an interest in acquiring additional interties with Tacoma Public Utilities' (TPU) Second Supply Pipeline that would enhance the reliability of water service in the City and among adjacent purveyors. The second Supply Pipeline runs through the north end of the Cities Retail Water Service Area between 30th and 37th Streets NE. The Second Supply Pipeline Project route runs from the east into the Lea Hill service area, across the Green River Valley and then up the West Hill into the LUD's service area. Three turnouts for potential future interties were constructed as part of the pipeline project: one on Lea Hill and two in the Valley Service Area. The City is currently evaluating construction of interties at two locations in the Valley.

## 6.6 SUPPLY EVALUATION

The City holds Ecology-certificated rights to annually withdraw a total of 23,475 ac-ft/year of groundwater with a maximum instantaneous withdrawal of 19,055 gpm (27.44 mgd), including the Algona water right. This assumes that all of the City's sources are producing their maximum instantaneous (Qi) flow rate. However, as discussed in Chapter 5 and summarized in Table 6.2, the City is not able to pump their total water right from all of their sources. The City's total Qi capacity is 16.46 mgd and the total Qa capacity is 15.24 mgd.

In the event that a supply facility was to fail, the City plans to enact their water shortage emergency response plan which can be found in Appendix J. Additionally, the City's source reliability criteria, as described in Chapter 3, states:

> 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.

Additionally, Chapter 3 states that the City should plan for a source to be out of service for 6 months, and thus the City needs to be able to meet the average day demand (ADD) (using sources and interties) with the largest source out of service 6 months of the year. Excluding any interties, with the largest source out of service (Well 4), the reliable Qi capacity of the System is 12.72 mgd and the reliable Qa capacity is 13.80 mgd.

The future water demand described in Chapter 4, and summarized in Table 6.3, was calculated based on an ERU planning value of 230 gallons/day and a peaking factor of 1.8. These demand values do not include conservation. The demands are divided into three groups: retail (further subdivided into each of the service areas), retail plus firm wholesale (includes the Algona and MIT agreements), and retail plus total wholesale (includes the Algona, MIT, CWD and WD#111 agreements).

The City needs to plan the demand from the MIT. An agreement dated from 1986 (included in Appendix E) 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.

**Table 6.2 Water Rights and Ability to Pump Summary**
**Comprehensive Water Plan**
**City of Auburn**

| Source | Instantaneous (Qi), mgd | | Annual (Qa), mgd | |
|---|---|---|---|---|
| | Water Right | Ability to Pump | Water Right | Ability to Pump |
| West Hill Springs | 0.90 | 0.86 | 0.90 | 0.86 |
| Coal Creek Springs | 9.69 | 2.88 | 8.40 | 2.88 |
| Valley Well Field | | | | |
| Well 1 | 3.17 | 0.00 | 1.00 | 0.00 |
| Well 2 | 3.46 | 2.30 | 3.43 | 2.30 |
| Well 3A | 4.03 | 0.00 | 3.21 | 0.00 |
| Well 3B | | 0.00 | | 0.00 |
| Well 4 | 4.03 | 3.74 | 3.21 | 3.21 |
| Well 6(1) | 5.04 | 2.59 | | 2.59 |
| Well 7(1) | 5.04 | 2.88 | | 2.88 |
| Total | 14.69(2) | 11.52 | 10.86 | 10.86 |
| Upland Well Field | | | | |
| Well 5 | | 0.94 | | 0.64 |
| Well 5A | | 0.26 | | 0.26 |
| Well 5B | | 0.00 | | 0.00 |
| Total | 1.44 | 1.22 | 0.64 | 0.64 |
| Total | **26.72** | **16.46** | **20.80** | **15.24** |
| Total + Algona(3) | **27.44** | **16.46** | **20.96** | **15.24** |
| Reliable(4) | | **12.72** | | **13.80** |

Notes:
(1) Wells 6 and 7 are supplemental to the Valley Well Field.
(2) The total does not include the Qi water rights for the supplemental Wells 6 and 7.
(3) Based on the wholesale water agreement with the City of Algona (IA3), the City acquired the 500 gpm, 175 ac-ft/year water right to the Algona Well 1.
(4) The City's reliability criteria is for the largest source (Well 4) out of service for six months.

| **Table 6.3** | **Water Demand Summary**<br>**Comprehensive Water Plan**<br>**City of Auburn** | | | | |
|---|---|---|---|---|---|
| | **2008** | **2014** | **2018** | **2028** | **Ultimate** |
| ADD, mgd | | | | | |
| Retail | 7.52 | 9.83 | 10.68 | 12.03 | 15.27 |
| Retail + Algona + MIT(1) | 10.50 | 12.87 | 13.72 | 15.07 | 18.31 |
| Total Demand(2) | 15.50 | 17.87 | 18.72 | 20.07 | 23.31 |
| MDD, mgd | | | | | |
| Retail | 13.62 | 17.79 | 19.33 | 21.78 | 27.64 |
| Retail + Algona + MIT(1) | 16.50 | 20.84 | 22.38 | 24.83 | 30.69 |
| Total Demand(2) | 21.50 | 25.84 | 27.38 | 29.83 | 35.69 |

Notes:

(1) Includes the maximum contract quantities for Algona and 2.5 mgd for MIT (ADD) and 1.9 mgd for MIT (MDD).

(2) Total demands include the retail, Algona, MIT, CWD and WD#111 demands.

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 3.0 cfs (1.9 mgd). For planning purposes, the MIT demand was added to the Algona demand and included in the "Retail + firm wholesale" group of demands.

Figures 6.2 and 6.3 compare the ADD and MDDs to the water right and the City's ability to pump. As shown in Figure 6.2, the City has sufficient average annual reliable pumping capacity to serve the retail customers, Algona, and MIT through 2019.

As shown in Figure 6.3, the City does not currently have sufficient Qi reliable pumping capacity to serve the retail customers, Algona, and MIT. By 2028, the City will need an additional 16.3 mgd of reliable pumping capacity to serve the MDD of the retail customers.

## 6.7 WATER SUPPLY STRATEGIES

The City does not currently have sufficient reliable supply to meet the ADD and MDD through the planning period. As stated in Chapter 3, the City plans to meet the current and projected demands for all firm customers. Additionally, the City plans to meet their source reliability requirement through the use of permanent and interruptible interties. The City's water supply strategy has five parts that are described in this section.

### 6.7.1 Additional Supply from Other Water Purveyors

TPU Second Supply Project represents a new regional source available to King County water utilities. Although a significant section of the Second Supply Pipeline transmission has been routed through the City, the City has not been a project participant to date. The City has envisioned an emergency intertie with TPU. Recently the City has explored the feasibility of purchasing up to 5 mgd of water from TPU.

The City currently has emergency intertie agreements with the City of Kent and the Lakehaven Utility District and is considering purchasing water from these purveyors. Finally, the City is also considering purchasing water from the Cascade Water Alliance, Lakewood Water District, and Lake Tapps.

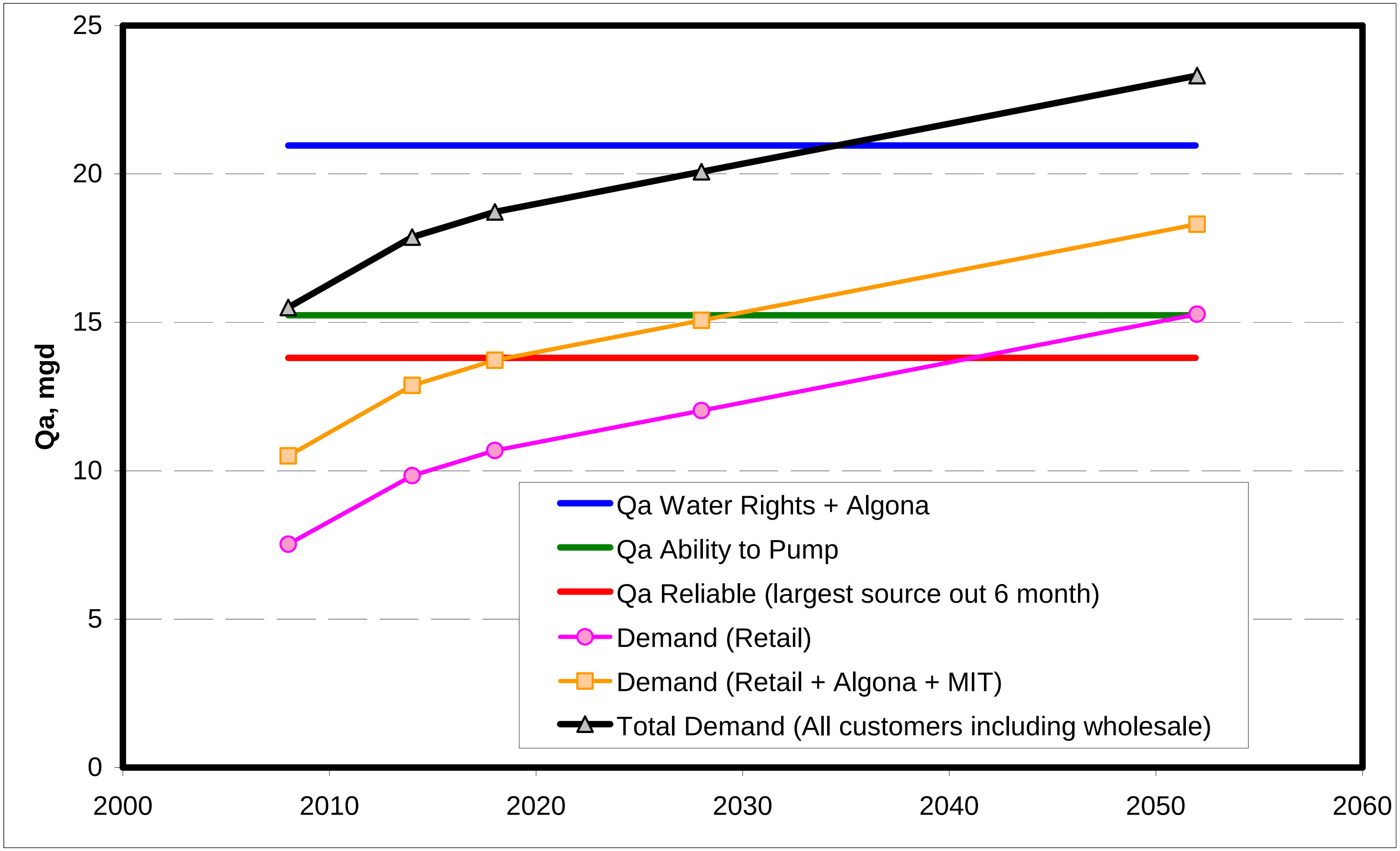
To meet the projected MDD of the year 2018, the City plans to purchase 2.7 mgd from one or more of their adjacent purveyors. In addition to buying water, the City is pursuing establishing emergency interties with neighboring water utilities to provide reliability for their largest source. By the year 2018, the City plans to have 3.74 mgd of emergency interties available to fully back-up their largest source, Well 4.

To meet the projected MDD for build-out, the City plans to purchase an additional 0.6 mgd from their adjacent purveyors. Additionally, the City may need to secure additional emergency interties to fully backup Coal Creek Springs as their largest source (discussed below).

### 6.7.2 Improve Existing System

As described below and summarized in Table 6.4, the City is not able to use their entire water right for several sources including:

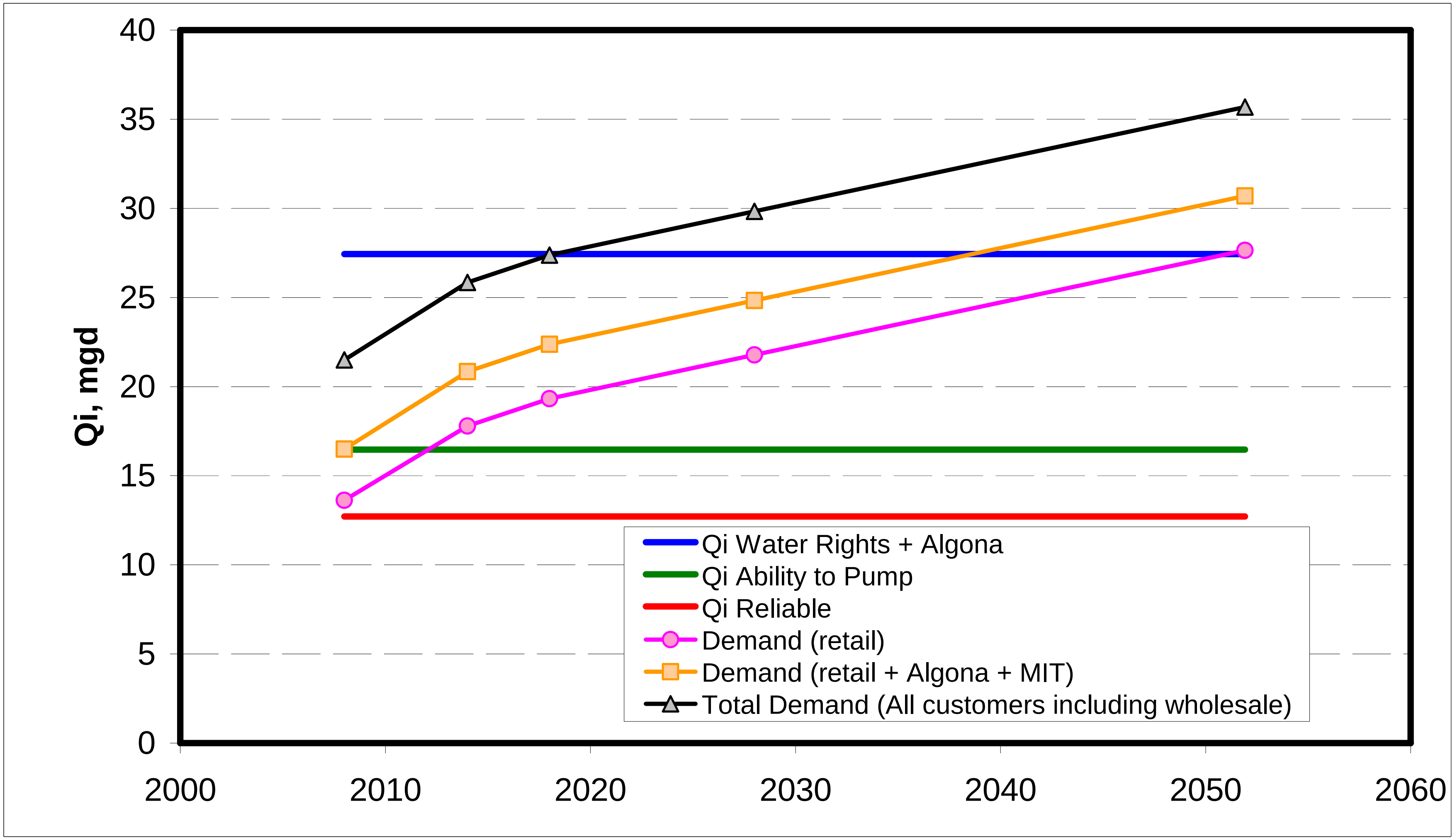
1. <u>Coal Creek Springs</u>: There is an additional 6.8 mgd of unused water right from this source.
2. <u>Valley Well Field:</u> With Wells 1, 3A and 3B not operating, and Wells 2, 6, and 7 operating below their water rights, there is currently 3.2 mgd of unused water rights.




**ADD COMPARISON**

FIGURE 6.2

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*




**MDD COMPARISON**

FIGURE 6.3

CITY OF AUBURN
*COMPREHENSIVE WATER PLAN*

3. Upland Well Field: Although the Upland Well Field has sufficient capacity to meet its water right, since Well 5B is not functional, there is no redundancy for this source.

4. Algona Well: The City owns the water right of this well and could increase their pumping ability by 0.7 mgd by bringing this well online.

The source improvement strategy to meet the demands of the year 2018 begins with a focus on Well 1. It is recommended that the City conduct a hydrologic investigation into the problems with Well 1 and re-drill the well. This improvement could add an additional 3.2 mgd of Qi pumping ability.

To meet the Ultimate demands, it is recommended that the City look into improving Coal Creek Springs, Well 5B and the Algona Well. To understand the declining water production at Coal Creek Springs, it is recommended that the City conduct a hydrologic investigation of the Springs. Potential options that this investigation may recommend is the construction of a new collector to improve production at the spring or the construction of several shallow wells to pump the spring water to the surface. Additionally, if the investigation finds that the entire water right of the Spring cannot be used, the investigation may recommend transferring the remaining unused water right to a different location. The current assumption is that the capacity of Coal Creek Springs can be increased in two phases with Phase 1 adding 3.1 mgd of capacity to the Springs and Phase 2 adding an additional 3.7 mgd to the Springs. It is also recommended that the City conduct a hydrologic investigation into the problems with Well 5B and possibly re-drill the well. The final source improvement recommendation is to conduct a hydrologic investigation into the Algona well and either install a well on the existing site or transfer the water right to a different site and re-drill the well. These improvements could add an additional 7.7 mgd of Qi pumping ability.

### 6.7.3 Secure Additional Water Rights

By the build-out year, the City will need an additional 1.7 mgd of Qi water rights to serve it's retail customers, Algona and MIT. To address these concerns, the City has an application into the Ecology for new primary water rights.

### 6.7.4 Water Reuse

Reclaimed water, in the form of both wastewater reuse and rainwater reclamation, 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. The City will plan to conduct a reclaimed water evaluation and to participate in local and regional wastewater reuse planning efforts.

### 6.7.5 Continue an Aggressive Water Conservation Program

The final element of the City's supply strategy is to continue to reduce demand through an aggressive conservation program. Already the City has realized the benefits of aggressive conservation. The previous Water Comprehensive Plan (Roth Hill, 2001) projected the Ultimate MDD at 36 mgd (for retail customers), 10 mgd higher than the current ultimate MDD. This decrease in MDD is due to a lower assumed ERU value of 230 gpd/ERU versus the previous plans' value of 262 gpd/ERU. Additionally, the current projections assume a MDD peak factor of 1.8 while the previous plan assumed a value of 1.9. Finally, the current plan assumes a lower leakage of 7.8 percent while the previous plan assumed a value of 12.4 percent. The observed drop in the ERU value, MDD peak factor, and leakage can be attributed in part to the City's aggressive conservation program. The effects of water conservation on the City's water demands, is further evaluated in Chapter 8.

### 6.7.6 Summary

The City plans to pursue all five aspects of the future supply strategy including buying water, improving existing supply sources, securing new water rights, evaluating potential reuse opportunities and continuing their aggressive water conservation program.

The short-term recommended approach to meet the MDD for the year 2018 is to rehabilitate Well 1 and purchase an additional 2.7 mgd of water from adjacent purveyors. Additionally, with these improvements Well 4 is still the largest source so the City would need to secure 3.74 mgd of emergency interties to backup this source and meet the source reliability requirement. By making these two improvements and securing interties to backup Well 4, the City will have sufficient water to meet the ADD through build-out.

The long-term recommended approach to meet the ultimate MDD includes several supply improvements. The first task is to conduct the initial phase of rehabilitation for Coal Creek Springs. It is estimated that this initial phase could yield an additional 3.1 mgd of water from this source. This improvement would secure enough water to meet the demand for the year 2028. To meet the ultimate demands, it is recommended that the City conduct the second phase of rehabilitation for Coal Creek Springs (which is assumed to increase the capacity of the Springs to its water right), improve Well 5B, improve or transfer Algona Well 1 and purchase an additional 0.6 mgd of water from the adjacent purveyors. Additionally, with both phases of improvements to Coal Creek Springs, the Springs would be the largest source, and thus the City would need to secure an additional 5.94 mgd of emergency interties to fully backup this source.

## 6.8 GROUNDWATER MANAGEMENT

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.

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 (WHPPs). 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 basic elements of a WHPP include:

- Assessment of initial groundwater susceptibility for each water supply source.
- Delineation of the wellhead protection area (WHPA) 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.

### 6.8.1 Wellhead Protection Program

Pacific Groundwater Group (PGG) initially delineated the City of Auburn wellhead protection areas in 1997, and later updated them in 2000. As part of this plan, Robinson, Noble, & Saltbush Inc. used the modeled capture zones to perform a hazard assessment within the wellhead protection area. A detailed Well Head Protection Report is included in Appendix K.

### 6.8.2 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 4.5-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, 352 sites or categories of land-use activities were identified as known or potential hazards to the City's wells. These were prioritized and ranked such that the WHP implementation process can address each site or land use in a systematic manner (Appendix K). Each site was ranked according to four factors which include proximity of potential hazard to the WHPA; type of contamination; straight-line distance from the wells to the potential hazard; and type of contaminated media, whether potential or actual.

### 6.8.3 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. These tasks include placing proper signage throughout the WHPA, education of the public, proper zoning within the WHPA, annual review of environmental databases, and the cooperation between the City and appropriate enforcement and emergency response agencies. These tasks are presented in a general order of importance and are expected to require implementation by City staff.

The strategic goals and implementation tasks provided in the WHP plan are typically work that is completed by internal City staff as a part of their on-going education/awareness efforts directed at their customer base. However, it is not uncommon that the full list of goals or tasks cannot be immediately adopted because there is insufficient staff time available.

Therefore, the City's first responsibility will be to prioritize its WHP goals and select which tasks to implement in order to achieve those goals. The City should pick the strategic goals that are most important to its overall goal of groundwater protection. The City will then define which implementation tasks will be needed to meet the defined goals. In both cases, prioritization is done using the criteria of: 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).

# WATER QUALITY

## 7.1 INTRODUCTION

The purpose of this chapter is to review current and upcoming regulations relevant to the City of Auburn (City) and to review the City's Water Quality Monitoring Plan (WQMP). 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
- Review of the City's WQMP
- 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 most recent revision of the WAC became effective February 14, 2008.

The City of Auburn'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 of Auburn also owns and operates a smaller system located in southeast Auburn in the Hidden Valley Acres development. This system is classified as a Group A - Community Water System by the DOH. This system is not included in this plan.

### 7.2.1 Source Water Quality

Regulations that address source water quality for groundwater systems are described herein. The City does not have any supplies that are either surface water or groundwater under the direct influence (GWI) of surface waters. The 2001 Comprehensive Water Plan noted that a study was being conducted to determine whether the City's Coal Creek Springs is influenced by surface waters (GWI). In a letter dated February 6, 2004, the DOH documented its determination that the Coal Creek Springs source is not GWI and is classified as a groundwater source. As the City does not have any surface water or GWI supplies, regulations relevant to surface water supplies are not discussed herein. These regulations include: the Surface Water Treatment Rule; the Interim, Long Term 2 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 are currently set for 92 contaminants. Maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) have been established for 83 contaminants, while the remaining nine have treatment technique requirements. It was assumed for this evaluation that all treatment technique requirements are being addressed. 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 exceedences 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 Arsenic Rule (2001)

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 249-290-310.

#### 7.2.1.3 Radionuclide Rule (2000)

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-225/-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 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<br>Comprehensive Water Plan<br>City of Auburn | |
|---|---|
| **Constituent** | **MCL** |
| Combined Radium-226 and Radium-228 | 5 pCi/L |
| Gross Alpha Particle Activity (including Radium-226, but excluding radon and uranium) | 15 pCi/L |
| Tritium | 20,000 pCi/L |
| Strontium-90 | 8 pCi/L |
| Gross Beta Particle Activity | 50 pCi/L |
| Uranium | 30 μg/L |

#### 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 compliance date for triggered source water monitoring and the associated corrective actions, as well as compliance monitoring, is December 1, 2009. Because assessment monitoring is at the discretion of the state, there is no timeframe associated with assessment monitoring. 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.

Many of the requirements of the GWR will be determined by the individual state agencies. The requirements of the GWR have not yet been adopted by the Washington DOH. However, the DOH has provided a Fact Sheet for Group A utilities with recommended actions to prepare for the GWR. These actions include the following:

- Correct deficiencies from the last sanitary survey.
- Install a sample tap at each wellhead.
- Know specifically where each well's water goes. Triggered source water monitoring will require monitoring of all sources, unless it can be shown that the area of concern in the distribution system is only served by a limited number of sources.
- Update your emergency response plan, to be ready to provide alternate water, if needed.
- If you currently treat groundwater from a well, contact your regional office engineer to confirm whether you currently achieve 4-log virus inactivation. Systems that treat to this level will not be required to conduct triggered source water monitoring, but will instead be required to meet treatment technique monitoring requirements.

The DOH has also indicated that they are not planning to require systems to perform assessment monitoring and that the sanitary surveys completed under the GWR will not differ significantly from those currently required.

#### 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; a regulatory determination on these contaminants is expected in 2009. The third CCL (CCL3) is scheduled for publication in 2009.

### 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 *Escherichia coli (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 heterotrophic plate counts (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 nonacute MCL violations are defined under WAC 246-290-310 (2), and required follow-up actions are specified under WAC 246-290-320.

The TCR is currently under review by the USEPA to initiate possible revisions. In parallel with the review of the TCR, the USEPA is also considering a possible Distribution System Rule to address distribution system issues that have the potential to impact public health risk.

#### 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, 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 trihalomethanes (THMs) and haloacetic acids (HAAs) of 0.080 and 0.060 mg/L, respectively. Compliance with the THM and HAA MCLs is based on a system-wide 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 THM4 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 THM and HAA 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 THM and HAA 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 THM4 and HAA5 concentrations.
- System-Specific Study (SSS), based on historical data and a system model.

The Washington DOH has not yet adopted the Stage 2 DBPR; IDSE Plans are being submitted directly to the USEPA.

### 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.

#### 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; recommended changes to those monitoring practices are discussed below in the review of the City's WQMP.

**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 is only required once every 36-month compliance period; the current compliance period is from January 2008 through December 2010. 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. Additional testing for manganese is conducted at Well 5B when the source is in use. This source is treated with pressure filtration to remove manganese and iron and manganese samples are collected both before and after 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. The current waiver lasts through 2010.
- *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 Chemical (VOC) Monitoring*. At the majority of the City's sources, sampling is conducted for VOCs once during each 36-month compliance period; the current compliance period is from January 2008 through December 2010. 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 facility at Fulmer Field Park. Sampling is conducted at all sources, at the entry point following treatment.

- *Synthetic Organic Chemical (SOC) Monitoring*. Sampling for SOCs is conducted for two consecutive quarters every 36 months. 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. Monitoring of these constituents is waived through December 2010.
- *Radionuclide Monitoring*. Radionuclide monitoring currently consists of Radium-228 monitoring twice each 36-month compliance period at all entry points following treatment.

The City may be eligible to apply for waivers from the DOH that would reduce or eliminate sampling requirements for some of the above constituents during the January 2008 to December 2010 compliance period. In 2009, the DOH will notify the City of waiver options for this compliance period. However, City staff have indicated they do not intend to apply for the waivers, as sampling may need to be conducted to meet the requirements of the UCMR.

**Total Coliform Rule.** The City currently conducts monitoring at 52 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, Coal Creak Springs and at the corrosion control treatment facility at Fulmer Field Park and at four wholesale intertie sites 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 conducts annual monitoring of seven distribution system sample sites for THMs and HAAs. Monitoring is conducted during the month of peak temperature (assumed to be August).

**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. The current compliance period is from January 2007 through December 2009.

## 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 2003 through 2007 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. With the exception of one secondary contaminant, all regulated primary or secondary contaminants are well below their respective MCLs. Concentrations of manganese in Well 7 exceeded the secondary MCL in 2003, however levels have been below the MCL since 2003. Since 2007, Wells 2, 6 and 7 are represented by samples collected from the Fulmer Field Corrosion Control Treatment Facility (CCTF).

Separate monitoring for manganese was conducted at Well 5B during 2006. Well 5B is treated by pressure filtration to remove iron and manganese. When it is in operation, manganese samples are collected both before and after treatment. During operation in 2006, the concentration before treatment was 0.03 mg/L, which is below the secondary MCL; concentrations after treatment were below the detection limit.

Synthetic organic compounds were monitored in all of the City's sources in 2003; all constituents were below the detection limit. The City was granted a waiver for monitoring during the January 2005 through December 2007 compliance period and no SOC monitoring was conducted.

Volatile organic compound (VOC) were monitored in all the City's active sources in 2003 and 2007. In addition, annual sampling was conducted at Wells 2 and 6; these wells were represented by samples collected from the Fulmer Field CCTF starting in 2005.
Well 5B was also monitored in 2005, when it was restarted as an active source. The only VOCs detected during the sampling period were trichloroethylene and tetrachloroethylene detected in Wells 2 and 6. Detected concentrations are summarized in Table 7.3 and were well below their respective primary MCLs. Sample concentrations in all other years were below their respective detection limits. No VOCs were detected in the other sources.

**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 2 | Well 4 | Well 5 | Well 5A | Well 6 | Well 7 | Fulmer CCTF |
| **USEPA Regulated (Primary)** | | | | | | | | | | | |
| Arsenic | 0.05 | mg/L | < 0.002 | < 0.002 | < 0.002 | 0.01 | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 |
| Barium | 2 | mg/L | < 0.1 | < 0.1 | < 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 | < 0.002 | < 0.002 |
| Chromium | 0.1 | mg/L | < 0.01 | < 0.01 | < 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 | < 0.0005 | < 0.0005 |
| Selenium | 0.05 | mg/L | < 0.005 | < 0.005 | < 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 | < 0.003 | < 0.003 |
| Nickel | 0.1 | mg/L | < 0.04 | < 0.04 | < 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 | < 0.005 | < 0.005 |
| Thallium | 0.002 | mg/L | < 0.002 | < 0.002 | < 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 | < 0.05 | < 0.05 |
| Fluoride | 4 | mg/L | < 0.2 | < 0.2 | < 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 | < 0.2 | < 0.2 |
| Nitrate-N | 10 | mg/L | 1.5 | 4.7 | 3.6 | 1.6 | 0.9 | < 0.2 | 1.9 | 1.7 | 1.3 |
| Total Nitrate/Nitrite | 10 | mg/L | 1.5 | 4.7 | 3.6 | 1.2 | 0.9 | < 0.4 | 1.9 | 1.7 | 1.3 |
| **USEPA Regulated (Secondary)** | | | | | | | | | | | |
| Iron | 0.3 | mg/L | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.19 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Manganese | 0.05 | mg/L | < 0.01 | < 0.01 | 0.03 | 0.01 | < 0.01 | < 0.01 | 0.03 | **0.07** | **0.02** |
| Silver | 0.1 | mg/L | < 0.01 | < 0.01 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Chloride | 250 | mg/L | 33 | 7 | 10 | 3 | 3 | 2 | 5 | 8 | 8 |
| Sulfate | 250 | mg/L | 6 | 15 | 16 | 11 | 9 | 6 | 16 | 16 | 13 |

**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 2** | **Well 4** | **Well 5** | **Well 5A** | **Well 6** | **Well 7** | **Fulmer CCTF** |
| Zinc | 5 | mg/L | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| **State Regulated** | | | | | | | | | | | |
| Sodium | | mg/L | 5 | 9 | 13 | 7 | 8 | 6 | 14 | 13 | 12 |
| Hardness | | mg/L | 60 | 130 | 132 | 68 | 95 | 67 | 96 | 112 | 105 |
| Conductivity (micromhos/cm) | 700 | micromhos/ cm | 132 | 288 | 273 | 152 | 218 | 133 | 228 | 246 | 236 |
| Turbidity (NTU) | | NTU | 0.4 | 0.2 | 1.8 | 17 | 1.5 | 0.2 | 0.7 | 0.5 | 0.3 |
| Color (color units) | 15 | Color Units | < 5 | < 5 | 5 | 10 | 5 | 5 | < 5 | < 5 | < 5 |
| Total Dissolved Solids(2) | 500 | mg/L | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **State Unregulated** | | | | | | | | | | | |
| Lead | | mg/L | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Copper | | mg/L | < 0.02 | 0.08 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |

Notes:

(1) Based on monitoring conducted between 2003 and 2007. Wells 1, 3A and 3B were not in use during this time period and no monitoring was conducted. The Fulmer Corrosion Control Treatment Facility (CCTF) was monitored only in 2007 and replaced monitoring of Wells 2, 6, and 7.

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

| Table 7.3 | Detected Volatile and Synthetic Organic Compounds<br>Comprehensive Water Plan<br>City of Auburn | | |
|---|---|---|---|
| **Constituent** | **Source, Year** | **Concentration (ug/L)** | **MCL (ug/L)** |
| Trichloroethylene | Well 2, 2003 | 1.2 ug/L | 5 ug/L |
| | Well 6, 2004 | 1.5 ug/L | |
| Tetrachloroethylene | Well 2, 2003 | 0.7 ug/L | 5 ug/L |
| | Well 6, 2004 | 1.6 ug/L | |

Radionuclide monitoring of all sources was conducted in 2002; levels in all sources were below their respective detection limits. Sampling for Gross Alpha Particle Activity and Radium-228 was conducted at the Fulmer Field CCTF and at Well 5B in 2006; levels in both sources were again below their respective detection limits.

#### 7.4.1.1 Groundwater Rule

As noted above, specific requirements under the GWR have not yet been established by the DOH. However, the City should take the actions recommended by the DOH to prepare for the GWR. These include:

- *Correct deficiencies from the last sanitary survey.* The last sanitary survey was completed by DOH in August 2008 in and found only minor deficiencies. The City should correct these deficiencies and respond to the DOH in writing, as requested.The issues identified in the survey and required actions are summarized in Table 7.4 below.
- *Install a sample tap at each wellhead.* The City already has the ability to sample each well; no action under this item is required.
- *Know specifically where each well's water goes in your distribution system*. The City's WQMP specifies the service area for each of the City's sources. The sources serve either Lakeland Hills or the remainder of the system. The City may want to better delineate the area of the distribution system affected by each well to limit the number of wells that must be sampled during triggered source water monitoring. This will not be necessary if the City is exempted from triggered source water monitoring by meeting disinfection requirements, as discussed below.
- *Update your emergency response plan to be ready to provide alternate water, if necessary*. It is not anticipated that the City's next sanitary survey will find significant deficiencies, nor that fecal indicators will be found in the City's sources. However, it is prudent to regularly review the City's emergency response plan for a source outage. This could be completed in conjunction with the recommended review of the City's Water Resource Protection Program, which includes water supply contingency plans.

**Table 7.4 Summary of Issues Identified in 2008 Sanitary Survey**
**Comprehensive Water Plan**
**City of Auburn**

| | Issues/Recommended Improvements | Required Action (if any) |
|---|---|---|
| **Sources and Treatment** | | |
| Coal Creek Springs | Need to route access hatch drains to discharge outside of vaults. Seal the hole in valve access cover on main/last vault. Address vault access cover security concerns. Verify how overflow system ties in with supply system. Clear overflow area so overflow can be routinely visually inspected. | Provide written status to DOH once openings are sealed and hatch drains are rerouted on Coal Creek collector vaults. |
| West Hill Springs | As telemetry controls are updated, it is recommended to add an automatic shutdown/diversion if disinfection fails. | |
| Howard Road and Fulmer Field Treatment Plants | Verify if the clearwell has an overflow and if so, that the overflow is appropriately screened and discharges to daylight. | Provide written notice to DOH of overflow design or alternative for treatment clearwells. |
| **Storage** | | |
| Reservoir 2 | For hatch, be sure to clean out gutter drain as needed to prevent trapped stormwater from entering tank. | |
| Lea Hill Reservoirs | When reasonable, evaluate modifications to inlet piping to promote adequate mixing and improved water quality. | |
| **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 | Emergency intertie with adjacent water systems will be added to the City's Water Facilities Inventory. | |
| Total Coliform Rule | Include updated Coliform Monitoring Plan with the WSP. Update sample locations as needed to best represent distribution system. | Provide updated Coliform Monitoring Plan with WSP. |

- *If you currently treat groundwater from a well, contact your regional engineer to determine if you are providing 4-log virus inactivation or removal*. Chlorination is added at the majority of the City's wells. The exceptions are Wells 1, 3A, and 3B, which are currently not in service, and Well 5, which serves the Lakeland Hills area. The City should contact its regional engineer to determine whether chlorination at the remaining wells is sufficient to provide 4-log virus inactivation or removal. If so, triggered source water monitoring may not be required.

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.

### 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 Total Coliform Rule

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 been in violation of the TCR once since the previous 2001 Comprehensive Plan during which greater than five percent of monthly distribution system samples collected tested positive for the presence of total coliform bacteria. Coliform bacteria were detected in 12 of the 120 samples collected during the month of June in 2001. From these samples, fecal coliform were detected in one sample. However, repeat samples at that site indicated no coliform present and no *E. coli* bacteria were reported in any of the samples. Although no source of contamination was determined, the City increased system flushing and the chlorination level to correct the problem.

Additional TCR testing results were reviewed for 2003 through 2007. Over this period, total coliforms were detected in only a single sample in October 2005 but did not result in a TCR violation.

The monitoring frequency under the TCR for total coliforms is based on the population served by the system. Previously, the City has served a population between 40,001 and 50,000 customers and compliance with the TCR required the City to collect 50 representative samples every month. However, this current Comprehensive Water Plan has estimated the current served population to be 50,900, as discussed in Chapter 4. In accordance with the TRC, systems that serve between 50,001 - 60,000 people are required to collect 60 representative samples every month. The City has the option of either identifying additional sample sites, or increasing the frequency of sampling at the existing sites.

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 0.64 to 0.67 mg/L over the period from 2004 to 2007, as summarized in Table 7.5. Although the range of chlorine residuals appears to vary throughout the year, the levels appear consistent from year to year.

**Table 7.5 Total Chlorine Residuals**
**Comprehensive Water Plan**
**City of Auburn**

| | Sample Results (mg/L) | |
|---|---|---|
| **Year** | **Average** | **Range** |
| 2004 | 0.64 | 0.23 - 1.25 |
| 2005 | 0.67 | ND - 1.29 |
| 2006 | 0.67 | 0.03 - 1.41 |
| 2007 | 0.65 | 0.030 - 1.09 |

Chlorine residuals at the 52 individual sites were also evaluated for the period from January through December 2007. Six of the 52 sites had average chlorine residuals less than 0.5 mg/L; average and minimum chlorine residuals for those six sites are presented in Table 7.6. Three of the sites had minimum residuals less than 0.05 mg/L, which is very close to the detection limit for free chlorine. The City may wish to evaluate and address the cause of the low chlorine residuals at these sites. This is consistent with the City's 2003 Sanitary Survey, which noted that there were a couple areas where the City should "keep an eye on" low chlorine residuals.

**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) |
|---|---|---|---|
| A-5 | 710 47 St SE | 0.32 | 0.04 |
| A-6 | 5110 Mill Pond Dr SE | 0.45 | 0.03 |
| A-7 | Elizabeth Ave SE | 0.25 | 0.03 |
| A-8 | 4431 47 St SE | 0.41 | 0.21 |
| A-9 | 2001 36 St SE | 0.44 | 0.23 |
| A-13 | 5208 Nathan Loop SE | 0.44 | 0.10 |

Note:
(1) Based on chlorine residual data collected between January and December 2007.

### 7.4.2.2 Stage 1 and 2 Disinfectants/Disinfection By-products Rules

The City is easily meeting the requirements of the Stage 1 DBPR and is anticipated to meet the requirements of the Stage 2 DBPR. THM and HAA data collected under the Stage 1 DBPR are summarized in Table 7.7. Sample results from 2004 were well below the concentrations that the DOH uses to determine whether a water system qualifies for reduced monitoring (0.040 mg/L THMs; 0.030 mg/L HAAs). Therefore, starting in 2005, the City's THM and HAA monitoring has been conducted once per year during the month with the warmest water temperature (assumed to be August).

**Table 7.7 Historical Trihalomethane and Haloacetic Acid Concentrations
Comprehensive Water Plan
City of Auburn**

| Sample Site | Trihalomethane Concentration (µg/L) | | Haloacetic Acid Concentration (µg/L) | |
|---|---|---|---|---|
| | Average(1) | Max | Average1 | Max |
| 3615 Orchard St SE | 3.6 | 6.4 | 0.6 | 2.1 |
| 3705 West Valley Hwy N | 6.1 | 11.5 | 1.7 | 3.5 |
| 31512 115th Pl SE | 2.3 | 3.8 | 0.6 | 1.4 |
| 2001 36th St SE | 5.6 | 10.0 | 0.9 | 4.0 |
| 710 47th St SE(2) | ND | ND | ND | ND |
| 5208 Nathan Loop(2) | 2.0 | 6.1 | ND | ND |

Notes:
(1) Average concentrations calculated assuming a concentration of 0 µg/L for all non-detect samples.
(2) 47th and Nathan Loop monitoring results from 2005 - 2007 only.

In 2006, the USEPA approved the City's 40/30 certification, which meets the initial IDSE requirement of the Stage 2 DBPR without requiring additional sampling. A monitoring plan for the Stage 2 DBPR must be completed before the City is required to begin Stage 2 DBPR compliance monitoring starting in April of 2012. Since the last Comprehensive Plan was conducted in 2001, the City's current served population has exceeded 50,000 people and thus, monitoring will be required at eight Stage 2 sample sites. Until Stage 2 DBPR compliance monitoring begins, the City must continue to conduct Stage 1 DBPR monitoring.

### 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 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 systems treat water from Coal Creek Springs and Wells 2, 6, and 7, respectfully.

The Bilateral Compliance Agreement included requirements for increased monitoring following completion of the corrosion control facilities. The increased monitoring consisted of collecting at least 30 water samples in each 6-month period. Results from 2003 to 2006 are summarized in Table 7.8. Since the corrosion control facilities were constructed, the copper levels have been well below the action level.

**Table 7.8 Lead and Copper Concentrations**
**Comprehensive Water Plan**
**City of Auburn**

| Constituent | Sampling Year | | | | |
|---|---|---|---|---|---|
| | 2003 | 2004 | | 2005 | 2006 |
| | | Round 1 | Round 2 | | |
| Copper Concentrations (mg/L) | | | | | |
| Copper range | <0.02 - 2.55 | <0.02 - 2.55 | <0.02 - 3.07 | <0.02-1.03 | <0.02 - 0.64 |
| Copper 90th percentile | 0.24 | 0.24 | 1.05 | 0.64 | 0.46 |
| Lead Concentrations (mg/L) | | | | | |
| Lead range | <0.002 - 0.090 | <0.002 - 0.090 | <0.002 | <0.002-0.004 | <0.002 - 0.005 |
| Lead 90th percentile | <0.002 | <0.002 | 0.005 | <0.002 | 0.002 |

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. The current compliance period is from January 2007 through December 2010.

## 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 2008, as required.

### 7.4.3.2 Public Notification Rule

The public notification requirements have been revised since the previous Comprehensive Water Plan. The new 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 WATER QUALITY MONITORING PLAN REVIEW

The City's WQMP was reviewed for compliance with Washington DOH requirements. The most recent WQMP was revised on March 4, 2008; a copy of the WQMP is provided in Appendix L. Overall, the WQMP generally complies with all requirements, with the few exceptions noted below. Recommended changes are summarized in Table 7.9. In addition, the City is required to develop a monitoring plan for the Stage 2 DBPR by 2012; this plan should be included as an attachment to the WQMP.

**Table 7.9 Recommended Changes to the City's Water Quality Monitoring Plan**
**Comprehensive Water Plan**
**City of Auburn**

| Section | Recommended Change |
|---|---|
| 4. Monitoring Waivers | • The text states that the City has "applied for waivers during the 2005 - 2007 compliance cycle." Text should be amended to indicate that<br>– The City was granted waivers for the 2005 - 2007 compliance period<br>– It is the City's intention to not apply for waivers during the 2008 - 2010 compliance period. |
| 6. Monitoring Schedule | • The text notes that annual VOC testing is required for Wells 2 and 6. It would clarify to note that both wells are represented by the sample from the Fulmer Field CCTF.<br>• The text notes that Radium-228 monitoring is conducted during two consecutive quarters in each 36-month compliance period. According to discussion with the DOH, this should be replaced by monitoring for both Radium-228 and Gross Alpha Particle Activity, once each 36-month compliance period. |
| Coliform Monitoring Plan | • Based on the estimated current population served and anticipated increases in that population, the City will need to increase the number of coliform samples collected each month from 50 to 60 (in addition to the Hidden Valley system samples). The Coliform Monitoring Plan should be amended to indicate this increase, either be increasing the number of sample sites, or increasing the frequency of monitoring. |
| Inorganic Chemical and Physical Parameter Monitoring Plan | • The sampling schedule section indicates sampling is conducted every 12 months. For consistency, the City may want to amend the schedule to note sampling is required once each 36-month compliance period, but may be conducted annually. |

| Table 7.9 | Recommended Changes to the City's Water Quality Monitoring Plan<br>Comprehensive Water Plan<br>City of Auburn |
|---|---|
| **Section** | **Recommended Change** |
| Asbestos Monitoring Plan | • The sampling schedule section indicates sampling is conducted every 36 months. For consistency, the City may want to amend the schedule to note sampling is only required every 9 years if a waiver is granted, and is otherwise required once each 36-month compliance period. |
| Volatile Organic Chemical Monitoring Plan | • The analysis section indicates that trihalomethane monitoring is not included in this monitoring program and is addressed in the Trihalomethane Monitoring Procedure. This should instead refer to trihalomethane and haloacetic acid monitoring, and the Stage 1 DBPR monitoring plan.<br>• The sampling schedule section indicates that samples are collected every 36 months. The section should be revised to indicate that samples are required every 12 months from the Fulmer Field CCTF (Wells 2 and 6). |
| Radionuclide Monitoring Plan | • The analysis section indicates samples are monitored for Radium-226, Radium-228 and Gross Alpha Particle activity. Monitoring for Radium-226 is not required.<br>• The sampling location section indicates that samples are to be collected prior to treatment. Samples should instead be collected at each entry point to the system, downstream of treatment.<br>• The sampling schedule section indicates samples are to be collected twice every 36 months. Based on discussions with the DOH, sampling is required only once each 36-month compliance period. |
| Residual Disinfection Concentration Monitoring Plan | • In the City's 2003 sanitary survey, the DOH requested that the Game Farm Wilderness Park be added to the chlorine monitoring schedule, or used as a substitute for an existing site, as it is a compliance point for chlorination of the Coal Creek Springs source. |

## 7.6 RECOMMENDATIONS

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

1. Take actions recommended by the DOH to prepare for the upcoming Groundwater Rule requirements, including:
    a. Correcting deficiencies identified in the 2008 Sanitary Survey.
    b. Updating the City's emergency response plan; and
    c. Contacting the City's regional office engineer to determine whether treatment provided at the City's wells is sufficient to provide 4-log virus inactivation or removal.

2. Prepare a monitoring plan for the Stage 2 DBPR prior to 2012, for inclusion in the City's WQMP.
3. Amend the City's Coliform Monitoring Plan to increase the number of samples collected per month to at least 60, in response to the City's population exceeding 50,000 people.
4. Review the City's public notification procedures to confirm they are in compliance with the 2000 revisions to the Public Notification Rule.
5. Complete the additional minor amendments to the City's WQMP, as noted above in Table 7.9.

Chapter 8

# 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 provide water for other environmental uses. 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 program by examining how it was formed, its program and goals, and analyzes the savings. The second section of this chapter presents the City's new 2009 Water Use Efficiency Program (WUE), 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, a 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. In 2001 the City enhanced the program and is currently using it today. This revised program will provide the basis of the historical review in this chapter.

In preparing the 1995 and the 2001 Water Conservation Programs, the City reviewed the 1990 South King County Coordinated Water System Plan (CWSP), and the state *Conservation Planning Requirements (CPR) - Guidelines and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs*. Other materials used to prepare the program included the *Water Conservation Bibliography for Public Water Systems*, and other materials and handouts prepared by the DOH to be used by utilities when implementing water conservation.

### 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 them 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 WUE program.

The City of Auburn's 2000-2005 Conservation Program is comprised of measures and goals following the format of the CPR. The measures include four categories as presented in the Figure 8.1 below: Public Education, Technical Assistance, System Measures, and Incentives.


Figure 8.1 Conservation Program Diagram

Ultimately, the City chose to implement conservation measures (system measures) to meet the City's goal of reducing the retail water demand by 10 percent in the year 2005. These measures targeted various customer classes ranging from single family, multi-family, commercial, manufacturing/industrial, schools, city accounts, and irrigation.

#### 8.1.2.1 <u>2000-2005 Program Goals and Objectives</u>

The City developed a set of conservation goals and objectives for the 2000-2005 program that were based, in part, on the results of the 1995 Water Conservation Program. The City also wanted to raise the visibility and performance of the Conservation Program. The focus was on implementing conservation measures targeted to the City's retail customers, considering all customer classes. The City selected the following goals for the 2000 Water Conservation Program:

- Reduce Water Demand by 10percent:
  - The top priority of the program was to reduce overall retail demand by 10 percent by 2005. The program targeted the residential customer class by establishing a goal of reducing residential demand by 16 percent. Goals for reducing demand were established for the other customer classes as shown in Figure 8.2 below.

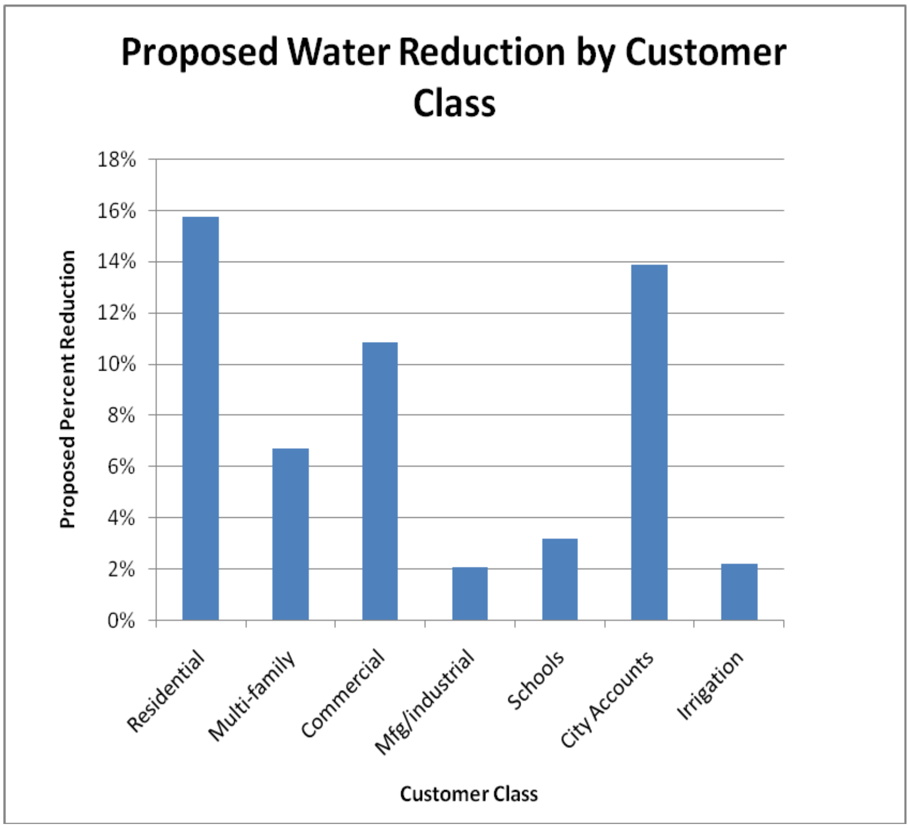



Figure 8.2 Proposed Water Reduction by Customer Class

- Community Leadership: Become a community leader in water conservation through example and public education.
  - Customer Support: 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: Support and participate in the *South King County Coordinated Water System Plan (SKC-CWSP)* and other applicable regional plans in order to maintain a reliable and adequate supply of water for the region.

– Regulatory Compliance: Design and manage a conservation program that meets or exceeds current regulations of DOH or other appropriate regulatory agencies.

### 8.1.3 Historical Seasonal Water Usage

The City took an innovative approach to evaluate the historical water usage by examining seasonal water use. Seasonal water use can have a huge impact on the system's ability to deliver water during peak demands. Using seasonal water data has become an important element in the City's new program. An analysis was performed on seasonal water use prior to implementing the conservation program, which identified the variation of water use for each customer class throughout the year. The winter months show a constant monthly usage, while summer months show an increase, peak, and decrease in water usage. Historically, residential customer classes would produce a large peak in the summer months; however, as a result of the City's conservation program, this peak has become relatively flat. Interestingly, the most dramatic peak was from the school customer class, which can be attributed to watering of play fields and landscaping. Figure 8.3 depicts the average demand from 2001 to 2007 for each customer class. The peaking factor comparing summer MDD to winter ADD is 2.01. These dramatic summer increases have influenced the City to create goals that will target reducing peaking factors during the summer months.

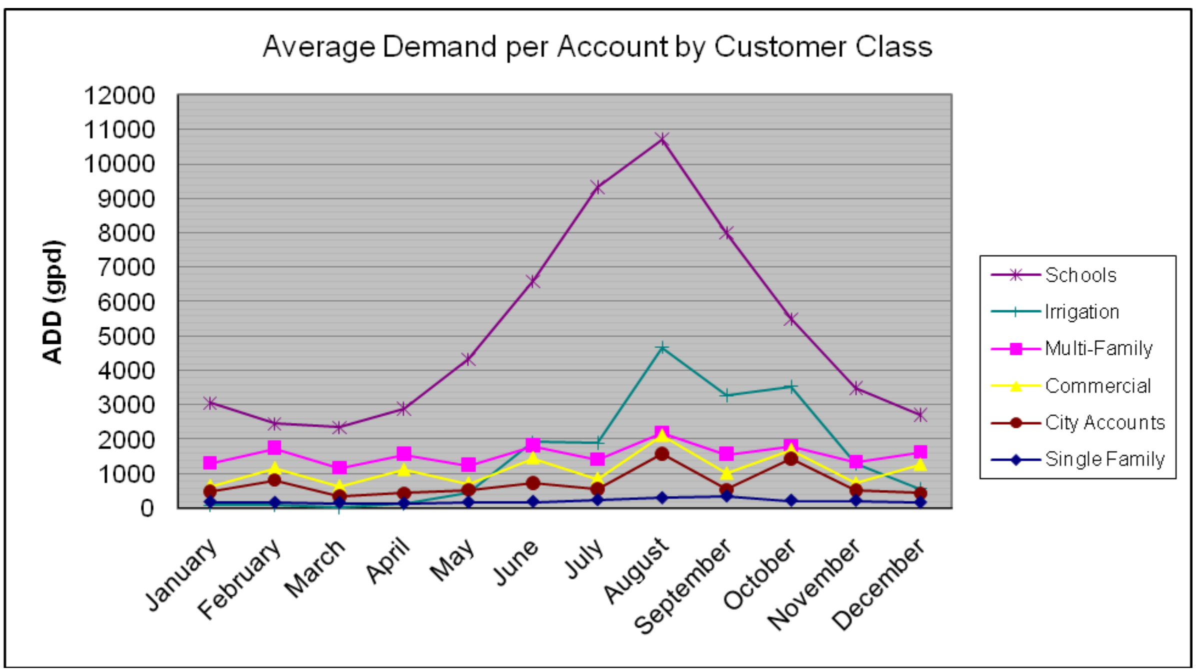



Figure 8.3 Monthly Average Demand per Account by Customer Class

### 8.1.4 Historic Water Savings

The City experienced a water savings in all customer classes from 2000-2005. More specifically, the City reduced their single family/duplex customer water use from 260 to 206 gallons per day, which contributed to meeting their goal of reducing water demand by 10 percent. The previous comprehensive planning period was from 2000 to 2005, however, the City did not initiate the update until 2007 and therefore Table 8.1 below shows the historic water use by customer class for 2000, 2007 and the savings during this time period. The 2007 demand per account is approximately 27 percent less than the 2000 demand.

**Table 8.1 Historical Water Savings by Customer Class**
**Comprehensive Water Plan**
**City of Auburn**

(Gallons per day per account)

| Classification | 2000 | 2007 | % change |
|---|---|---|---|
| Single-family/Duplex | 260 | 205 | -21% |
| Multifamily | 2,150 | 1,484 | -31% |
| Commercial | 1,150 | 1,315 | +14% |
| Mfg/Industry | 23,000 | 13,894 | -40% |
| Schools | 6,000 | 6,779 | +13% |
| City Accounts | 2,000 | 636 | -68% |
| Irrigation | 1,600 | 1,951 | +22% |
| Total | 36,160 | 26,264 | -27% |

### 8.1.5 Historical Distribution System Leakage

For the 2000 conservation program, the City performed leak detection and implemented other programs to meet the City's distribution system leakage goals. The City's goal was to reduce distribution system leakage for water to 10 percent or less within the planning period.

Historical distribution system leakage is shown in Table 4.7. The variation in percent of authorized consumption is largely due to flushing practices. The City maintained distribution system leakage at less than 10 percent of supply, which met their goal.

## 8.2 2009-2014 WATER USE EFFICIENCY PROGRAM

The development of the WUE program is the foundation for using water wisely. The 2009-2014 WUE program will be a continuation of the 2002-2005 conservation program with specific enhancements to the program to comply with current regulations and create an emphasis on efficient water usage rather than only conserving. The following sections includes requirements that are mandatory by the WUE program and shows the measures the City intends to continue implementing as well as recommended enhanced measures. The City will need to implement enhancements in order to achieve its overall goal.

### 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 deadline to do so was 01/22/2008. Because the City was still in the process of updating its Water Plan, the City continued its established goals from the previous 2001 plan. The proposed goal for the 2009-2014 WUE program will target a 1 percent reduction per year in Equivalent Residential Unit Values as defined in the Policy Chapter earlier herein. The WUE program measures are designed to help meet this established goal. This goal was posted to the City website in July 2009.

### 8.2.2 Program Requirements

The new WUE requirements emphasize the importance of measuring water usage and evaluating the effectiveness of the City's program. There are three fundamental elements of a WUE Program that the City will follow:

- **Planning Requirements** – Municipal water suppliers are required to:
  - Collect data
  - Forecast demand
  - Evaluate WUE measures
  - Calculate distribution system leakage
  - 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 2009-2014 Program Measures

Under the new WUE requirements, a program measure may include water efficient devices, actions, business practices, or policies that promote efficient water use. As mentioned, the City is required to implement a minimum of nine WUE measures. Eight of the nine measures in this program were implemented in the previous plan.

WUE measures can target specific customer classes or a combination of customer classes. The WUE guidelines state that a measure can be counted for each class it is attributed to. For example, the water savings device kits measure is provided across multiple customer classes (single family, multifamily), which means it could be counted as two measures.

In order to achieve the program goals as stated, the City must enhance its program with new measures and also maintain the effectiveness of the previous program by continuing to implement the previous measures. The City will provide the required nine measures and is proposing to not double count measures that cross into multiple customer classes. The City will do this because it has successfully implemented the eight measures in the past and desires to continue its effective program further into the future. This is a conservative approach to reach the City's goals. Measures that are required, like system measures, are being implemented but do not count as part of the City's program as discussed later herein. The program measures are provided below and separated into measures previously implemented and new measures implemented in this new plan.

- **Previous Program Measures:**
  - School Outreach:

    School programs were arranged to educate students on efficient water usage. The City partnered with the Solid Waste Utility and Puget Sound Energy to have environmental programs taught to Auburn middle school and junior high school students. The original program called "*In Concert with the Environment"* was replaced by "Powerful Choices for the Environment". These programs educated students on many environmental issues, including water use, and how their actions can make a difference for the environment.
  - Speakers' Bureau:

    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.
  - Program Promotion:

    The City will seek opportunities for television and/or radio public service announcements for water use efficiency, and submit news articles to local papers on efficient water usage especially during the spring and summer months.
  - Theme Shows/Fairs:

    The City will participate in local theme shows and fairs, providing portable water efficiency displays and distribution of water efficiency brochures and other materials. Water saving device kits could be distributed to interested single family and multiple family residential customers.
  - Water Audits:

    The City will conduct water audits for the City's "Top 10" water users and all city accounts. 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.
  - Bills Showing Consumption History:

    The City will continue to provide customer bills showing previous year's water usage. Showing the percentage increase/decrease in addition to water usage would provide customers with better information regarding efficient water usage. Incorporate percentage increase/decrease calculation into the City's new billing system.

– 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.

– Conservation Pricing:

  The City will conduct a cost of service/rate study to determine the most appropriate water structures and rate levels to achieve the City's WUE goals, while generating sufficient revenues for utility operations. The study should include an analysis of alternative conservation-based water rate structures and associated impacts, including uniform rates by class, inverted block rates, seasonal rates, and excess use rates.

- **New Program Measures:**
  – Water Efficient Toilet or Clothes Washer Rebates:

    The City will provide rebates to customers that replace old toilets or clothes washers with new water efficient models. The City will explore options to partner with Puget Sound Energy on clothes washer replacements.

  – School Outdoor Water Use Reduction:

    The City will target schools in an effort to reduce their outdoor water consumption. Water audits and incentives to replace inefficient irrigation systems or landscaping (including turf) that use large qualities of water will be considered.

  – Other High Users:

    The City will evaluate the high volume users for water saving opportunities.

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.

### 8.2.4 Mandatory Measure requirements

In addition to the nine required measures discussed above, the WUE program requires supply side requirements that must be implemented. Any supply side measures that are implemented do not count towards the minimum number of measures discussed earlier. These are considered activities 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 must be implemented:

- Install production (source) meters
- Install consumption (service) meters
- Perform meter calibration
- Implement a water loss control action plan to control leakage
- Educate customers about water use efficiency practices

The measures that must be evaluated are:

- Evaluate rates that encourage water demand efficiency
- Evaluate reclamation opportunities

The City in the past has complied with these requirements and will continue to comply with these regulations.

### 8.2.5 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. Evaluation of reclaimed water use is required in the WUE program and reclaimed water use can be used as a WUE program measure. Currently, the City plans to conduct an evaluation of reclaimed water use savings. The City will implement reclaimed water as a conservation measure and include this savings in the demand projections when specific opportunities arise.

The City 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. Changes to the City's development and service policies and regulations may be desirable in order to encourage the promotion of these programs and technologies and will be included.

Currently, the City considers the most likely user of reclaimed water to be the irrigation customer class. Total irrigation use for 2007 was 292,351 CCF, which is 218,678,548 gallons more than any other customer class throughout the service area. Attachment 9 of the Municipal Water Law that identifies potential reclaimed water users has been completed and is included in Appendix M.

### 8.2.6 Distribution System Leakage

Distribution system leakage is a significant element of the new WUE requirement although it is not considered a program measure. In the past, distribution leakage was referred to as “unaccounted-for-water”. The WUE requirements now use the terms “authorized consumption” and “distribution system leakage.” It is calculated as shown below.

Volume of Distribution System Leakage = Total Water Produced and Purchased – Authorized Consumption

Authorized consumption is considered water delivered to costumers by service meters, water sold to other water systems, and other authorized uses such as fire protection, flushing, construction, street cleaning, 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 WUE Rule requires that the three-year average of distribution leakage be maintained at less than 10 percent of the supply. The City has made a significant commitment to maintain this status. The City has budgeted $275,000 just in 2009 towards leak detection, service meter replacement programs, and large meter replacement programs.

### 8.2.7 Projected Water Demand

The 2009-2014 WUE Program assumes water savings from retail customers only. In the tables below are the projected water requirements for the Retail Water Service Area with and without WUE, followed by projections of total water system demand with and without WUE. As shown in the tables, it is important to note retail demand is only one component of total system demand.

The water demand savings presented in this section are based upon the recommended WUE Program, discussed earlier herein, developed for the 6-year implementation period

(2009 through 2014). In the demand estimates, a one percent reduction was applied only to this 6-year planning period. After that, no reduction was applied which is represented in Figure 8.4.

Table 8.2 presents the comparison of projected water demand, both average day demand (ADD), and maximum day demand (MDD) for retail customers with and without WUE for the 20-year planning period. Figure 8.4 shows a graphical representation of the Table 8.2. As shown in the table, WUE measures are projected to result in an average day reduction in retail demand of 0.58 mgd by 2014, representing a reduction of approximately 6 percent. A reduction of 0.70 mgd is projected by year 2028. MDD is calculated at 1.8 times ADD. As shown in the Figure 8.4, WUE measures are projected to result in a reduction in retail MDD of 1.04 mgd by 2014, and approximately 1.27 mgd by the year 2028.

**Table 8.2 ADD & MDD Values with and without WUE**
**Comprehensive Water Plan**
**City of Auburn**

| **Average Day Demand** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2018** | **2028** |
|---|---|---|---|---|---|---|---|---|---|
| ADD w/o WUE | 7.52 | 7.90 | 8.29 | 8.67 | 9.06 | 9.44 | 9.83 | 10.68 | 12.03 |
| ADD w/ WUE | 7.52 | 7.81 | 8.10 | 8.39 | 8.67 | 8.96 | 9.25 | 10.05 | 11.32 |
| Savings | 0.00 | 0.10 | 0.19 | 0.29 | 0.38 | 0.48 | 0.58 | 0.62 | 0.70 |
| % Savings | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 6% | 6% |
| **Maximum Day Demand** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2018** | **2028** |
| MDD w/o WUE | 13.62 | 14.31 | 15.01 | 15.70 | 16.40 | 17.10 | 17.79 | 19.33 | 21.78 |
| MDD w/ WUE | 13.62 | 14.14 | 14.66 | 15.18 | 15.71 | 16.23 | 16.75 | 18.20 | 20.50 |
| Savings | 0.00 | 0.17 | 0.35 | 0.52 | 0.69 | 0.87 | 1.04 | 1.13 | 1.27 |
| % Savings | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 6% | 6% |

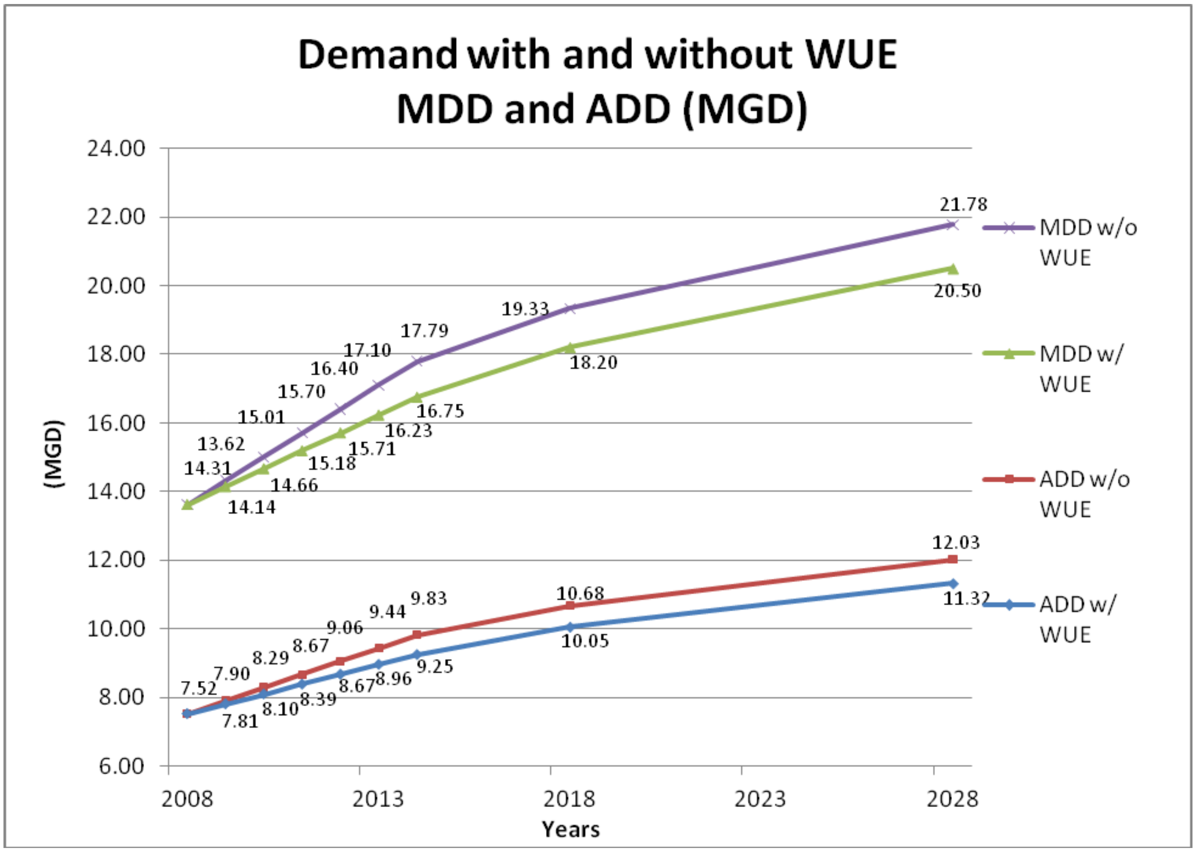



Figure 8.4 Demand Savings

The estimated 2014 ADD savings in mgd by measure is shown in Figure 8.4. This estimate was produced by applying the percentages of the budget of each measure to the estimated savings that is projected by the end of the City's 6-year planning period, 2014. It is difficult to estimate the savings of the measures such as school outreach and speaker's bureau and therefore the budget percentages were applied. Reporting the evaluation of the measures can be more precise when a measure has a specific water savings and quantities are known, as an example, low flow faucets. The City has had success with these measures and will continue to use these methods.

### 8.2.8 Budget

The budget for each measure was carried over from the previous Comprehensive Plan and adjusted accordingly, shown in Table 8.3. The budget was inflated by 4 percent during the entire program planning period to estimate the projected program budget.

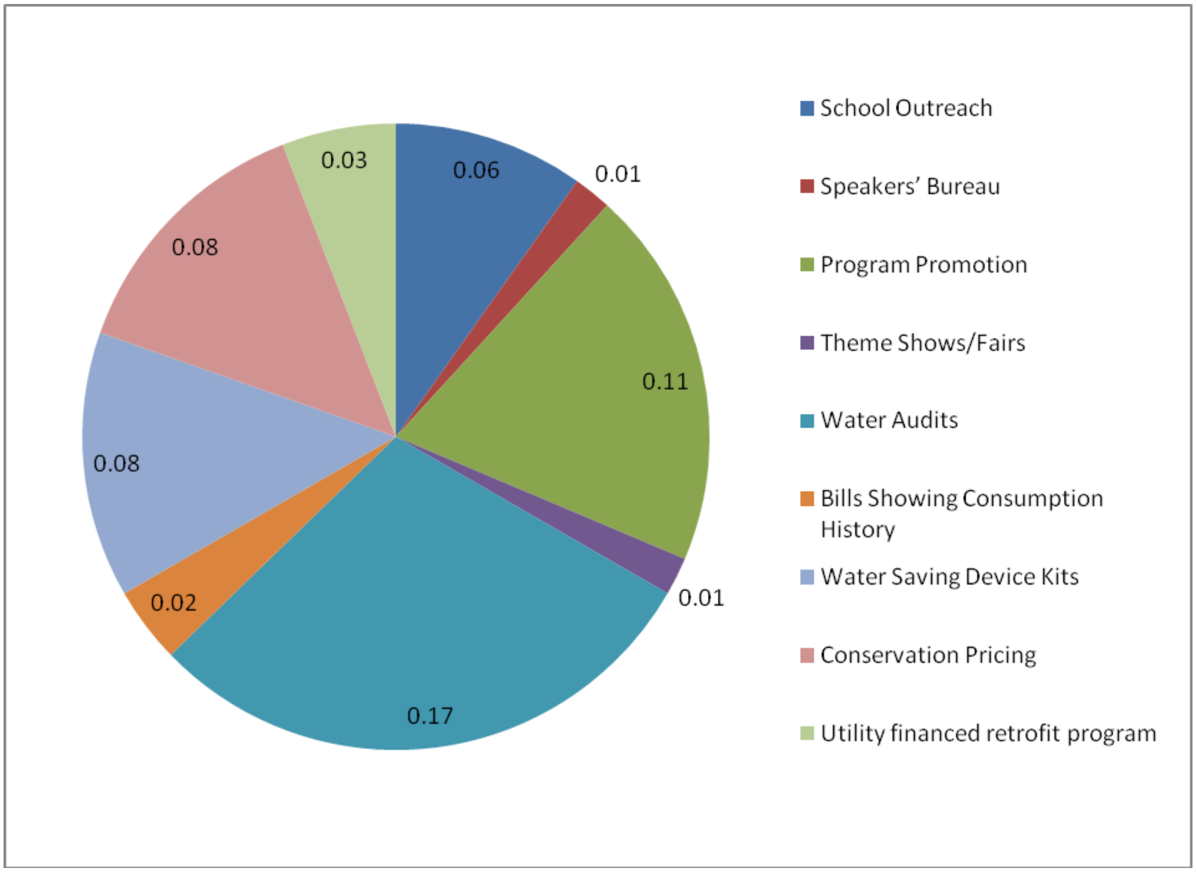



Figure 8.5 Estimated Savings in MGD by Measure for 2014

**Table 8.3 2008 to 2014 Budget for each Program Measure**
**Comprehensive Water Plan**
**City of Auburn**

| Measure | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| School Outreach | $9,000 | $9,200 | $9,410 | $9,630 | $9,860 | $10,090 | $10,330 |
| Speakers' Bureau | $1,000 | $1,040 | $1,080 | $1,120 | $1,160 | $1,210 | $1,260 |
| Program Promotion | $4,000 | $4,400 | $4,820 | $5,250 | $5,700 | $6,170 | $6,660 |
| Theme Shows/Fairs | $1,000 | $1,040 | $1,080 | $1,120 | $1,160 | $1,210 | $1,260 |
| Water Audits | $15,000 | $15,600 | $16,220 | $16,870 | $17,540 | $18,240 | $18,970 |
| Bills Showing Consumption History | $2,000 | $2,080 | $2,160 | $2,250 | $2,340 | $2,430 | $2,530 |
| Water Saving Device Kits | $7,000 | $7,280 | $7,570 | $7,870 | $8,180 | $8,510 | $8,850 |
| Conservation Pricing | $7,000 | $7,280 | $7,570 | $7,870 | $8,180 | $8,510 | $8,850 |
| Utility financed retrofit program | $5,000 | $5,120 | $5,240 | $5,370 | $5,500 | $5,640 | $5,790 |
| Totals | $ 51,000 | $ 53,040 | $ 55,150 | $ 57,350 | $ 59,620 | $ 62,010 | $ 64,500 |

Approximately 0.1 full time employees are working on WUE measures currently and there is no proposed additional staff time in the future. The City also has budgeted for future regulatory requirements, which are to accommodate any unknown requirements that the City of Auburn will need to fulfill to be compliant.

Table 8.4 shows the City's budget for required WUE measures through the planning period. Although leak detection, large meter test/repair/replace, and service meter replacements are not considered to be measures in the official WUE program, the City has dedicated a significant portion of their budget to reduce leakage and inaccuracies with the meter replacement programs and leak detection and repair programs.

**Table 8.4 Budget for System Required WUE Measures**
**Comprehensive Water Plan**
**City of Auburn**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| Leak Detection & Repair | $25,000 | $28,000 | $29,100 | $30,300 | $31,500 | $32,800 |
| Large Meter Test/Repair/Replace | $50,000 | $55,000 | $57,200 | $59,500 | $61,900 | $64,400 |
| Service Meter Replacements | $200,000 | $200,000 | $208,000 | $216,300 | $225,000 | $234,000 |
| Total | $275,000 | $283,000 | $294,300 | $306,100 | $318,400 | $331,200 |

### 8.2.9 Cost Savings

The City has completed a cost analysis of their proposed WUE program using historical data and projected annual water savings. The City currently budgets approximately $53,000 annually for materials and professional services for their WUE program. This annual expenditure is budgeted and expended through the City's operation and maintenance budget.

The projected annual savings of water ranges from approximately 29 MG in 2009 to 41 MG in 2014. Based on the 2009 budget of $326,000 (sum of budgets for WUE program measures and supply side required measures), the projected unit cost of water saved by the City's program for 2009 is estimated to be $11,200 per MG and over $9,700 per MG in 2014 when adjusted for inflation and adjusted for increased annual water savings by the City customers. This is shown in Figure 8.6. The cost to produce one gallon of water is approximately $0.00287 in 2007 and $0.00328 in 2008.

According to the above cost to produce one gallon of water in 2008 and adjusted for inflation, the cost to produce 29 MG of water (the estimated amount of water saved in 2009) is approximately $98,000. Likewise, the cost to produce 41 MG (the estimated amount of water saved in 2014) is $170,000. For 2009, this number represents a return on investment of $0.30 per dollar put into the program. In 2014, the return is $0.43 per dollar put into the program. For the above WUE program budget, the approximate volume of water savings needed to equal the coast to produce that same amount of water (return on investment of $1 dollar for $1 dollar) is 96 MG.

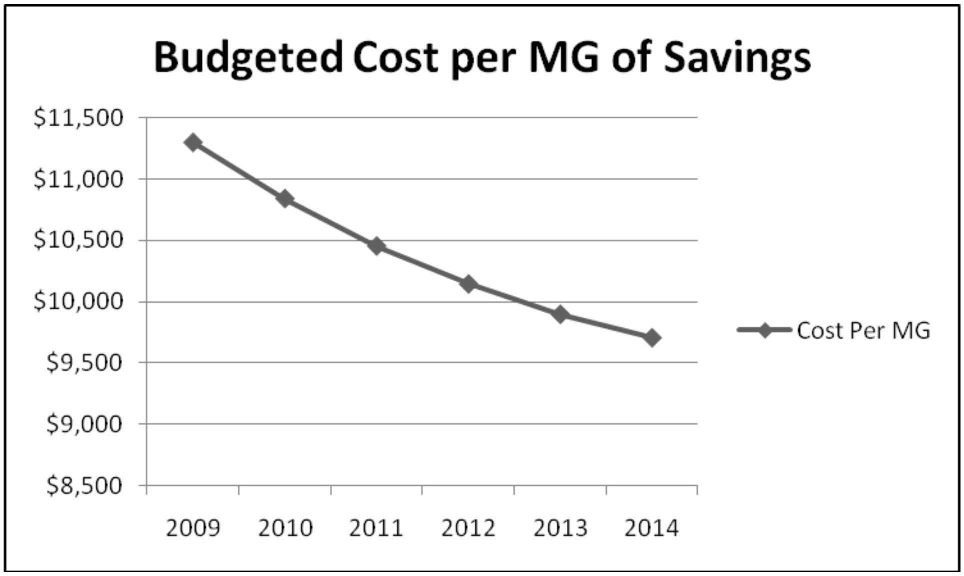



Figure 8.6 Budgeted Cost Per MG of Savings

### 8.2.10 Summary of Water Use Efficiency Program

The City, by implementing this new program, will provide for more efficient water use and support continued growth. This program will fulfill all the necessary requirements of the new WUE.

In conclusion, the City will maintain the target water use efficiency goal of one percent per year per ERU till 2014. This should reduce the 2008 ERU Planning Value of 230 gallon/day to 217 gallon/day by 2014. Through the implementation of the measures proposed and a staff position dedicated towards this program, this goal will be met.

Chapter 9

# HYDRAULIC 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 residential, commercial, and wholesale customers within and adjacent to the City. Service is provided through four major service areas that are further divided into pressure zones as required by local topography.

The City's water model was updated to reflect the best available infrastructure data and current demands. Then the model was calibrated to establish a level of confidence that it provides a reasonable representation of actual water system behavior. Following calibration, the model was used to evaluate both current and future water system conditions to determine if the City's performance criteria were met and to identify improvements that may be needed. Additional infrastructure was added to the model to resolve deficiencies and then the model was used to demonstrate that the improvements allow the water system to satisfy the City's performance criteria.

This chapter explains the process of preparing the model for these analyses, and contains the results of the evaluations. The following sections are included in this chapter:

- Hydraulic Model - This section describes the model and calibration process.
- Distribution System Evaluation - This section explains the analyses that were undertaken with the model.
- Summary of Improvement Alternatives - This section summarizes the capital improvements that will be included in the Capital Improvement Program (CIP) in Chapter 10.

## 9.2 HYDRAULIC MODEL

The City has a numerical model of the distribution system for planning and analysis that was used in the previous Comprehensive Water Plan. The modeling software that the City uses is WaterCAD 8.0, a Bentley software product. The hydraulic model includes most of the distribution system mains greater than 6-inches in diameter, the junctions, PRVs as well as supply sources, tanks, and pumping facilities. Most of the water mains equal to and less than 4-inches in diameter are not included. In addition, some of the spur piping to individual hydrants is also not included. The water demands where these small mains are located were placed at the nearest upstream junction.

The initial model contained 2,003 nodes and 2,752 pipes. In addition, there were 7 tanks, 12 well and spring sources, and 46 pumps.

### 9.2.1 Model Update

The City completed numerous projects to improve and expand service since the last Comp Plan (City of Auburn Department of Public Works, 2001, Comprehensive Water Plan) in 2001. The City provided a list of completed projects and revised field verified record drawings. All of the recent projects and field verified infrastructure was incorporated into the model. The key model changes by service area are summarized in the following sub-sections.

### 9.2.2 Infrastructure Updates

#### 9.2.2.1 Lea Hill Service Area Improvements

The Green River/Inter-tie pump station transmission line was added to the model. The PRV locations and settings were checked. Piping was added to the model to serve new developments in the pressure zone.

#### 9.2.2.2 Academy Service Area Improvements

Flow through the Academy pressures zones and service area were significantly improved and simplified as recommended in the last CIP. Most of the PRVs have been removed. The parallel piping from the Academy Pump Station to the Academy reservoirs has been reconfigured to separate transmission and distribution lines. The 14-inch diameter line is primarily a transmission main to the tanks and serves the 531 zone. The Muckleshoot Casino has a high pressure demand, and is also served from the 14-inch diameter transmission line. The parallel 10-inch diameter line serves as a distribution line with a PRV at each end. The 10-inch distribution line serves most of the area north and south of Auburn Way South, which is the 445 zone. There are two PRVs from the 445 zone to the 350 zone.

#### 9.2.2.3 Valley Service Area Improvements

Two treatment facilities were added in the Valley Service Area. Howard Road, a corrosion control treatment facility, was added to treat water from Well 4 and Coal Creek Springs. The facility includes a new clearwell and pump station with 3 pumps that pump to Reservoir 1. The pump controls are based on the level in Reservoir 1. The Coal Creek Pump Station is still at the facility, but is no longer in service.

The Fulmer Treatment Facility was also added in the Valley to treat water from Wells 2, 6, and 7. The well flows are controlled based on the level in Reservoir 2. The wells discharge to the treatment facility clearwell, where a booster pump station containing 4 pumps conveys water from the clearwell to Reservoir 2.

There have been piping improvements made throughout the Valley Service Area. Some pipes have been replaced and/or upsized. New piping has been added to serve new developments, or to improve looping within the area.

#### 9.2.2.4 Lakeland Hills Service Area Improvements

The Terrace View Development has been added to the west side of Lakeland Hills. This area is served by a 12-inch transmission line running from the 630 zone down toward the Valley Service Area. There are several branch lines with PRV's along the transmission line to connect to the multifamily developments that have been constructed. A new pump station that is in design as a developer project has been added to the model for future system analyses, as well as a transmission line connecting the pump station to the Valley Service Area.

The fire pumps to the 697 boosted zone have trimmed impellers to meet the pressure and flow requirements for firefighting near the top of the hill. The pump curves for these pumps were measured in the field and adjusted in the model.

### 9.2.3 Model Controls

The control settings are summarized in Table 9.1.

### 9.2.4 Demands

The model was updated to include the projected demands for 2014 and 2028. Future growth and redevelopment is governed by the land use zoning. The land use spatial zoning is maintained in a geographic information system (GIS) shape file. The City planning department has a 20-year growth projection categorized by customer class, which is further broken down by service area. These were converted to equivalent residential units (ERU) based on the demands of each customer class relative to a single family residence. The average day demand (ADD) projected future demand for each ERU was 230 gallons per day (gpd), and maximum day demands (MDD) were calculated as 1.8 times the ADD. The projected leakage is 7.8 percent. The total demand was summed for each service area. The ERU's and leakage percent were distributed between the land uses zones within the GIS land use shape file.

Within the WaterCAD model Thessian polygons were generated around the existing demand nodes. The extent of new piping into currently undeveloped areas was not known when the model was loaded; therefore this area was assigned to polygons at the nearest node where new piping would likely begin. This approach approximates the impact of expansion on the existing system for analysis. The Thessian polygons were exported as a GIS shape file.

The Thessian polygon data was overlaid with the zoning shape file containing the ERU information. The total service area demand was distributed to each Thessian polygon based on the proportion of ERU's within each polygon. The polygons were then imported into WaterCAD and the polygon demand assigned to the respective node. This was done for the 2014 and 2028 population projections.

**Table 9.1 Existing Pump Stations Control Settings**
**Comprehensive Water Plan**
**City of Auburn**

| Facility | Supplies | Pump Number | Control | On | Off |
|---|---|---|---|---|---|
| Coal Creek Springs | Valley | | Reservoir 1 Level | 21 feet | 23 feet |
| Well 4 | Valley | | Reservoir 1 Level | 20 feet | 23.5 feet |
| Well 7 | Valley | | Reservoir 2 Level | 23 feet | 27 feet |
| Well 2 | Valley | | Reservoir 2 Level | 26 feet | 28.5 |
| Well 6 | Valley | | Reservoir 2 Level | 25 feet | 28 feet |
| Well 1 | Valley | | Reservoir 2 Level | 21 feet | 27.5 feet |
| Academy Pump Station 1 | Academy | 1 | Academy Reservoir Level | 60 feet | 68.8 feet |
| | | 2 | | 60 feet | 68.8 feet |
| Academy Pump Station 2 | Academy | 3 | Academy Reservoir Level | 63.5 feet | 69 feet |
| | | 4 | | 63.5 feet | 69 feet |
| Intertie | Lea Hill Boosted | | | | |
| Lea Hill Pump Station | Lea Hill Zone | 1 | Lea Hill Reservoir Level | 67 | 74.5 |
| | | 2 | | 67 | 74.5 |
| | | 3 | | 65 | 73 |
| Well 5 | Lakeland Hills | | Lakeland Hills Reservoir | 53 | 58.5 |
| Well 5a | Lakeland Hills | | Lakeland Hills Reservoir | 56 | 58.5 |
| Lakeland Hills Pump Station | Lakeland Hills Zone 5 | 1 | Zone Pressure and Demand | 52 psi | 0 gpm |
| | | 2 | | 48 psi | 10 gpm |
| | | 3 | | 44 psi | 180 gpm |
| | | 4 | | 39 psi | 300 gpm |
| | | 5 | | 37 psi | 400 gpm |
| | | 6 | | 35 psi | 500 gpm |

## 9.3 MODEL CALIBRATION

Once the water system components were added to the model, the model was calibrated to predict the system velocities and pressures: hydraulic test data was used for calibration. Model calibration serves as a check on model data such as pipe network information, system demands, pump curves, and valve operation information. Calibration is important to establish confidence that the model has sufficient accuracy to base capital improvement and operational decisions on the model results. Calibration includes checks on the following information:

- Check connectivity and completeness of infrastructure data.
- Make sure that the demands in each zone are correct.
- Check controls to make sure that pumps and control valves in the model are functioning in a manner similar to the way the actual components work.
- Once the above activities are completed, then the calibration process can be used to adjust friction factors.

Friction losses in a water system are caused by pipe roughness and fittings. Pipe roughness can vary over the life of the pipe and also varies by pipe material. In this model the Hazen-Williams equation was used to predict friction losses. This equation utilizes a loss coefficient C that provides an indication of pipe roughness. Higher values of C indicate lower energy losses per unit of pipe length, whereas lower values of C indicate more energy loss per unit of pipe. Table 9.2 summarizes typical Hazen-Williams C factors as reported in the WaterCAD help file. As a water main ages, the pipe roughness can increase, so C factors should be periodically checked and adjusted in the model.

**Table 9.2 Typical Hazen-Williams C Factors**
**Comprehensive Water Plan**
**City of Auburn**

| Material | Age/process | C |
|---|---|---|
| Asbestos Cement | | 140 |
| Cast-iron | New, unlined | 130 |
| | 10 yr. Old | 107-113 |
| | 20 yr. Old | 89-100 |
| | 30 yr. Old | 75-90 |
| | 40 yr. Old | 64-83 |
| Concrete or concrete lined | Steel forms | 140 |
| | Wooden forms | 120 |
| | Centrifugally spun | 135 |
| Copper | | 130-140 |
| Galvanized iron | | 120 |
| Plastic | | 140-150 |
| Steel | Coal-tar enamel, lined | 145-150 |
| | New unlined | 140-150 |
| | Riveted | 110 |

### 9.3.1 Field Tests

Field data for the actual system are obtained from hydrant flow tests where pressure at the hydrant is measured with the hydrant closed, to measure the static pressure. Then the hydrant is opened and allowed to flow and this flow is measured, while the pressure drop at adjacent hydrants is measured to obtain the residual pressure. The hydrant flow rate is then placed on the corresponding node in the computer model, and the model is balanced. The distribution system pressures are then compared with pressures predicted by the computer model to determine how well the model is predicting actual pressures. If the difference between model and actual pressures is excessive, then the model is reviewed for any data errors. If no errors can be identified, then C-factors may be adjusted to improve model predictions. The calibrated model pressures should be within plus or minus 10 percent of the measured pressures. This 10 percent allowance is needed to allow for instrumentation accuracy, and because the model represents a true static condition, but pressures and flows in the distribution system are changing continuously.

The City conducted 13 hydrant tests. The first 11 tests were conducted in April and May of 2008, and the last 2 tests were conducted in August 2008. The test locations were distributed throughout the system service areas. Figure 9.1 shows locations of the hydrant tests.

## 9.4 CALIBRATION RESULTS

The final results of modeling the 13 hydrant test conditions are summarized in Table 9.3. These tests were run using the ADD for 2008 from the previous CIP for the first 11 locations and at MDD for the last 2 locations. There is a good correlation between measured pressures and predicted pressures for most of the hydrant locations. Only one static pressure and one residual pressure were greater than the 10 percent tolerance. Only a few pipes required adjustments to the C-factors. New pipes were assigned a C factor of 130. The following subsections discuss the changes that were made to the model in each service area.

### 9.4.1 Lakeland Hills Service Area Calibration

The hydrant data initially showed that the Lakeland Hills booster pump curves were off in the model, as the impellers had been trimmed. Therefore, new pump curves were measured in June. Calibration also showed that the fitting losses needed to be included on the discharge side of the pumps. The model comparison was very good with these changes.

### 9.4.2 Academy Service Area Calibration

The pressure zones in this area have been reconfigured since the last plan. The model showed up to 11.4 percent difference for some of the conditions in this area for Test Number 7. There are parallel PRVs at the stations, including a primary small PRV with a higher setting for normal conditions, and larger secondary PRV with a lower setting that is used to pass more water during a fire.

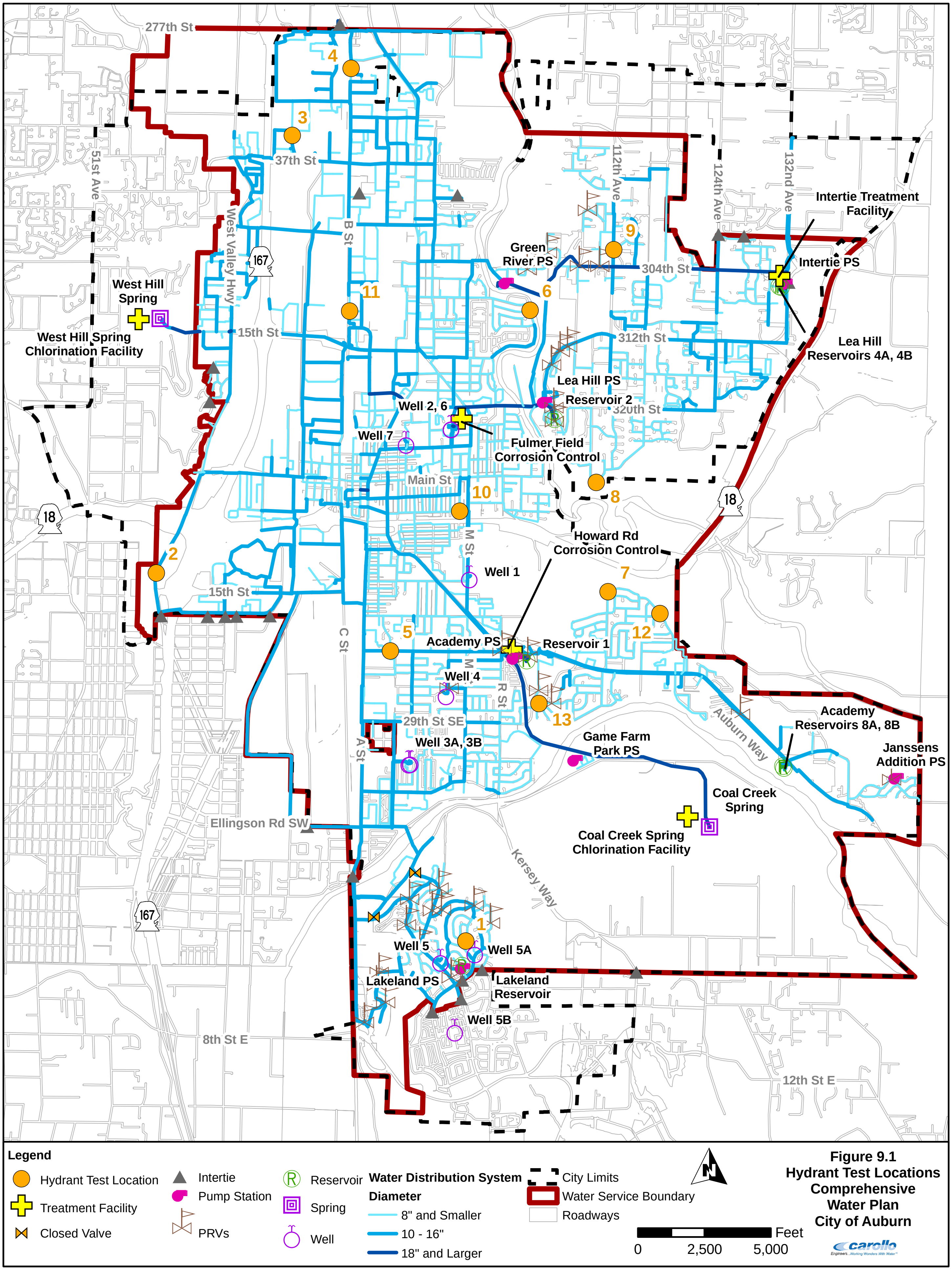



**Figure 9.1**
**Hydrant Test Locations**
**Comprehensive Water Plan**
**City of Auburn**

**Table 9.3 Hydraulic Model Calibration Locations**
**Comprehensive Water Plan**
**City of Auburn**

| Test Number: Location | Service Area | Hydrant Test Month/ Year | Hydrant Test Hydrant No. | Hydrant Test Flow (gpm) | Node in Model | Static Pressure Field[1] (psi) | Static Pressure Model (psi) | Static Pressure Percent Diff. | Residual Pressure Field[2] (psi) | Residual Pressure Model (psi) | Residual Pressure Percent Diff. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1: 5428 Nathan Ave SE | Lakeland Hills | 4/2008 | 1733 | 1720 | J-1110 | 64 | 62.4 | -2.6 | 55.5 | 60.0 | 7.4 |
| 2: Perimeter Road | Valley | 5/2008 | 2373 | 1931 | J-5190 | 69 | 70.9 | 0.7 | 62.5 | 65.3 | 4.3 |
| 3: I ST North of 37th ST NW | Valley | 5/2008 | 1676 | 2014 | J-899 | 86 | 83.9 | -4.4 | 83.0 | 78.0 | -6.4 |
| 4: 4710 B ST NW | Valley | 5/2008 | 2572 | 2094 | J-1348 | 86 | 85.5 | -2.4 | 82.0 | 77.9 | -5.3 |
| 5: 2025 C ST SE | Valley | 5/2008 | 1427 | 1843 | J-231 | 63 | 64.8 | 0.8 | 60.0 | 61.1 | 1.7 |
| 6: 1720 Riverview DR NE | Valley | 5/2008 | 688 | 1987 | J-527 | 80 | 78.6 | -2.4 | 74.0 | 67.4 | -9.9 |
| 7: 1302 Dogwood ST SE | Academy | 5/2008 | 684 | 1588 | J-21 | 81 | 90.6 | 2.5 | 59.0 | 53.0 | -11.4 |
| 8: 32724 111th PL SE | Lea Hill | 5/2008 | 1395 | 2171 | J-1624 | 100 | 98.1 | -1.7 | 84.0 | 75.3 | -9.6 |
| 9: 112th Ave SE | Lea Hill | 5/2008 | 49 | 1873 | J-1551 | 66 | 63.5 | -2.5 | 65.0 | 65.9 | 1.3 |
| 10: 326 L ST SE | Valley | 5/2008 | 417 | 1688 | J-317 | 68 | 68.4 | -1.2 | 63.5 | 65.6 | 3.1 |
| 11: 1808 B ST NW | Valley | 5/2008 | 2447 | 2068 | J-1443 | 82 | 80.7 | -3.4 | 78.0 | 77.2 | -1.1 |
| 12: 3345 Scenic Dr SE | Academy | 8/2008 | 498 | 1622 | J-698 | 64 | 72.2 | 11.4 | 48.0 | 48.8 | 1.6 |
| 13: 2715 V CT SE | Academy | 8/2008 | 2223 | 1814 | J-1620 | 80 | 75.5 | -0.6 | 53.0 | 48.4 | -9.5 |

Notes:
(1) Static pressure reported for test hydrant.
(2) Average of residual pressure reported for two adjacent hydrants.

The hydrant test conditions require the secondary PRV to be open. The model only used a single PRV. An effort was made to balance the static and residual pressures with satisfactory results.

### 9.4.3 Lea Hill Service Area Calibration

The two test points in the Lea Hill Service Area compared reasonably well. The model under-predicted the static pressure for Test Number 8. The model nodes do not correspond with the exact hydrant location. Therefore, there may be a slight elevation variation between the hydrant measurement location and model junction location.

### 9.4.4 Valley Service Area Calibration

All of the points tested compared very well in the Valley Service Area. The largest difference was 6.4 percent, but most points were within 2 or 3 percent.

## 9.5 MODEL MAINTENANCE RECOMMENDATIONS

The model should be updated periodically depending on system changes to make sure that it provides a 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.

Hydrant tests should be conducted every year to verify the accuracy of the model and aid in monitoring system changes.

There are a number of applications for a current model that could benefit the City. These applications include:

- Evaluating the ability of the network to supply new developments.
- Fire analysis for proposed developments.
- Evaluating alternative supply and operating scenarios.
- Determine the impact of critical main failures.
- Estimating water age as a predictor of water quality.

## 9.6 DISTRIBUTION SYSTEM EVALUATION

### 9.6.1 Existing System

The water distribution network was evaluated using demands that have been estimated for the 6-year and 20-year planning period. The estimated increase in population was distributed based on the current land use and the corresponding increase in water demand was added to the model. Key improvements that were required to operate the system in the future were also added to the model. These included the new supply sources, the proposed Terrace View pump station, the new tank at Lakeland Hills, the expanded Lakeland Hills booster pump station, expansion of the Lea Hill boosted zone, and the new Academy booster pump station.

The model was used to determine distribution system deficiencies that would need to be resolved to supply demands in the 6 and 20-year planning period. To satisfy the City's criteria, the system should be able to maintain pressures between 35 psi and 80 psi at all times except during a fire. The velocity in transmission and distribution mains should be less than 8 ft/s. The system needs to provide fire flow under MDD, while maintaining a minimum pressure of 20 psi or greater.

The City's fire flow requirements are 1,500 gallons per minute (gpm) for residential areas and 2,500 gpm for all other land use areas except City parks and open spaces. Figure 9.2 shows the hydrants that need to provide 1,500 gpm and the hydrants that need to provide 2,500 gpm. There are specific buildings requiring larger fire flows up to 4,000 gpm. These locations are shown in Figure 9.3, and the required flows at each address are listed in Table 9.4. These sites included manufacturing sites, retirement communities, a casino, and some schools.

## 9.7 6-YEAR PLANNING SCENARIO

For the six-year scenario, the model included the minimum additional infrastructure needed to operate the system and still satisfy the City's performance criteria. Table 9.5 summarizes these assumptions.

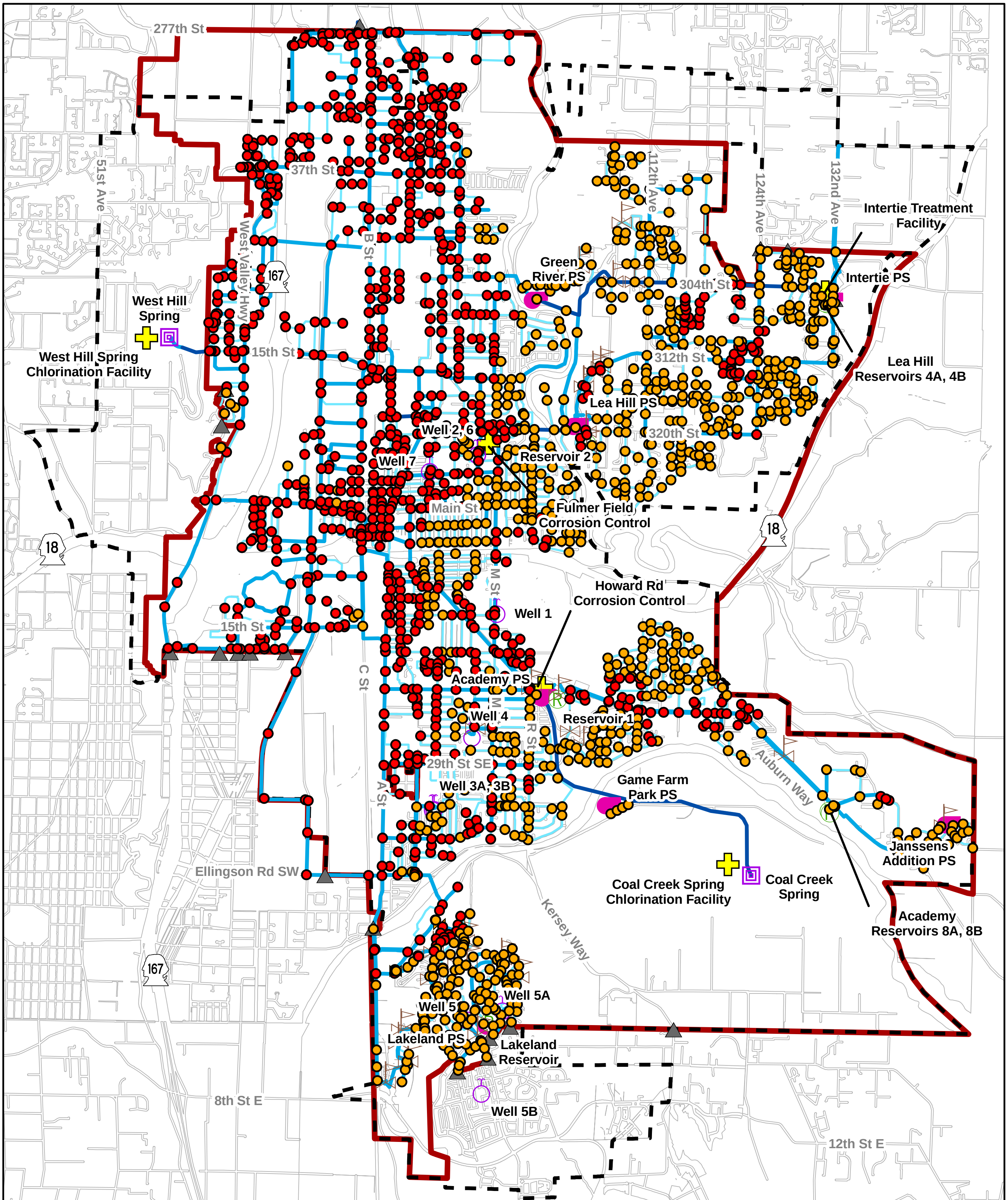
### 9.7.1 Pressure and Velocity Analysis

The model was run during MDD condition in 2014 to identify locations where the pressure was inadequate. For the analysis the tank levels were set near the bottom of the fire volume. Figure 9.4 identifies nodes below 35 pounds per square inch (psi) and above 80 psi, the target pressure range. The model was also used to determine if any of the distribution pipes had a velocity that exceeded the maximum velocity criteria of 8 ft/s. Figure 9.5 highlights mains where the velocity criteria are exceeded during MDD conditions.

In the Valley, the Gains Park area on the west side of the service area, near Lakehaven Water and Sewer District, has pressures below 35 psi. Gains Park extends up the ridge from the Valley near elevation 66 feet, to a high point of 158 feet, and is located relatively far from the tanks. To meet the pressure criteria, either a booster pump station would be required, or the area should be moved to the adjacent Lakehaven Water and Sewer District. The northern portion of the Valley has high pressures due to being generally a little lower than the central valley area and well looped. Decreasing the pressure would be difficult due to the system looping.

**Table 9.4 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 |




**Legend**

**Required Available Fire Flow**
- 1,500 gpm
- 2,500 gpm

- Treatment Facility
- Closed Valve
- PRVs
- Intertie
- Pump Station
- Well
- Spring
- Reservoir

**Water Distribution System Diameter**
- 8" and Smaller
- 10 - 16"
- 18" and Larger

- City Limits
- Retail Water Service Area
- Roadways

Feet
0 2,500 5,000

**Figure 9.2**
**Required Available Fire Flow**
**Comprehensive Water Plan**
**City of Auburn**

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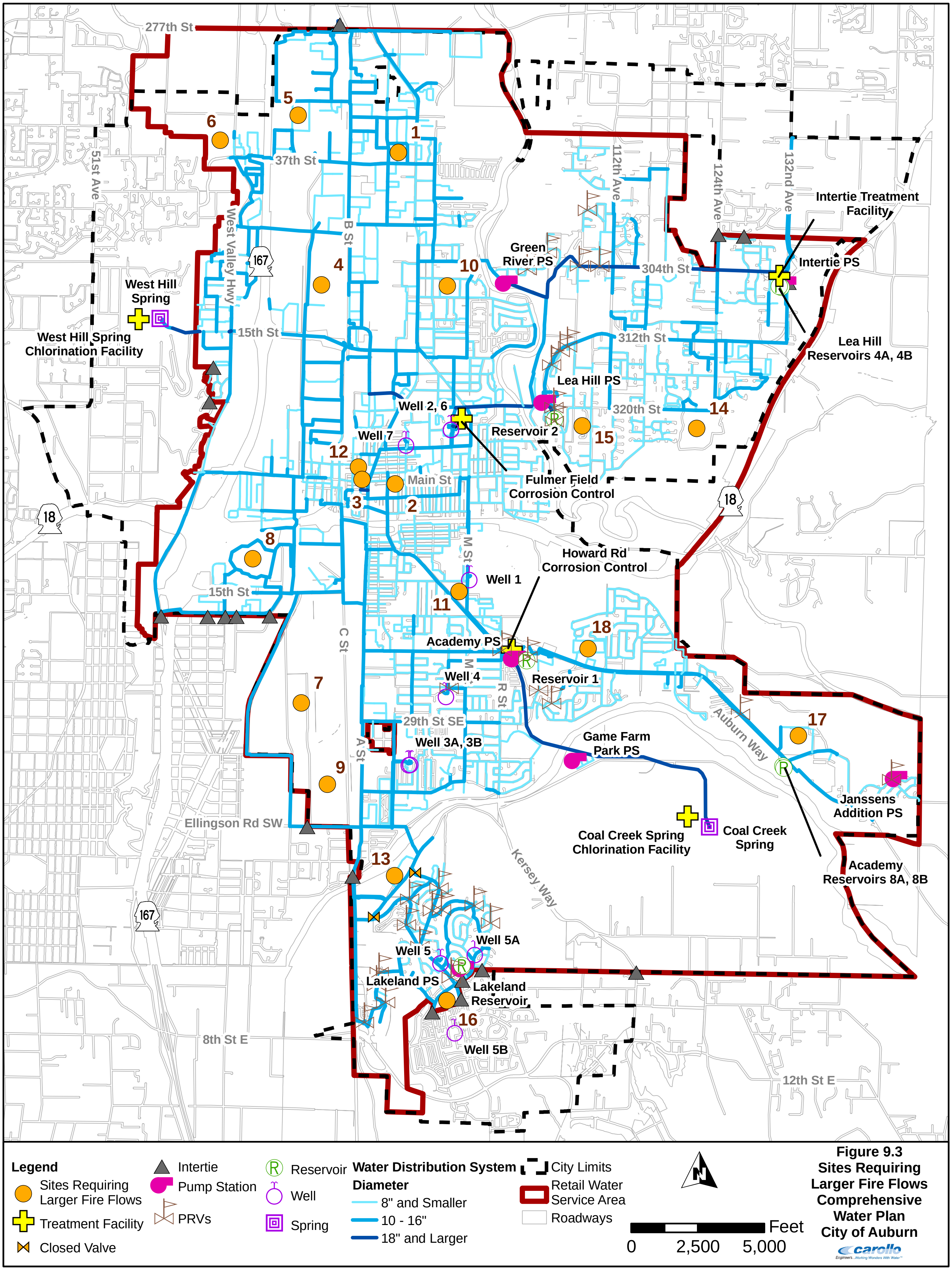


**Figure 9.3**
**Sites Requiring Larger Fire Flows**
**Comprehensive Water Plan**
**City of Auburn**

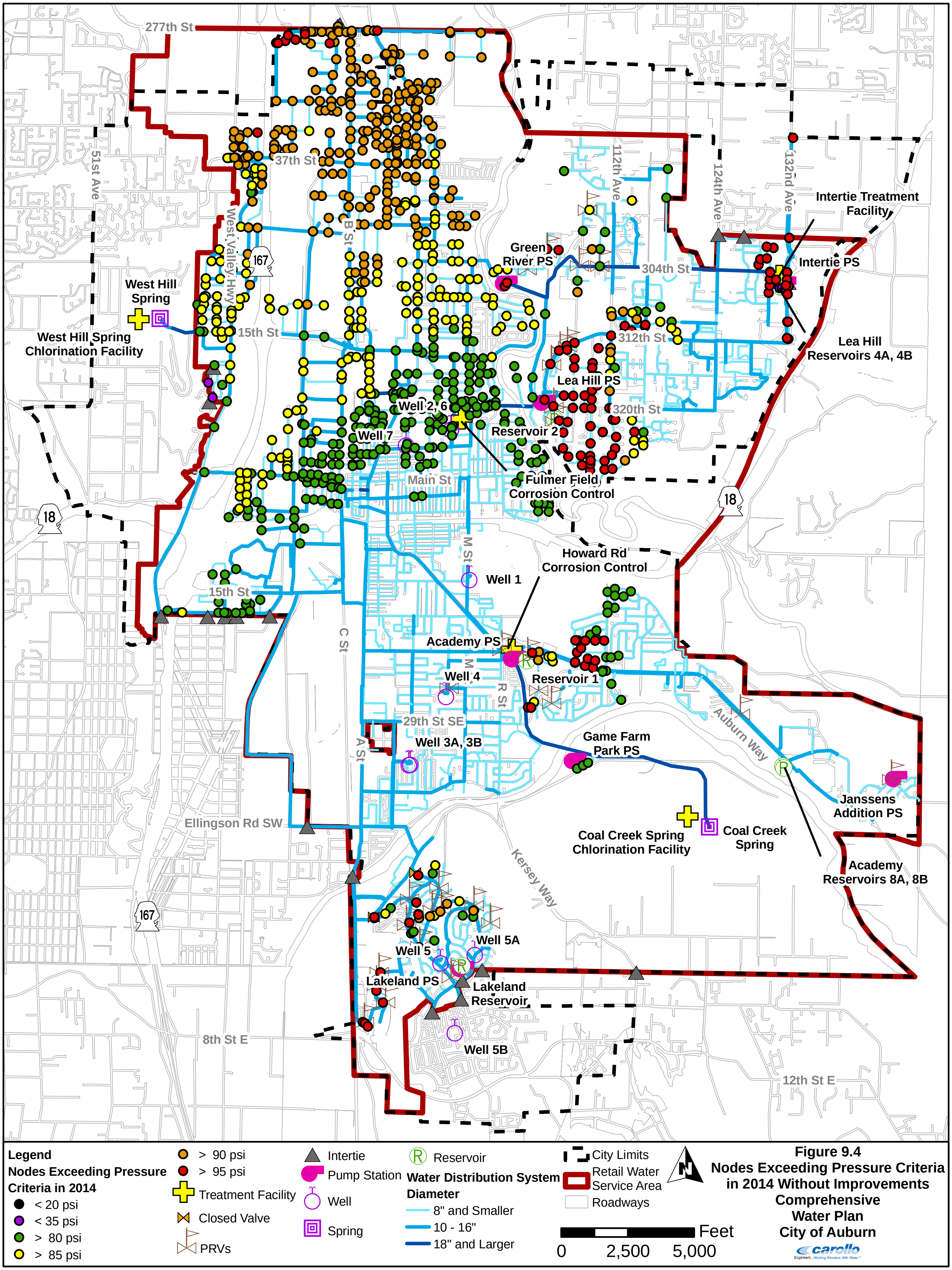


**Figure 9.4**
**Nodes Exceeding Pressure Criteria in 2014 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

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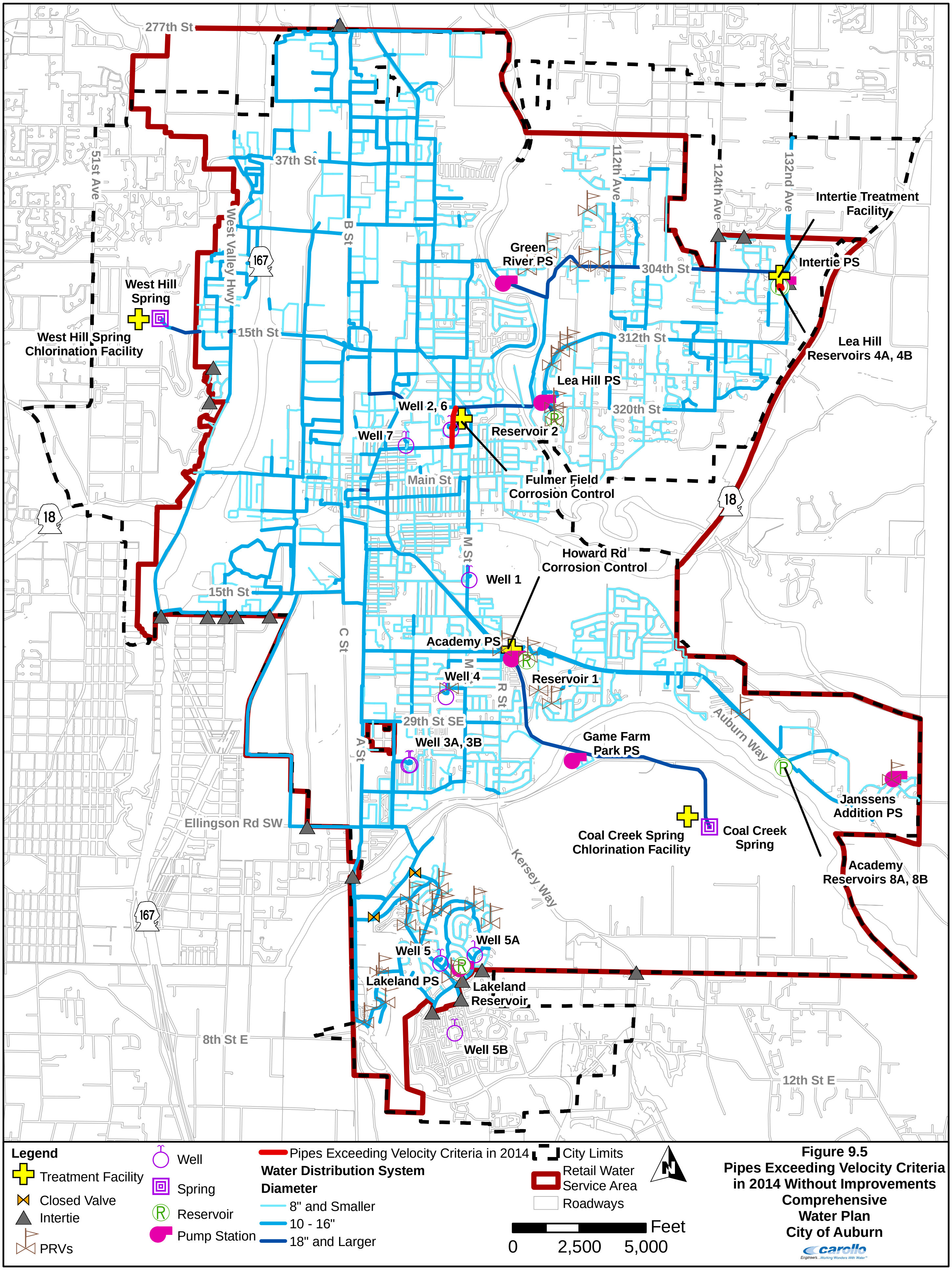





**Figure 9.5**
**Pipes Exceeding Velocity Criteria in 2014 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

carollo

| Table 9.5 | 6-year Planning Scenario Improvement Assumptions<br>Comprehensive Water Plan<br>City of Auburn | |
|---|---|---|
| **Category** | **Improvement** | **Added Firm / Reliable Capacity** |
| Pumping | Lakeland Hills Booster Pump Station expansion | 1,600 gpm |
| | Terrace View Pump Station | 1,000 gpm |
| | Green River Pump Station back-up power | 3,500 gpm |
| Storage | New Lakeland Hills Reservoir | 1.0 mg |
| Supply | Well 1 Improvement | 3.2 mgd |
| | Purchased Water | 2 x 1.35 mgd |

The transmission piping leading from the Fulmer treatment facility to the Valley distribution system has high velocity, which can be addressed with parallel transmission piping.

In Lea Hill there are nodes with pressure below 35 psi near the Lea Hill reservoirs. The reservoirs are not very high relative to the surrounding terrain; a booster pumps station already serves some of the area. The pressure can be improved by expanding the boosted zone, which would require changing the closed valves and increasing the fire pump capacity at the booster pump station. The lower part of Lea Hill has high pressures, which could be improved by increasing the number of pressure zones below the Lea Hill 563 zone. Some of the piping in the vicinity of the Lea Hill reservoirs has high velocity.

The Academy Service Area has some nodes with high pressures. The highest pressures are at the Casino and are intended to be high for fire flow. The majority of the high-pressure nodes fall between 80 and 85 psi, which is acceptable. There are also a few nodes at the lowest point in the service area that are high. These could be improved by adjusting PRV's.

Lakeland Hills has a node with pressures below 35 psi. There are also high pressures in the zone. The low pressure can be improved by slightly expanding the boosted zone. In addition, the package pumps in the existing booster pump station should be evaluated so the fire pump is not required to meet max day operating conditions. The high-pressure area can be addressed by adjusting PRV settings.

### 9.7.2 Fire Flow Analysis

The model was run to evaluate the system fire flow capabilities. Modeling assumed that a new Academy boosted zone has been created, as well as improvements to the Lakeland Boosted zone. The tank levels were lowered to a level near the bottom of the fire storage. Figure 9.6 shows nodes that do not meet the 1,500 gpm and 2,500 gpm minimum fire requirements. The results of the higher fires are summarized in Table 9.6.

The higher fire requirements can be met everywhere in the Valley. There are cul-de-sac's and areas with 4 and 6-inch mains where the 1,500 or 2,500 gpm fire requirements cannot be met. All of these deficiencies can be met with piping changes and modifications to the Gains Park development.

In the Lea Hill Service Area, there are nodes near the boosted zone that do not meet the fire flow requirements, as well as an area in the northern part of the service area and part of the boosted area. The fire requirements can be met in the tank served area with piping improvements. A fire pump will need to be added to the boosted zone to meet the fire requirements at the station firm capacity.

In the Academy Service Area there are points that do not meet the minimum fire requirements. The Janssens Addition had flows of approximately 700 gpm during preliminary analysis, therefore a new booster pump station is proposed and was included in modeling.

**Table 9.6 Fire Flow Test Locations 2014 Check without Piping Modifications**
**Comprehensive Water Plan**
**City of Auburn**

| Test No. | Location | Service Area | Flow Required (gpm) | Flow Available (gpm) |
|---|---|---|---|---|
| 1 | RPS Distribution Center | Valley | 4,000 | 5,000+ |
| 2 | Justice Center | Valley | 2,250 | 4,000+ |
| 3 | New Annex Building | Valley | 2,500 | 4,000+ |
| 4 | Emerald Downs | Valley | 3,000 | 3,360 |
| 5 | Panattoni Warehouse | Valley | 4,000 | 5,000+ |
| 6 | Span Alaska | Valley | 3,125 | 4,000+ |
| 7 | AMB Valley Distribution Center | Valley | 4,000 | 4,400 |
| 8 | Super Mall | Valley | 2,000 | 5,000+ |
| 9 | Safeway Distribution Center | Valley | 2,000 | 4,400 |
| 10 | Auburn Meadows Sr. Housing | Valley | 2,375 | 4,000+ |
| 11 | Grace Community Church | Valley | 3,750 | 4,000+ |
| 12 | Auburn RMC Bed Tower Addition | Valley | 1,750 | 4,000+ |
| 13 | Riverside High School | Valley | 3,000 | 3,250 |
| 14 | Green River Community College | Lea Hill | 2,250 | 5,000 |
| 15 | Wesley Homes Sr. Housing | Lea Hill | 4,000 | 4,500 |
| 16 | Auburn Elementary School @ Lakeland | Lakeland Hills | 3,125 | 2,500 |
| 17 | Academy Campus | Academy | 4,000 | 2,600 |
| 18 | MIT Casino Expansion | Academy | 2,625 | 3,400 |

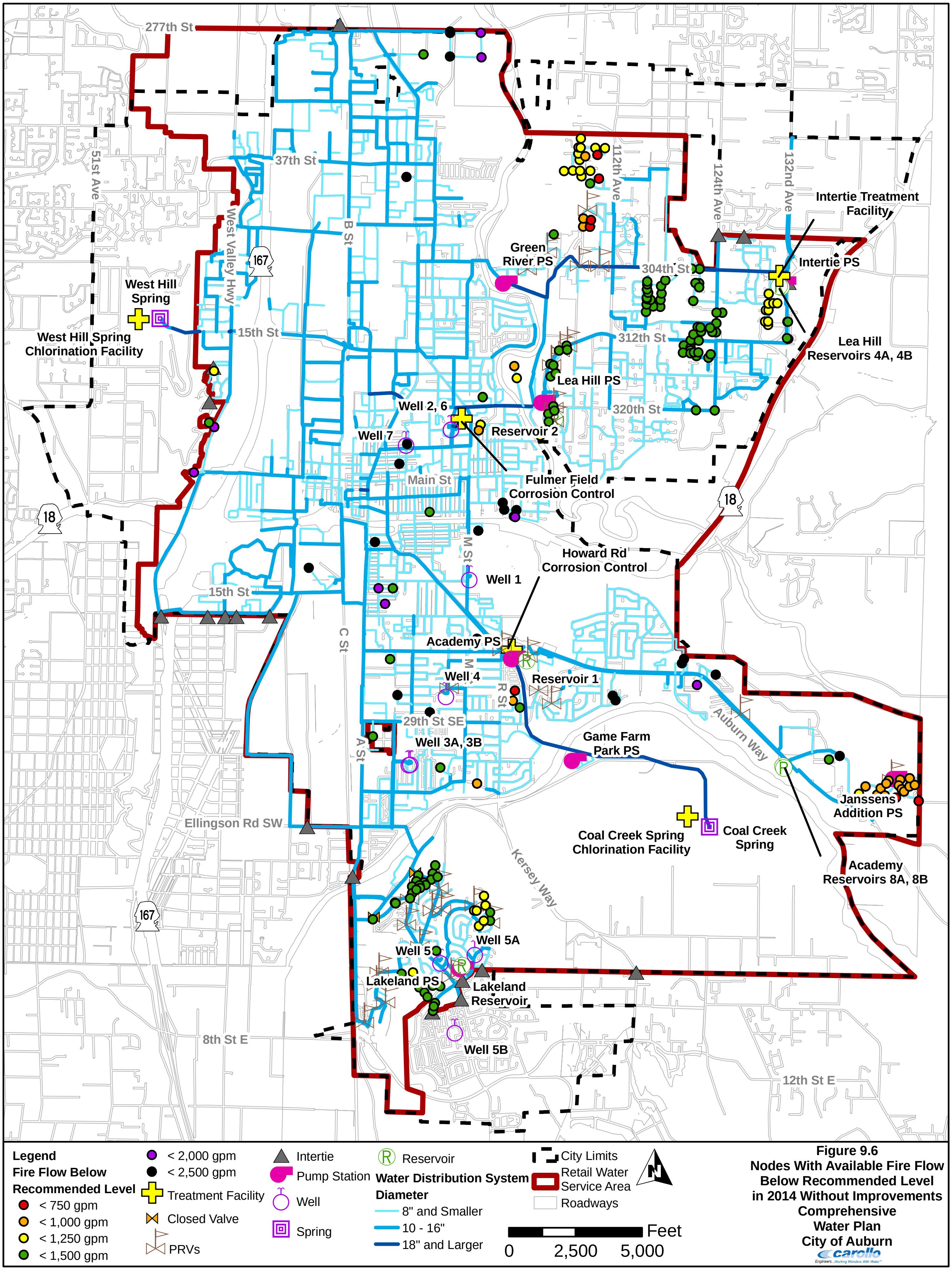



**Figure 9.6**
**Nodes With Available Fire Flow Below Recommended Level in 2014 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

There is also a fire flow deficiency at the Academy campus. All of the deficiencies can be addressed with piping improvements after the new booster pump station is constructed.

The Lakeland Hills Service Area included additional fire pumps that will be installed as part of the booster pump station upgrade under design, as well as the proposed new tank. Without the tank some nodes do not meet the minimum 20 psi requirement during a fire, therefore the model cannot complete a fire analysis without the tank. Additional fire pumps were added to the station, as the booster pump station did not have sufficient capacity to meet the fire requirement at Auburn Elementary in 2014 without the new pumps. There were points lower in the zone that could not meet the minimum fire requirements. Most of these could be addressed with PRV adjustments. The upgraded booster pump station did not completely meet the fire requirements at Auburn Elementary school, one piping change was also required.

## 9.8 20-YEAR PLANNING SCENARIO

The minimum required improvements for the 2028 scenario to run were incorporated into the model. This included improvement of Coal Creek Springs to add an additional supply of 3.1 mgd.

### 9.8.1 Pressure and Velocity Analysis

The model was run during MDD condition in 2028. The tank levels were lowered to the bottom of the fire volume. Figure 9.7 identifies nodes below 35 psi and above 80 psi in 2028. Figure 9.8 highlights piping with high velocities.

The pressure distribution in the Valley follows the same trends as observed for the 2014 scenario. Gains Park has low pressure, and the northwestern part of the valley has high pressures, as observed in the 2014 scenario. The transmission piping from Fulmer Field has velocities greater than 8 ft/s.

A few model nodes near the Lea Hill reservoir are below 20 psi, there area also areas with pressure below 35 psi near the Lea Hill boosted zone. The southwest part of Lea Hill has high pressures. The pressures in these areas outside of criteria can be addressed by both expansion of the boosted zone and creation of a new pressure zone near the valley.

The Academy Service and Lakeland Hills Service Areas shows similar pressure trends as observed in the 2014 scenario. The pressures are either close to the target levels, or could be improved with changes in the PRV settings. In addition, the boosted zone in Lakeland Hills would have nodes below 35 psi, but one of the fire pumps comes on to meet the pressure requirements.

### 9.8.2 Fire Flow Analysis

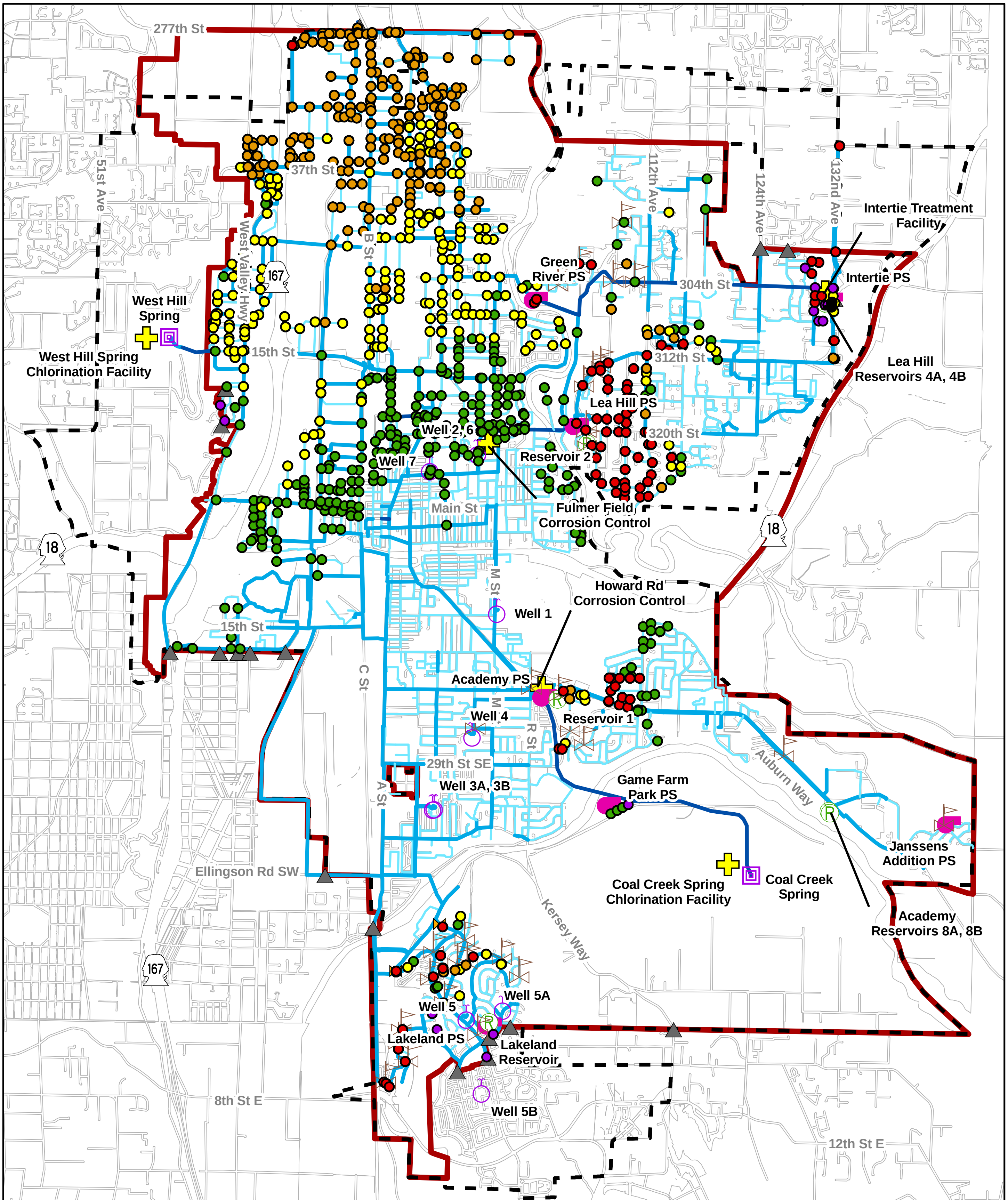
The junctions with less that the minimum fire requirements are highlighted Figure 9.9. The results of the higher fire flow tests are summarized in Table 9.7.

As observed in the 2014 scenario, the required fire flows are generally available throughout the Valley Service Area, except for some cul-de-sac's and some areas with 4 and 6-inch mains. All of the higher fire flows are available. As previously observed, these deficiencies can be met with piping changes and a change to Gains Park development.

In the Lea Hill Service Area, there are nodes near the reservoirs that are connected to hydrants that do not have 20 psi. Fire analysis is not possible when pressures are below 20 psi. These hydrants were assumed to be moved to an expanded boosted zone to evaluate the rest of the service area. The minimum fire requirement deficiencies were similar to those observed in the 2014 scenario and can be addressed with piping improvements. There was not sufficient flow available for the larger fires. Piping improvement and expansion of the boosted zone can address these deficiencies.

**Table 9.7 Fire Flow Test Locations 2028 Check without Piping Modifications**
**Comprehensive Water Plan**
**City of Auburn**

| Test No. | Location | Service Area | Flow Required (gpm) | Flow Available (gpm) |
|---|---|---|---|---|
| 1 | RPS Distribution Center | Valley | 4,000 | 5,000+ |
| 2 | Justice Center | Valley | 2,250 | 4,000+ |
| 3 | New Annex Building | Valley | 2,500 | 4,000+ |
| 4 | Emerald Downs | Valley | 3,000 | 3,200 |
| 5 | Panattoni Warehouse | Valley | 4,000 | 4,800 |
| 6 | Span Alaska | Valley | 3,125 | 4,000+ |
| 7 | AMB Valley Distribution Center | Valley | 4,000 | 4,200 |
| 8 | Super Mall | Valley | 2,000 | 5,000+ |
| 9 | Safeway Distribution Center | Valley | 2,000 | 4,200+ |
| 10 | Auburn Meadows Sr. Housing | Valley | 2,375 | 4,000+ |
| 11 | Grace Community Church | Valley | 3,750 | 3,960 |
| 12 | Auburn RMC Bed Tower Addition | Valley | 1,750 | 4,000+ |
| 13 | Riverside High School | Valley | 3,000 | 3,690 |
| 14 | Green River Community College | Lea Hill | 2,250 | 2,600 |
| 15 | Wesley Homes Sr. Housing | Lea Hill | 4,000 | 2,200 |
| 16 | Auburn Elementary School @ Lakeland | Lakeland Hills | 3,125 | 1,450 |
| 17 | Academy Campus | Academy | 4,000 | 2,660 |
| 18 | MIT Casino Expansion | Academy | 2,625 | 2,110 |




**Legend**

**Nodes Exceeding Pressure Criteria in 2028**

- < 20 psi
- < 35 psi
- > 80 psi
- > 85 psi
- > 90 psi
- > 95 psi

Treatment Facility
Closed Valve
PRVs
Intertie
Pump Station
Well
Spring
Reservoir

**Water Distribution System Diameter**

- 8" and Smaller
- 10 - 16"
- 18" and Larger

City Limits
Retail Water Service Area
Roadways

Feet
0 2,500 5,000

**Figure 9.7**
**Nodes Exceeding Pressure Criteria in 2028 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

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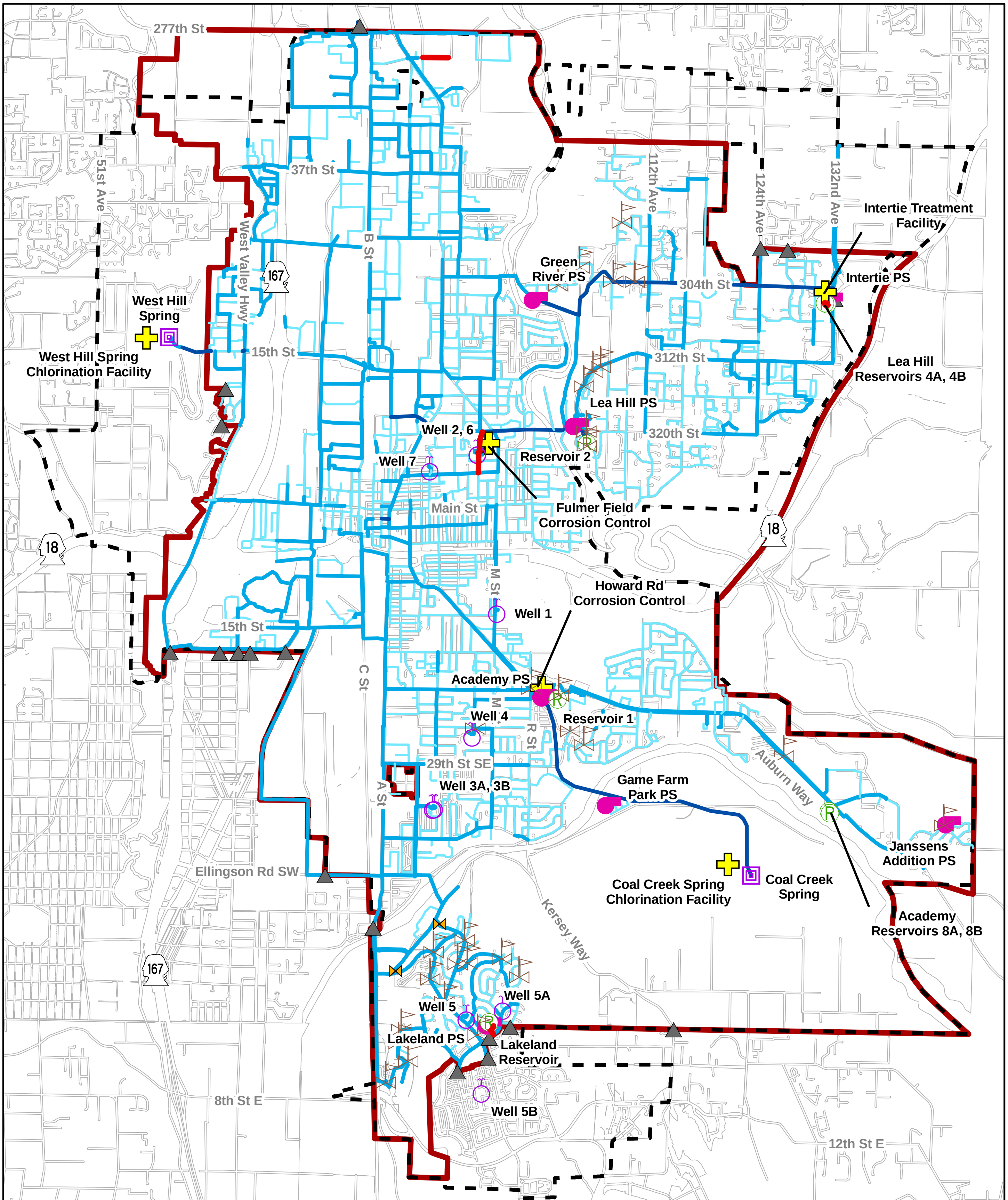


**Legend**

- Treatment Facility
- Closed Valve
- Intertie
- PRVs
- Well
- Spring
- Reservoir
- Pump Station
- Pipes Exceeding Velocity Criteria in 2028

**Water Distribution System Diameter**

- 8" and Smaller
- 10 - 16"
- 18" and Larger

- City Limits
- Retail Water Service Area
- Roadways

N

Feet

0 2,500 5,000

**Figure 9.8**
**Pipes Exceeding Velocity Criteria in 2028 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

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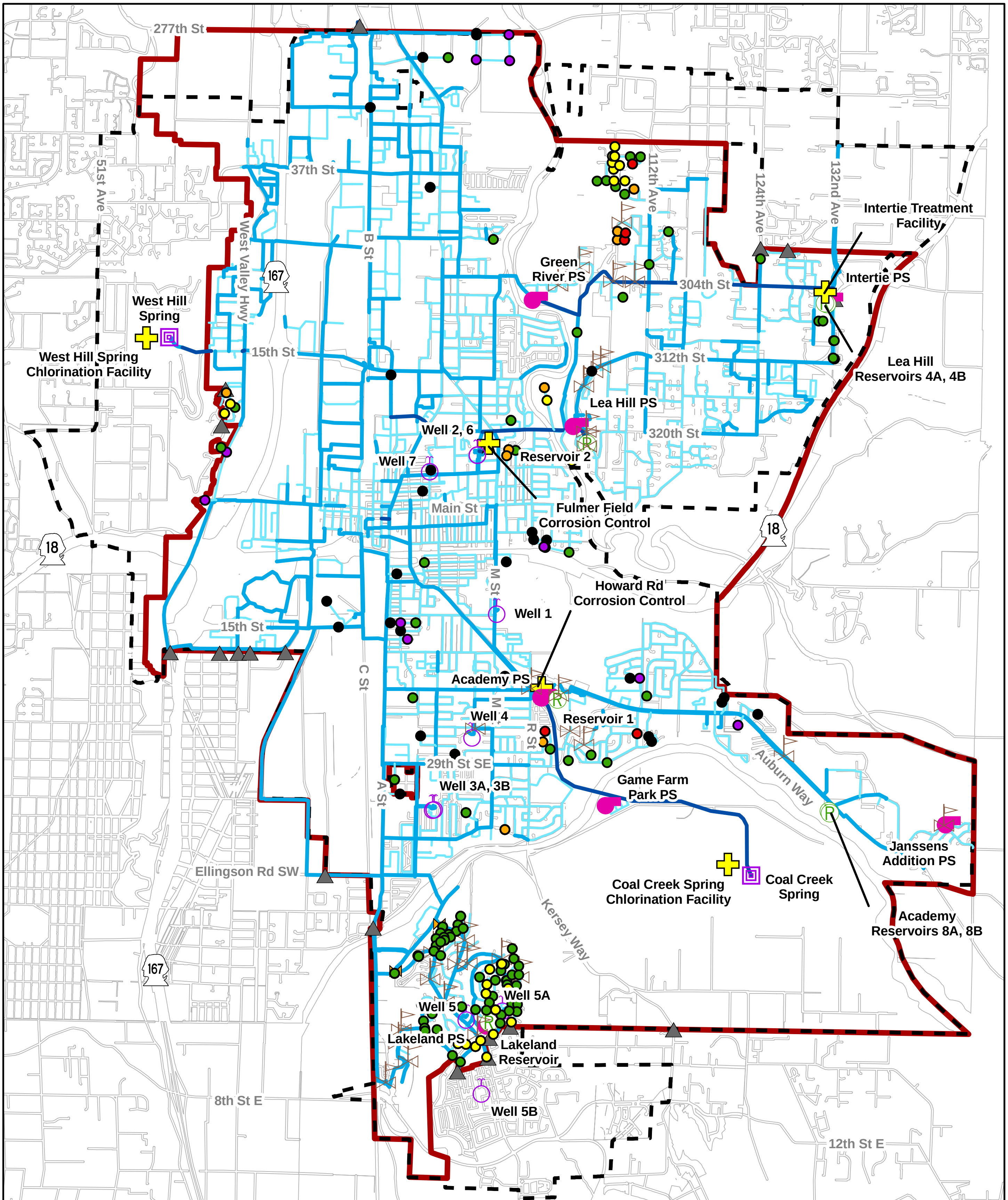


**Legend**

**Fire Flow Below Recommended Level**

- < 750 gpm
- < 1,000 gpm
- < 1,250 gpm
- < 1,500 gpm
- < 2,000 gpm
- < 2,500 gpm

Treatment Facility

Closed Valve

PRVs

Intertie

Pump Station

Well

Spring

Reservoir

**Water Distribution System Diameter**

- 8" and Smaller
- 10 - 16"
- 18" and Larger

City Limits

Retail Water Service Area

Roadways

Feet

0 2,500 5,000

**Figure 9.9**
**Nodes With Available Fire Flow Below Recommended Level in 2028 Without Improvements**
**Comprehensive Water Plan**
**City of Auburn**

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There are some points within the Academy Service Area that do not meet the fire requirements. The deficiencies were so high in Janssens Addition in 2014, modeling assumed that the proposed booster pump station had been installed. Other fire deficits were similar to those previously observed. The Academy Campus and Casino did not have sufficient higher flows available, but these could be met with piping improvements.

There are a number of hydrants within the Lakeland Hills Service Area that provide fire flows between 1,250 and 1,500 gpm. At this time these can be addressed with PRV changes and will need to be evaluated in the future. A thorough review of the proposed reservoir should include further analysis of the projected population growth to verify the new reservoir can meet fire requirements at build-out.

## 9.9 SYSTEM IMPROVEMENTS FOR FIRE, PRESSURE, AND VELOCITY

Hydraulic analysis showed a number of improvements were required to deliver water that meets the City’s polices. The model included the proposed future water supply from purchasing water, as well as increasing the supply from Well 1 and Coal Creek Springs.

The piping improvements needed to meet fire, pressure and velocity requirements are summarized in Table 9.8. The Lea Hill boosted zone needs to be expanded to meet pressure requirements near the reservoirs, which will require addition of a fire pump to meet firm capacity during a fire in the boosted zone. The lower part of Lea Hill should also be rezoned to lower pressures on the hill near the Valley. The Academy Service Area requires fire pumps to meet fire criteria in the Janssen’s Addition area. Additional storage is required in Lakeland Hills to meet minimum pressures within the service area following a fire. Larger fire pumping capacity is required in the Lakeland Hills boosted zone to meet MDD and a large fire at a school in the boosted pressure zone.

Table 9.8 **Piping Improvements**
**Water Comprehensive Plan**
**City of Auburn**

| Year | Area | Type of Improvement | Existing Size (in) | New Size (in) | Pipe Length, ft | Classification | Description/Location |
|---|---|---|---|---|---|---|---|
| 2014 | Valley | New Pipe | 12 | 12 | 700 | Pipe Capacity | Along K from Fulmer Clearwell north to 8th and south to 4th |
| 2014 | Valley | New Pipe | 12 | 20 | 710 | Pipe Capacity | Along K from Fulmer Clearwell north to 8th and south to 4th |
| 2028 | Valley | New Pipe | 20 | 18 | 755 | Pipe Capacity | from 8th & R street to Reservoir 2 |
| 2014 | Lakeland | Replace | 8 | 12 | 334 | Pipe Capacity | From Lakeland PS to Evergreen way |
| 2014 | Valley | Replace | 6 and 4 | 8 | 1235 | Fire Flow | Along S and T from R to 26th |
| 2014 | Valley | New Pipe | | 8 | 134 | Fire Flow | Along 13th ST SE from B street to C street |
| 2014 | Valley | New Pipe | | 8 | 1074 | Fire Flow | From 8th Street south on the west side of C street |
| 2014 | Valley | New Pipe | | 8 | 495 | Fire Flow | Along 37th ST SE from M to O |
| 2014 | Valley | Replace | 6 | 8 | 572 | Fire Flow | Along B street south from 29th ST |
| 2014 | Valley | Replace | 4 | 8 | 155 | Fire Flow | From D street and 22nd St SE, to the west |
| 2014 | Valley | Replace | 6 | 8 | 1805 | Fire Flow | From West Main St to Kinckerbocer Drive along West Valley Highway North |
| 2014 | Valley | Replace | 4 | 8 | 406 | Fire Flow | In apartment complex North of 8th Street Between Havey and Pike |
| 2014 | Valley | Replace | 6 | 8 | 249 | Fire Flow | Along 15th Street, East of B Street |
| 2014 | Valley | New Pipe | | 10 | 998 | Fire Flow | along 49th, east from G street |
| 2014 | Valley | Replace | 6 | 10 | 896 | Fire Flow | along 49th between D and G streets |
| 2014 | Valley | Replace | 4 | 8 | 520 | Fire Flow | along R street and 4th, south of 3rd |
| 2014 | Valley | Replace | 6 | 8 | 439 | Fire Flow | along R street and 4th, south of 3rd |
| 2014 | Valley | Replace | 6 | 10 | 304 | Fire Flow | along R street and 4th, south of 3rd |
| 2014 | Valley | New Pipe | | 8 | 500 | Fire Flow | from M street east in 600 block to apartment hydrant |
| 2014 | Valley | Replace | 4 | 8 | 171 | Fire Flow | along E street from 4th to Park |
| 2014 | Valley | Replace | 6 | 8 | 235 | Fire Flow | along 2nd from E to D |
| 2014 | Valley | Replace | 4 | 8 | 294 | Fire Flow | along 7th from A to B |
| 2014 | Valley | Replace | 6 | 8 | 398 | Fire Flow | along View Drive, west of W Valley Highway |
| 2014 | Valley | Replace | 6 | 8 | 347 | Fire Flow | along 35th ST NE, west of Auburn Way N |
| 2014 | Valley | Replace | 6 | 8 | 682 | Fire Flow | along 28th St SE from F street to I street |
| 2014 | Valley | Replace | 6 | 8 | 880 | Fire Flow | along 27th ST SE from F St to D St |
| 2014 | Valley | Replace | 6 | 10 | 468 | Fire Flow | at the Gildorey Elementary School |
| 2014 | Valley | Replace | 6 | 8 | 1072 | Fire Flow | along Garden Ave, north of SE 320th ST |
| 2014 | Valley | Replace | 6 | 8 | 1250 | Fire Flow | along Green River Blvd, south of SE 320th ST |
| 2014 | Valley | Replace | 4 | 8 | 1090 | Fire Flow | along N street from 2nd to 5th |
| 2014 | Valley | Replace | 4 | 8 | 538 | Fire Flow | Along 13th from A to B |
| 2014 | Valley | New Pipe | | 8 | 507 | Fire Flow | along 6th east of M |
| 2014 | Lea Hill | Replace | 4 | 8 | 495 | Fire Flow | Along 111th and 291st, south from 290th |
| 2014 | Lea Hill | Replace | 4 | 8 | 510 | Fire Flow | Along 111th from 295th to 294th |
| 2014 | Lea Hill | Replace | 6 | 8 | 3280 | Fire Flow | From 295th to the northwest |
| 2014 | Lea Hill | Replace | 6 | 8 | 685 | Fire Flow | Along 122 from 304th south |
| 2014 | Academy | Replace | 6 | 8 | 371 | Fire Flow | along Poplar Street SE, south west of Auburn Way S |
| 2014 | Academy | Replace | 6 | 8 | 1106 | Fire Flow | along Elm Street, south of Auburn Way S |
| 2014 | Academy | Replace | 8 | 12 | 1102 | Fire Flow | along Wyman Drive from 32nd SE to Maple Dr |
| 2014 | Academy | Replace | 8 | 10 | 1244 | Fire Flow | at the Chinook Elementary school. The 8" lines could be connected to the 530 zone as an alternative |
| 2014 | Academy | New Pipe | | 8 | 3200 | Fire Flow | east along Auburn Way South, then north along 148th. |
| 2014 | Academy | Replace | 8 | 10 | 1244 | Fire Flow | Chinook Elementry School |
| 2028 | Valley | Replace | 4 | 8 | 538 | Fire Flow | along 13th ST between B and C |
| 2028 | Valley | Replace | 6 | 8 | 463 | Fire Flow | Along 102 from approximate 10th to the end of the road |
| 2028 | Valley | Replace | 8 | 10 | 587 | Fire Flow | East of A street at about 35th |
| 2028 | Lea Hill | Replace | 8 | 12 | 558 | Fire Flow | into apartment complex south of SE 312 at 127th |
| 2028 | Lea Hill | New Pipe | | 8 | 697 | Fire Flow | Between 130 and 132nd SE at approximately S 309th ST |
| 2028 | Lea Hill | Replace | 8 | 12 | 647 | Fire Flow | along 118th, south of 304th |

# 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) to continue consistent, efficient water supply to its retail water service area throughout the 20-year planning period. Programs listed in this chapter consider water supply and storage requirements, improvements to the hydraulic system, and upgrades or replacement of aging facilities.

This comprehensive plan contains timeframes which 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 of Auburn 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 February 2009 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. The February 2009 CCI is 8,533. Additionally, since the projected costs will increase with inflation, costs were allocated to each year within the six-year planning period (2009 through 2014) by escalating each project cost to its midpoint of construction assuming an annual compounded inflation rate of 3 percent.

Cost estimates were developed using a Class 3 budget estimate, as established by the American Association of Cost Estimators (AACE). This level of estimate is used for budgeting and feasibility studies and assumes a 10 percent to 40 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. Indirect costs are assigned as a percentage of these direct costs as shown in Table 10.1.

Construction costs assume a 30 percent contingency, 15 percent markup for contractor overhead and profit and a 9 percent sales tax on both services and materials to the direct construction costs. Project costs were assumed to be the sum of the construction costs, legal and administration costs (assumed to be 15 percent of the construction cost), allied design (assumed to be 20 percent of the construction costs), and services during construction (assumed to be 15 percent of the construction cost). The CIP cost estimates should be periodically reevaluated to account for changes in inflation and sales tax.

## 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 are described in the sections below. The CIP projects have been assigned an identification number (Project ID) and are shown on Figures 10.1 through 10.4.

### 10.3.1 Water Supply

Table 10.1 provides a summary of the short and long term capital projects recommended for securing adequate supply to meet the systems future maximum day demands. These projects are also shown in Figure 10.1.

Well 1 Rehabilitation (S-01)

Critical to future supply, the first priority is to perform a hydrologic evaluation of Well 1 and potentially re-drill the well, providing an additional 3.2 million gallons per day (mgd) of Qi pumping ability and a redundant supply for the Valley Well Field. The cost estimate for this project includes the hydrologic assessment, re-drilling, a new building with pumps, hypochlorite generation, and back-up power. It is assumed that the new building will be on or near the site of the existing building; new property acquisition is not included in this estimate. The total cost estimate for Well 1 rehabilitation is $2.6M and the project is recommended for the years 2009-2010.

Well 4 and Intertie Pump Station Improvements (S-02)

This project provides improvements to Well 4, including a new building to house a diesel-fueled generator, new hypochlorite disinfection equipment, and restroom facilities accessible from inside and outside the building. Additionally, this project will determine the cost and feasibility of installing standby power to the Lea Hill Booster Pump Station. City estimates project costs to be $620,000 and the project is recommended for the year 2009-2010.

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. Providing a back-up generator, thereby ensuring reliability, is one of the three strategies to ensure that demands in the Valley Service Area are met until 2028. Costs for a back-up generator are estimated to be $268,000 and the improvements are recommended for the years 2013-2014.

**Table 10.1 Water Supply Improvements Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Project ID | Project Timing | Added Qi Capacity (mgd) | Estimated Cost | Comments |
|---|---|---|---|---|---|
| **Short-Term (2009 - 2014)** | | | | | |
| Well 1 Rehabilitation | S-01 | 2009 - 2010 | 3.2 | $2,600,000 | Perform a hydrologic study and possibly re-drill well. |
| Well 4 and Intertie Pump Station Improvements | S-02 | 2010 - 2011 | - | $620,000 | Back-up power, new housing, study on Intertie Pump Station Improvements |
| Well 7 Back-Up Power | S-03 | 2013 - 2014 | - | $268,000 | Back-up power provides reliability for this source |
| Water Supply Charges (Water Purchase & Emergency Intertie) | S-04 | 2011 | 6.44(1) | $7,000,000 | Purchase 2.7 mgd of firm supply and 3.74 mgd for emergency conditions. |
| Intertie Infrastructure | S-05 | 2011 - 2012 | - | $1,000,000 | Provide infrastructure for a total capacity of 6.44 mgd. |
| Well Inspection and Redevelopment Program | S-07 | 2009 - 2014 | - | $500,000/Year | Develop and implement a program to maximize production from City sources. Required for Capacity. |
| Water Resources Protection Program | S-08 | 2011 - 2014 | - | $20,000/Year | Tasks and strategies outlined in Wellhead Protection Program |

**Table 10.1 Water Supply Improvements Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Project ID | Project Timing | Added Qi Capacity (mgd) | Estimated Cost | Comments |
|---|---|---|---|---|---|
| **Long-Term (2015 - 2028)** | | | | | |
| Well 5 Upgrades | S-06 | 2015 - 2016 | - | $725,000 | Evaluate source issues and upgrade the Well 5 facility. |
| Water Resources Protection Program | S-08 | 2015-2028 | - | $20,000/Year | Tasks and strategies outlined in Wellhead Protection Program |
| Coal Creek Springs Phase I Rehabilitation | S-09 | 2018 | 3.1 | $3,400,000 | Includes a hydrologic study and expansion of the system |
| Well 7 Treatment | S-10 | 2025 | 2.1 | $13,000,000 | Will allow well to be used year-round and increases capacity |
| Wells 3A/3B Treatment | S-11 | 2025 | 4.03 | $10,500,000 | Without treatment, these wells are not used |
| Water Quality Improvements | S-12 | 2025 | | $300,000 | Modify West Hills Springs and Coal Creek Springs from chlorination systems to hypochlorite for safer operation. |

Notes:

(1) 2.7-mg for water purchase. Intertie capacity will provide additional 3.74-mg for emergency conditions.

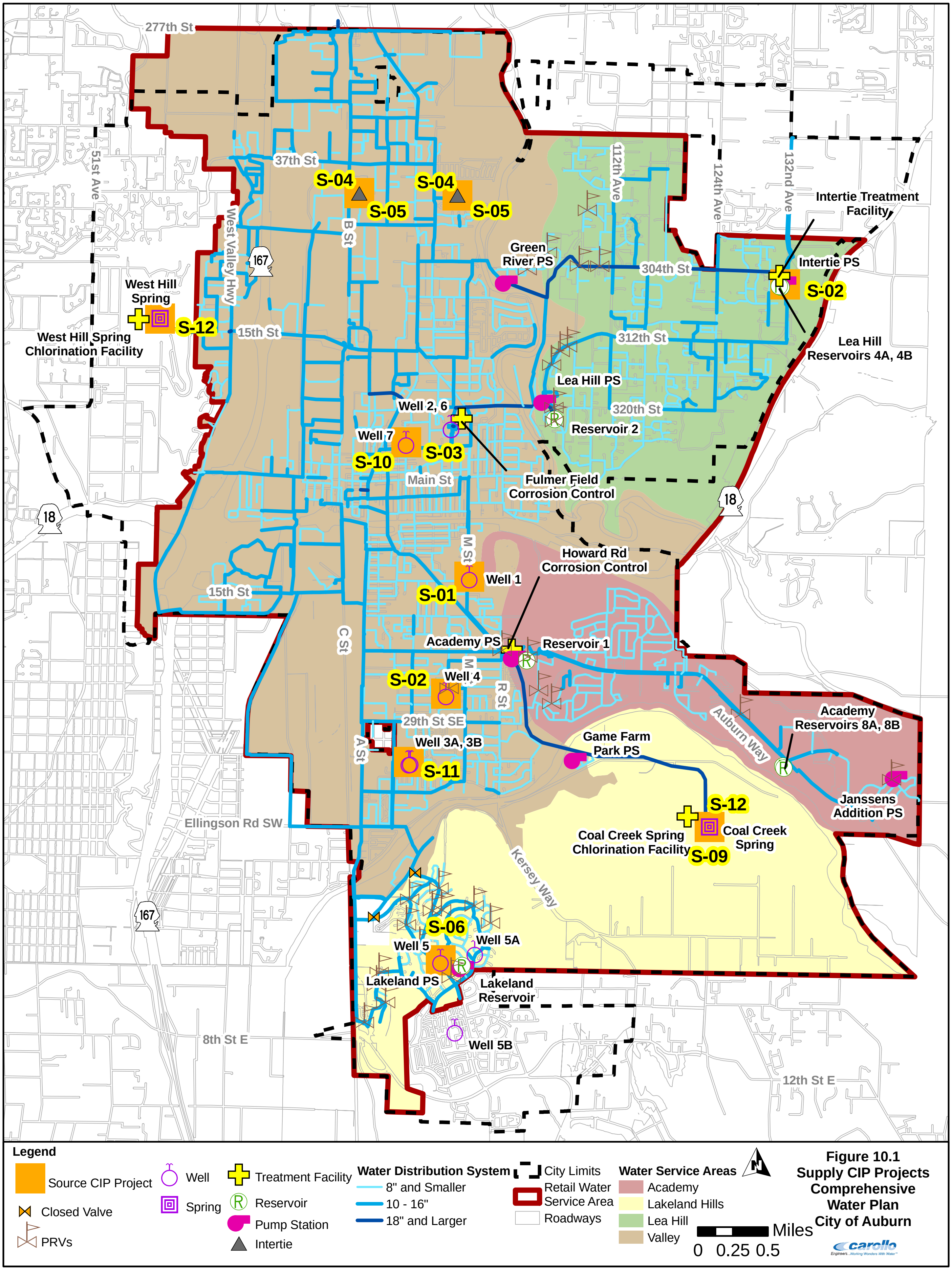


**Figure 10.1**
**Supply CIP Projects**
**Comprehensive Water Plan**
**City of Auburn**

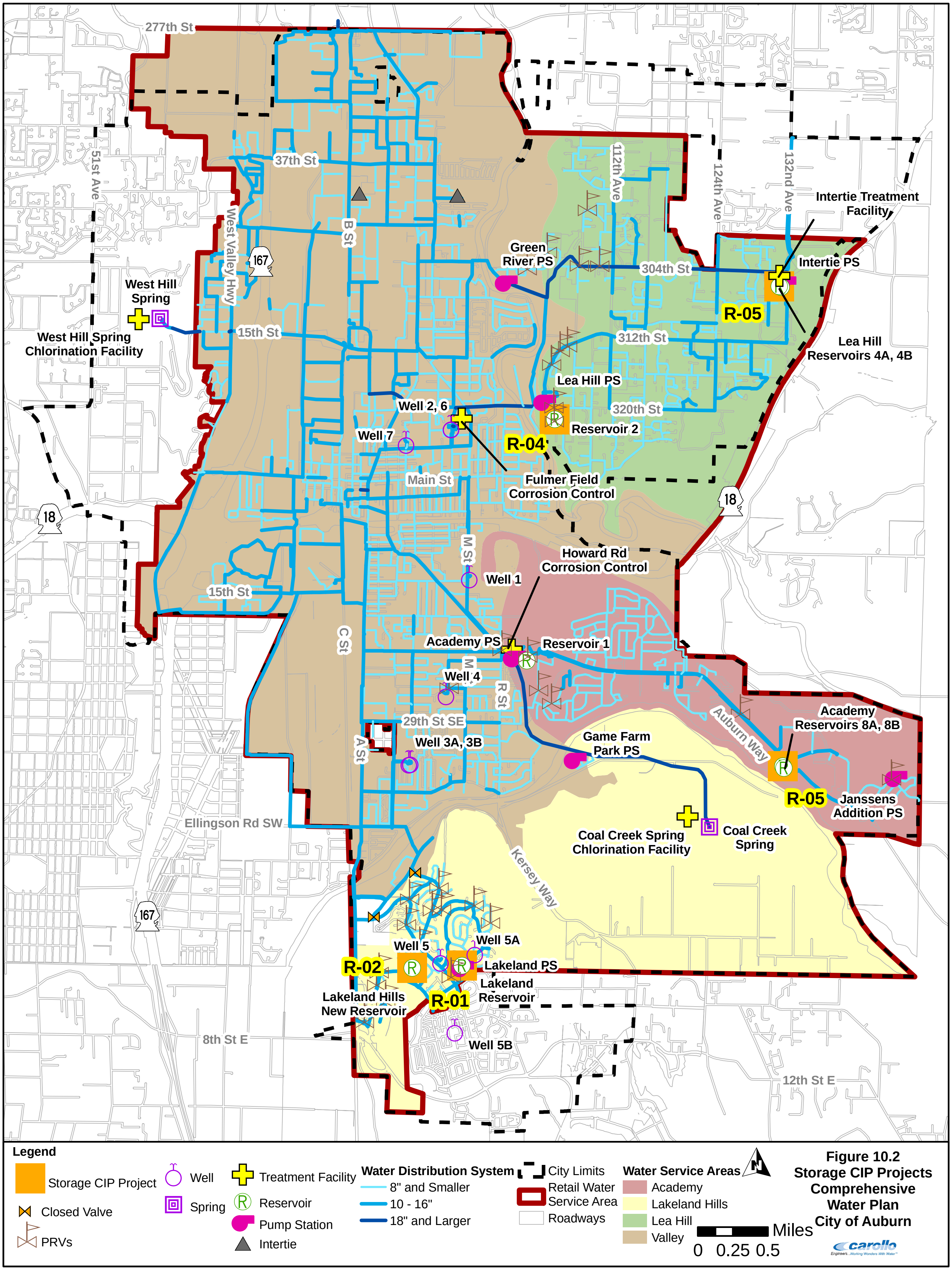


**Figure 10.2**
**Storage CIP Projects**
**Comprehensive**
**Water Plan**
**City of Auburn**

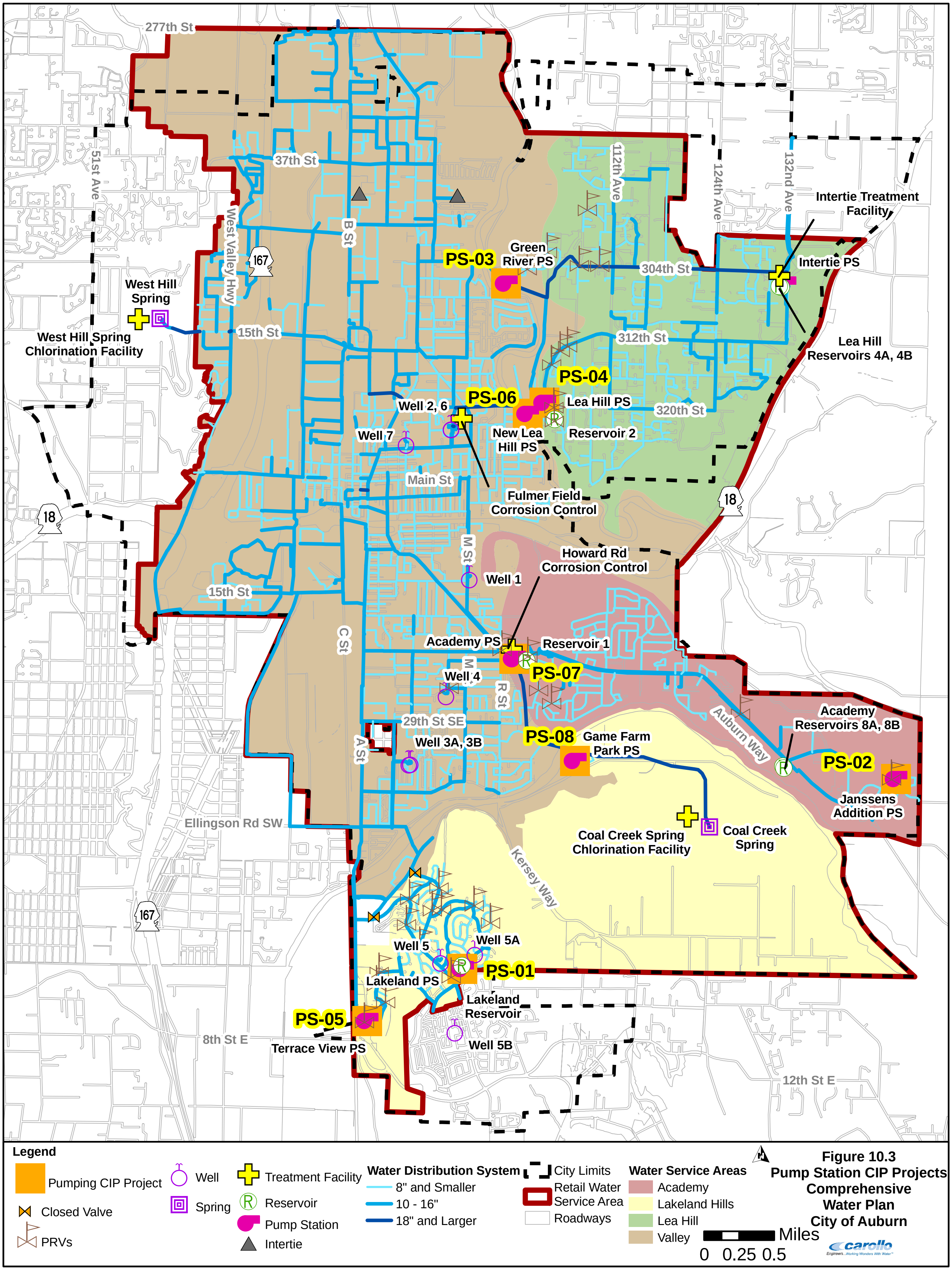


**Figure 10.3**
**Pump Station CIP Projects**
**Comprehensive Water Plan**
**City of Auburn**

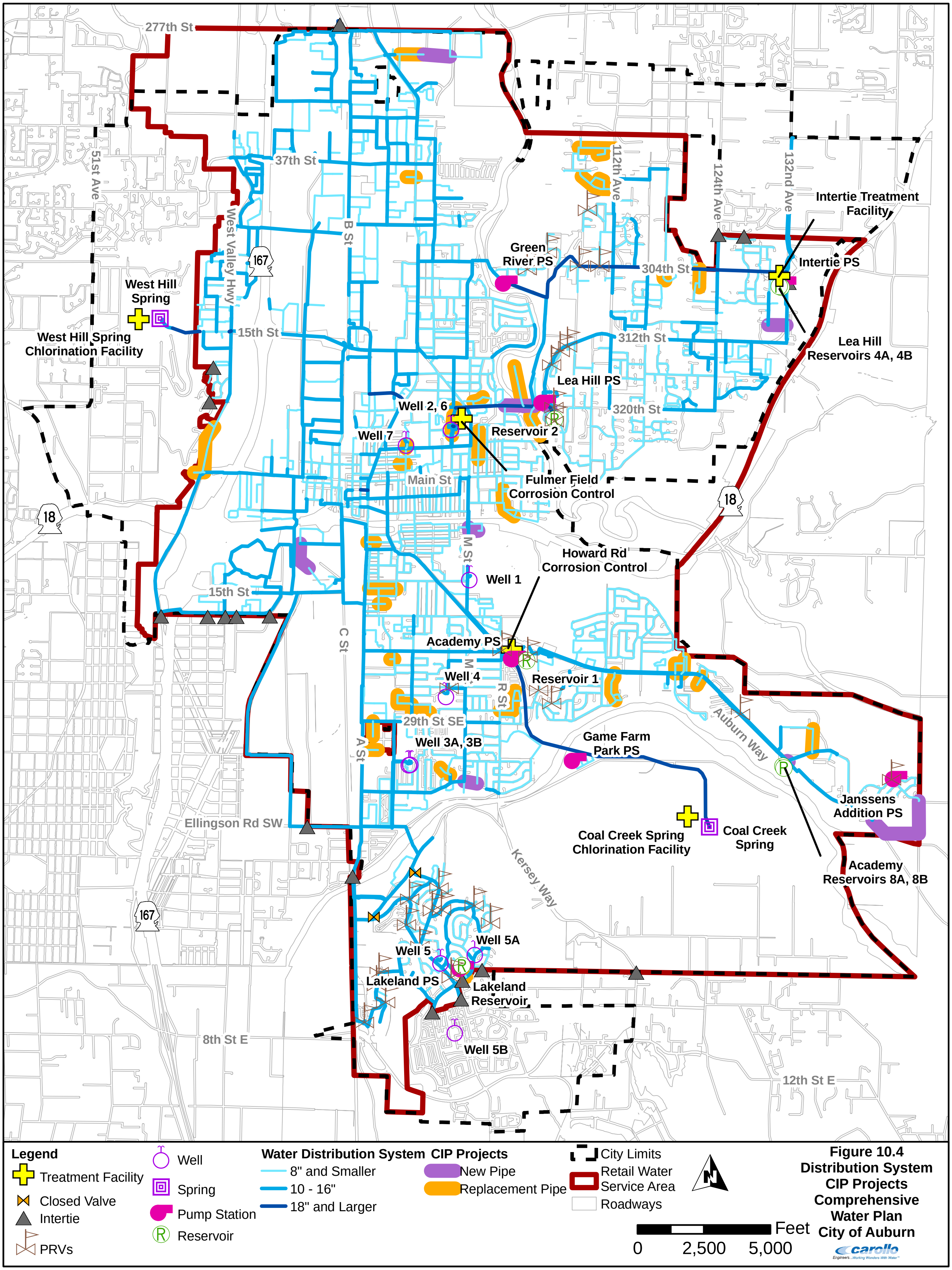


**Figure 10.4**
**Distribution System CIP Projects**
**Comprehensive Water Plan**
**City of Auburn**

Water Supply Charges (S-04)

This project will provide financing to purchase 2.7 mgd of water from adjacent purveyors to meet projected demand. Purchase agreements will include the ability to receive up to 3.74 mgd in emergency conditions. The costs include $150,000 for a water quality analysis of the purchased water, $1,850,000 for budgeted initial investment, intertie enhancement, and related infrastructure improvements and $5,000,000 for the anticipated system development charge from the adjacent purveyor. Total cost is estimated at $7,000,000.

Intertie Infrastructure (S-05)

This project allocates funding for two intertie infrastructures required for purchased water and for the long-term emergency intertie. The two facilities should have a total capacity of 6.44 mgd. It is estimated that each facility will cost $500,000.

Well 5 Upgrades (S-06)

Well 5 is in need of a new building, a backup generator and a hydrologic investigation to evaluate the reasons for the wells observed decreased production. The project is under evaluation; the initial findings may impact the total costs as deficiencies are identified. The City estimates the project cost to be $725,000.

Well Inspection and Redevelopment Program (S-07)

The City is allocating annual funding for investigations and redevelopment of the production wells. These evaluations are necessary to ensure wells are producing at their maximum water right, which assures the City that sources of supply are being efficiently utilized. The City is reserving $500,000 annually for these studies. This program includes an analysis of the hydrologic conditions at Well 5B, which is not producing as anticipated.

Water Resources Protection Program (S-08)

Starting in 2011, the City is allocating annual funding for the Water Resources Protection Program, which is necessary for implementing strategies identified in the Wellhead Protection Program. The City is reserving $20,000 per year for these projects.

Coal Creek Springs Ph 1 Rehabilitation (S-09)

The Coal Creek Springs supply source is currently producing only 3 mgd, which is 6.7 mgd short of its instantaneous water right. To meet future peak demands, it is highly recommended that the springs be evaluated for pumping limitations. To increase the production at this site, the proposed project includes a hydrologic investigation to characterize the spring source. This investigation may recommend the construction of a new collector to improve production at the spring or the construction of several shallow wells to pump the spring water to the surface.

The cost estimate assumes the latter of these possibilities, with six shallow wells, each with a small submersible pump and collection lines to a central pump control facility. The pump control facility would be equipped with a back-up generator. The estimate also assumes a cost for modifying the electrical service and switchgear. Since the nearby chlorination building already has electrical service, it is assumed that this cost will be less than adding a new service. Costs are projected to be $3.4M and the project is recommended for the year 2018.

Well 7 Treatment (S-10)

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. Using the well year-round will increase the annual capacity to 5.0 mgd, and allows the City to utilize the full right for this well. Costs for treatment are estimated to be $13M and the project is recommended for the year 2025.

Wells 3A/3B Treatment (S-11)

Wells 3A and 3B are not in operation due to high manganese levels. Manganese treatment is recommended to allow these wells to be used, adding 4.03 mgd of instantaneous flow. Costs for treatment are estimated to be $10.5M and include the costs to convert the current gaseous chlorination to a hypochlorite system. This project is recommended for the year 2025.

Water Quality Improvements (S-12)

General water quality improvements include converting the current chlorination systems to hypochlorite at the West Hill Springs and Coal Creek Springs. Hypochlorite systems are a safer way to operate disinfection facilities. Water quality improvements are estimated to cost $300,000 and are recommended in the year 2025.

### 10.3.2 Storage

The City should be able to meet most of its future storage requirements by implementing the suggested pumping improvements projects, with the exception of the Lakeland Hills and Valley Service Areas. For this reason, no additional storage capacity is recommended for the Academy and Lea Hill Service Areas. The City's reservoirs are generally in good condition with a few minor recommendations such as valving and painting.

Table 10.2 presents the capital projects associated with storage improvements and Figure 10.2 shows the locations for each of these improvements.

**Table 10.2 Storage Improvements Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Project ID | Project Timing | Added Storage (mg) | Cost | Comments |
|---|---|---|---|---|---|
| **Short-Term (2009 - 2014)** | | | | | |
| Lakeland Hills Reservoir Painting | R-01 | 2013 | -- | $623,000 | Required for maintenance and reservoir longevity. |
| Lakeland Hills New Reservoir | R-02 | 2010 - 2011 | 1.0 | $2,200,000 | Required for peak day supply and storage redundancy. |
| Annual Reservoir R&R Program | R-03 | 2011 - 2014 | -- | $50,000/ Year | For general reservoir maintenance and minor improvements. |
| **Long-Term (2015 - 2028)** | | | | | |
| Annual Reservoir R&R Program | R-03 | 2015 - 2028 | -- | $50,000/ Year | For general reservoir maintenance and minor improvements. |
| Valley Service Area New Reservoir | R-04 | 2028 | 2 | $4,400,000 | Required to meet future storage requirements in Valley Service Area. |
| Tank Painting | R-05 | 2020 | -- | $2,500,000 | Required for maintenance and reservoir longevity. |

Lakeland Hills Reservoir Painting (R-01)

The Lakeland Hills Reservoir's interior and exterior needs to be painted as part of its routine maintenance to help preserve the life of the reservoir. Staff will need to develop an operation plan while the reservoir is out of service for painting. Painting costs are estimated to be $623,000 based on the 2001 Comprehensive Water Plan's project costs and were projected to current dollars. The project is recommended for the year 2013.

Lakeland Hills New Reservoir (R-02)

To provide storage redundancy in the Lakeland Hills Service Area, it is recommended that the City construct a second reservoir. Storage redundancy allows one reservoir to be taken offline for maintenance (such as painting) during peak use operations. The new tank will serve Zone 4, as the current tank does. Cost estimates for this reservoir assume a 1.0-MG steel stand-pipe reservoir to be constructed on the Elizabeth Loop Parcel, purchased by the City for this project. Costs are estimated to be $2.2M. The project is recommended for the years 2010-2011.

Annual Reservoir Repair & Replacement (R&R) Program (R-03)

The City has allocated an annual capital expenditure of $50,000 for reservoir maintenance, beginning in 2011. Some projects already identified include evaluating the condition of Reservoir 2, and installing sample ports and seismic valves on influent/effluent piping at the reservoirs.

Valley Service Area New Reservoir (R-04)

To meet future storage requirements in the Valley Service Area, it is recommended that a new, 2-MG storage facility be provided. Costs for the reservoir are estimated to be $4.4M and the project is needed by the year 2028. This does not include property acquisition.

Tank Painting (R-05)

Both the Academy and Lea Hill reservoirs are due for painting in the year 2020. Painting is a necessary maintenance procedure for ensuring longevity of the tanks. Costs are estimated at $2.5M.

### 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.

**Table 10.3 Pump Station Improvements Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Project ID | Project Timing | Added Firm/Reliable Capacity (gpm) | Cost | Comments |
|---|---|---|---|---|---|
| **Short-Term (2009 - 2014)** | | | | | |
| Lakeland Hills Booster PS | PS-01 | 2009-2010 | 1,600 | $2,096,000 | Install larger pumps, back-up generator, new or expanded building. Project is necessary for meeting MDD and fire flow. |
| Academy Booster PS | PS-02 | 2010 - 2012 | 2,100 | $2,400,000 | Replace Janssen's Addition Pump Station. |
| Green River PS Back-Up Power | PS-03 | 2010 | 3,500 | $270,000 | Project will create reliability in Lea Hill Service Area. |
| New Terrace View PS | PS-05 | 2009 | 1,000 | -- | New PS for providing flow to Lakeland Hills Service Area. Funding by developer(s). |
| Academy PS #1 Pump Replacement | PS-07 | 2014 | 700 | $925,000 | Install larger pumps, back-up generator, new or expanded building. |
| **Long-Term (2015 - 2028)** | | | | | |
| Lea Hill Booster PS Expansion & Boosted Zone Rezone | PS-04 | 2015-2016 | 1,000 | $1,000,000 | Expand the fire flow capacity of the pump station. |
| Lea Hill New Pump Station | PS-06 | by 2028 | 1,200 | $2,700,000 | Replaces current pump station and increases capacity. |
| Game Farm Park PS | PS-08 | By 2028 | -- | $608,000 | Replace pump station when useful life is exceeded. |

Lakeland Hills Booster Pump Station Improvements (PS-01)

The Lakeland Hills Booster Pump Station is in need of two new, larger pumps, a back-up generator, and an expanded building. The new pumps are required for providing redundancy during peak demands with fire flow. The current reliable capacity with one pump out of service is 1,500 gallons per minute (gpm). Two 800-gpm additional pumps will provide a firm capacity of 3,100 gpm. The additional pumps will require an expanded building, additional electrical service, and a switchgear. Total costs for this project are estimated to be $2,096,000 and the project is recommended for the year 2009-2010 to provide reliable supply for projected peak demands.

Academy Booster Pump Station (PS-02)

The boosted zone within the Academy Service Area requires additional pumping capacity to meet projected peak demands. The area is currently served by the undersized Janssens Addition Pump Station, which is unable to be expanded. A new booster pump station will omit the need for the Janssen's Addition Pump Station and will meet redundancy and fire flow requirements for the area.

Costs estimated for this project include a small booster pump station package with three pumps (100, 200, and 200 gpm) and three fire flow pumps (500, 1,100, and 1,100 gpm). The pumps will be housed in a new building, with a back-up generator housed in the pump facility and likely to be located on the site of the existing reservoirs. The cost estimate includes costs with associated piping, electrical service, and a switchgear; new property acquisition is not included in this estimate. Total costs for this project are estimated to be $2.4M and the project is recommended for the years 2010-2012.

Green River Pump Station Back-Up Power (PS-03)

Without back-up power, 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 $270,000 and are recommended for the year 2010.

Lea Hill Booster Pump Station Expansion (PS-04)

The Lea Hill 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 stations 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 $1M and is recommended by the years 2015-2016.

New Terrace View Pump Station (PS-05)

With reduced capacity at the Lakeland Hills Well Field and growth in this service area, the Lakeland Hills Service Area needs additional water. The plan is to provide this capacity by a pump station, pumping from the Valley to Lakeland Hills Service Area. The planned Terrace View Pump Station is currently under design and includes three 500 gpm pumps. As this pump station serves new developments in the area, construction will be required as part of overall infrastructure improvements to be paid for by the developer.

Academy Pump Station 1 Pump Replacement (PS-07)

The Academy Service Area is served by Academy Pump Station # 1 (PS1) and # 2 (PS2). The pumps in Academy PS1 are reaching the end of their useful life. Additionally, the pump station capacity will need to be expanded to accommodate future demands. This project includes replacing the existing 300 and 500 gpm pumps with two 750-gpm pumps, and some electrical modifications. Back-up power is expected to continue to be shared between Academy PS1 and PS2. The pump replacement is estimated to cost $925,000 and is recommended by the year 2014.

Lea Hill New Pump Station (PS-06)

The Lea Hill Pump Station is reaching the end of its useful life, as the existing pumps are currently 26 years old. Additionally, the pump station site is located close to a busy road, representing both a potential vulnerability and security risk for the City. The existing facility is recommended for replacement and expansion to meet future peak demands. The project is expected to cost approximately $2.7M and is recommended by the year 2028.

Game Farm Park Pump Station Replacement (PS-08)

The Game Farm Wilderness Park Pump Station is reaching the end of its useful life. Additionally, the two pumps are located in a small enclosure, considered a confined space, making access difficult. It is recommended that the City replace the existing pump station. Costs for a new pump station are estimated to be $608,000 and the project is recommended by the year 2028.

### 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 Auburn system are described below and presented in Table 10.4. Figure 10.4 shows the high priority and capacity distribution system projects.

**Table 10.4 Distribution System Improvements Projects**
**Comprehensive Water Plan**
**City of Auburn**

| Project | Project ID | Project Timing | Cost | Comments |
|---|---|---|---|---|
| **Short-Term (2009 - 2014)** | | | | |
| Annual Distribution R&R Program - High priority | D-01 | 2009-2014 | $615,000/ Year | Pipe replacement or repair projects identified through hydraulic modeling. Required for meeting peak demands. |
| Annual Distribution Improvements Program | D-02 | 2009-2014 | $109,000/ Year | Pipe improvement projects required for meeting anticipated future demands due to growth. |
| SCADA System Improvements | D-03 | 2009 | $450,000 | Replace obsolete components; improve operator safety & efficiency. |
| Les Gove Waterline Replacement | D-04 | 2009-2010 | $1,680,000 | Water utility improvements to improve fire flow, reduce maintenance, and reduce water loss. |
| AWS Sewer - R Street SE Utility Improvements | D-05 | 2009 | $968,000 | Replace aging water mains concurrent with sewer replacement project. |
| Street Utility Improvements | D-06 | 2009 - 2014 | $186,000/ Year Average | Water main improvements concurrent with Save Our Streets and general arterial street improvements. |
| **Long-Term (2015 - 2028)** | | | | |
| Annual Distribution R&R Program - High priority | D-07 | 2015 – 2018<br>2019 - 2028 | $1,337,000/ Year<br>$107,000/ Year | Pipe replacement or repair projects identified through hydraulic modeling. Required for meeting peak demands. |
| Annual Distribution Improvements Program - Capacity | D-08 | 2015 - 2028 | $22,000/ Year | Pipe improvement projects required for meeting anticipated future demands due to growth. |
| Annual Distribution R&R Program - Condition | D-09 | 2015 - 2028 | $1,929,000/ Year | Pipe replacement or repair projects identified through conditions assessment. Required for reducing system losses. |

Annual Distribution Repair and Replacement Program (D-01, 02, 07, 08, 09)

Several improvements to the City's water distribution system have been identified through the hydraulic analysis and the conditions assessment as requiring repairs or replacement to meet current and future demands. These projects are grouped into three annual programs:

- Annual Distribution R&R Program - High Priority (for meeting current demands),
- Annual Distribution Improvements Program (improvements needed for anticipated growth), and
- Annual Distribution R&R Program - Conditions (repairs needed for identified pipe condition issues).

All identified projects and associated cost estimates are presented in Appendix N.

SCADA System Improvements (D-03)

The existing Supervisory Control and Data Acquisition (SCADA) system is in need of upgrading. The existing system has numerous obsolete components and does not allow for control of the water utility stations. SCADA improvements are estimated at $450,000 and are scheduled for the year 2009.

Les Gove Waterline Replacement (D-04)

The City will be replacing several aging waterlines in the area northwest of Les Gove Park. Replacing the existing lines will improve fire flow and reduce maintenance needs and water losses. The total cost for the project is estimated as $1,680,000 and the project is scheduled for 2009 to 2010.

AWS Sanitary Sewer - R Street SE Utility Improvements (D-05)

The City has allocated funding to replace a water line in SE "R" Street concurrent with a sanitary sewer replacement project planned near Auburn Way South (AWS). The project is scheduled for 2009 and is estimated to cost $968,000.

Street Utility Improvements (D-06)

The City has allocated $1,116,000 for water utility improvements associated with other utility or infrastructure programs such as the SOS 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 from 2009 through 2014.

### 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.

Facilities Evaluation Study (G-01)

The Facilities Evaluation Study is an evaluation of the City's water facilities to catalog and assess the condition of existing facilities and infrastructure including reservoirs, pump stations, pressure reducing stations, interties and metering stations. The study will include a preliminary assessment of vulnerability to natural hazards such as flood, earthquake, extreme weather, and lahars. Critical Facilities and Hazard mitigation projects that are anticipated to be identified in this study include reservoir isolation valves and M&O Facility Seismic retrofit. Costs estimated by the City are $80,000 and the project is planned to begin in 2009.

Rate Study (G-02)

The Rate Study will be completed in 2010 and will evaluate the possible funding options to implement the capital improvement projects identified in this Plan. The rate study is estimated to cost $148,000.

Comprehensive Water Plan Updates (G-03, 04, 07, 08)

The Department of Health requires that the Comprehensive Water Master Plan be updated every six years. The City has allocated $160,000 for 2009 and $300,000 for this update in 2014 – 2015, 2020, and 2026.

M&O Facility Improvements (G-05)

This program is identified for improvements to M&O facilities and operations including remodel the existing M&O building into a more functional and maintainable facility; possible acquisition of land and construction of a facility where vactor waste solids can be deposited (in conjunction with storm and possibly the City of Algona and the City of Pacific); construction of satellite facilities to support M&O operational activities including vactor waste solids transfer. This program is anticipated to cost $300,000 and anticipated to occur in 2013.

Muckleshoot Indian Tribe (MIT) Master Meters (G-06)

This project will install master meters to MIT properties to ease both City and MIT account administration. The project is anticipated to cost $500,000 and is scheduled for the years 2011 and 2012.

**Table 10.5 General Utility Capital Projects
Comprehensive Water Plan
City of Auburn**

| Project | Project ID | Project Timing | Cost | Comments |
|---|---|---|---|---|
| **Short-Term (2009 - 2010)** | | | | |
| Facilities Evaluation Study | G-01 | 2009 | $80,000 | Catalog and assess the condition and natural hazard vulnerability of the City's facilities |
| Rate Study | G-02 | 2009-2010 | $148,000 | Evaluate funding options for implementing the CIP. |
| Comprehensive Water Plan Update | G-03 | 2009 | $160,000 | Remainder of 2008 Plan Update |
| Comprehensive Water Plan Update | G-04 | 2014 - 2015 | $86,000 (in 2014) | Mandated by Washington Department of Health |
| M&O Facility Improvements | G-05 | 2013 | $300,000 | Remodel M&O facility for functionality; construct vactor waste solids facility. |
| MIT Master Meters | G-06 | 2011 | $500,000 | Evaluate and implement MIT Master Meters. |
| **Long-Term (2015 - 2028)** | | | | |
| Comprehensive Water Plan Update | G-04 | 2014 - 2015 | $214,000 (in 2015) | Mandated by Washington Department of Health |
| Comprehensive Water Plan Update | G-07 | 2020 | $300,000 | Mandated by Washington Department of Health |
| Comprehensive Water Plan Update | G-08 | 2026 | $300,000 | Mandated by Washington Department of Health |

## 10.4 CIP SUMMARY

Table 10.6 summarizes the short and long-term CIP elements. All costs shown in Table 10.6 are 2009 dollars. The total supply project costs are estimated at $42.8M, the total storage project costs are estimated at $10.7M, the total pump station project costs are estimated at $10.0M, the total distribution project costs are estimated at $42.3M and the total general water system project costs are estimated at $2.1M.

The projects anticipated for the next six years are summarized in Table 10.7. The costs have been escalated to the mid-point of construction by an inflation rate of 3 percent. The projects shown in Table 10.7 are broken down into two categories: 1) capacity and 2) non-capacity. The total escalated costs for capacity related projects over the next six years is $11.8M and the total cost for non-capacity related projects over the next six years is $23.0M.

**Table 10.6 Capital Improvements Projects (2009 Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| | Project | Total Project Cost (2009 dollars) | Annual Cost | Short-Term | Long-Term |
|---|---|---|---|---|---|
| **Supply Projects** | | | | | |
| S-01 | Well 1 Rehabilitation | $2,600,000 | | $2,600,000 | $ - |
| S-02 | Well 4 and Intertie Pump Station Improvements | $620,000 | | $620,000 | $ - |
| S-03 | Well 7 Back-Up Power | $268,000 | | $268,000 | $ - |
| S-04 | Water Supply Charges (Emergency Intertie and Water Purchase) | $7,000,000 | | $7,000,000 | $ - |
| S-05 | Intertie Infrastructure | $1,000,000 | | $1,000,000 | $ - |
| S-07 | Well Inspection and Redevelopment Program | $3,000,000 | $500,000(1) | $3,000,000 | $ - |
| S-06 | Well 5 Upgrades | $725,000 | | $ - | $725,000 |
| S-08 | Water Resources Protection Program | $360,000 | $20,000(2) | $80,000 | $280,000 |
| S-09 | Coal Creek Springs Phase 1 Rehabilitation | $3,400,000 | | | $3,400,000 |
| S-10 | Well 7 Treatment | $13,000,000 | | $ - | $13,000,000 |
| S-11 | Wells 3A/3B Treatment | $10,500,000 | | $ - | $10,500,000 |
| S-12 | Water Quality Improvements | $300,000 | | $ - | $300,000 |
| | **Total Supply Projects** | **$42,773,000** | **$520,000(1)/ $20,000(3)** | **$14,568,000** | **$28,205,000** |

**Table 10.6 Capital Improvements Projects (2009 Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| | Project | Total Project Cost (2009 dollars) | Annual Cost | Short-Term | Long-Term |
|---|---|---|---|---|---|
| **Storage Projects** | | | | | |
| R-01 | Lakeland Hills Reservoir Painting | $623,000 | | $623,000 | $ - |
| R-02 | Lakeland Hills New Reservoir | $2,200,000 | | $2,200,000 | $ - |
| R-03 | Annual Reservoir R&R Program | $900,000 | $50,000(2) | $200,000 | $700,000 |
| R-04 | Valley Service Area New Reservoir | $4,400,000 | | $ - | $4,400,000 |
| R-05 | Tank Painting | $2,548,000 | | $ - | $2,548,000 |
| | **Total Storage Projects** | **$10,671,000** | **$50,000** | **$3,023,000** | **$7,648,000** |
| **Pump Station Projects** | | | | | |
| PS-01 | Lakeland Hills Booster Pump Station Improvements | $2,096,000 | | $2,096,000 | $ - |
| PS-02 | New Academy Booster Pump Station | $2,400,000 | | $2,400,000 | $ - |
| PS-03 | Green River PS Back-Up Power | $270,000 | | $270,000 | $ - |
| PS-05 | New Terrace View Pump Station | $ - | | $ - | $ - |
| PS-07 | Academy PS #1 Improvements | $925,000 | | $925,000 | $ - |
| PS-04 | Lea Hill Booster Pump Station Expansion | $1,000,000 | | $ - | $1,000,000 |
| PS-06 | Lea Hill New Pump Station | $2,700,000 | | $ - | $2,700,000 |
| PS-08 | Game Farm Park PS | $608,000 | | $ - | $608,000 |
| | **Total Pump Station Projects** | **$9,999,000** | **$0** | **$5,691,000** | **$4,308,000** |

**Table 10.6 Capital Improvements Projects (2009 Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| | Project | Total Project Cost (2009 dollars) | Annual Cost | Short-Term | Long-Term |
|---|---|---|---|---|---|
| **Distribution System Projects** | | | | | |
| D-01/07 | Annual Distribution R&R Program High Priority | \$3,962,000(1)/ \$5,346,000(4)/ \$1,071,000(5) | \$615,000(1)/ \$1,337,000(4)/ \$107,000(5) | \$3,962,000 | \$6,417,000 |
| D-02/08 | Annual Distribution Improvements Program | \$656,000(1)/ \$310,000(3) | \$109,000(1)/ \$22,000(3) | \$656,000 | \$310,000 |
| D-03 | SCADA Upgrades | \$450,000 | | \$450,000 | \$ - |
| D-04 | Les Gove Waterline Replacement | \$1,680,000 | | \$1,680,000 | \$ - |
| D-05 | AWS Sewer - R Street SE Utility Improvements | \$ 968,000 | | \$968,000 | \$ - |
| D-06 | Street Utility Improvements | \$1,116,000 | \$186,000 | \$1,116,000 | \$ - |
| D-09 | Annual Distribution R&R Projects Condition | \$27,000,000(3) | \$1,929,000(3) | \$ - | \$27,000,000 |
| | **Total Distribution System Projects** | **\$42,289,000** | **\$910,000(1) / \$2,409,000(3)** | **\$8,562,000** | **\$33,727,000** |

**Table 10.6 Capital Improvements Projects (2009 Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| | Project | Total Project Cost (2009 dollars) | Annual Cost | Short-Term | Long-Term |
|---|---|---|---|---|---|
| **General Water System Projects** | | | | | |
| G-01 | Facilities Evaluation Study | $80,000 | | $80,000 | $ - |
| G-02 | Rate Study | $148,000 | | $148,000 | $ - |
| G-03 | Comprehensive Water Plan Update 2009 | $160,000 | | $160,000 | $ - |
| G-04 | Comprehensive Water Plan Update 2014 | $300,000 | | $86,000 | $214,000 |
| G-05 | M&O Facility Improvements | $300,000 | | $300,000 | $ - |
| G-06 | MIT Master Meters | $500,000 | | $500,000 | $ - |
| G-07 | Comprehensive Water Plan Update 2020 | $300,000 | | $ - | $300,000 |
| G-08 | Comprehensive Water Plan Update 2026 | $300,000 | | $ - | $300,000 |
| | **Total General Water System Projects** | **$1,874,000** | **$ 0** | **$1,274,000** | **$814,000** |
| | **TOTAL PROJECTS** | **$107,820,000** | **$1,480,000(1)**<br>**$2,479,000(3)** | **$33,118,000** | **$74,702,000** |

Notes:
(1) Short-term project (6 years) 2009 - 2014; average annual allocation of costs. Actual cost allocation may differ from average value.
(2) Project starting in the year 2011, total projected cost divided by 18 years.
(3) Long-term project (14 years) 2015 - 2028; annual allocation of costs.
(4) Mid-term project (4 years) 2015 - 2018; annual allocation of cost.
(5) Long-term project (10 years) 2019 - 2028; annual allocation of cost.

**Table 10.7 Short-Term Capital Improvements Projects (Escalated Costs)**
**Comprehensive Water Plan**
**City of Auburn**

| Project | | Cost in Project Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| **Capacity Related Projects** | | | | | | | |
| S-01 | Well 1 Rehabilitation | $ 610,000 | $ 2,070,000 | $ - | $ - | $ - | $ - |
| PS-03 | Green River Pump Station Back-Up Power | $ - | $ 280,000 | $ - | $ - | $ - | $ - |
| PS-05 | New Terrace View Pump Station | $ - | $ - | $ - | $ - | $ - | $ - |
| S-05 | Intertie Infrastructure | $ - | $ - | $ 1,090,000 | $ - | $ - | $ - |
| S-04 | Water Supply Charges (Water Purchase and Emergency Intertie) | $ - | $ - | $ 7,000,000 | $ - | $ - | $ - |
| D-02 | Annual Distribution Improvements Program | $ 109,000 | $ 113,000 | $ 116,000 | $ 119,000 | $ 123,000 | $ 127,000 |
| | **Total Capacity Related Projects** | **$ 719,000** | **$ 2,463,000** | **$ 8,206,000** | **$ 119,000** | **$ 123,000** | **$ 127,000** |
| **Non-Capacity Related Projects** | | | | | | | |
| D-03 | SCADA Upgrades | $ 450,000 | $ - | $ - | $ - | $ - | $ - |
| R-02 | Lakeland Hills New Reservoir | $ - | $ 530,000 | $ 1,810,000 | $ - | $ - | $ - |
| PS-01 | Lakeland Hills Booster Pump Station Improvements | $ 390,000 | $ 1,770,000 | $ - | $ - | $ - | $ - |
| S-07 | Well Inspection and Redevelopment Program | $ 500,000 | $ 515,000 | $ 530,450 | $ 546,364 | $ 562,754 | $ 579,637 |
| D-01 | Annual Distribution R&R Program - High Priority | $ 50,000 | $ 1,100,000 | $ 140,000 | $ 250,000 | $ 150,000 | $ 1,350,000 |
| G-01 | Facilities Evaluation Study | $ 80,000 | $ - | $ - | $ - | $ - | $ - |
| D-04 | Les Gove Waterline Replacement | $ 1,000,000 | $ 700,000 | $ - | $ - | $ - | $ - |
| D-05 | AWS Sewer - R Street SE Utility Improvements | $ 990,000 | $ - | $ - | $ - | $ - | $ - |
| PS-02 | New Academy Booster Pump Station | $ - | $ 580,000 | $ 400,000 | $ 1,600,000 | $ - | $ - |
| PS-07 | Academy Pump Station #1 | $ - | $ - | $ - | $ - | $ 250,000 | $ 830,000 |
| R-01 | Lakeland Hills Reservoir Painting | $ - | $ - | $ - | $ - | $ 700,000 | $ - |
| G-03 /G-04 | Comprehensive Water Plan Update | $ 160,000 | $ - | $ - | $ - | $ - | $ 100,000 |
| S-02 | Well 4 and Intertie Pump Station Improvements | $ 120,000 | $ 500,000 | $ - | $ - | $ - | $ - |

| Table 10.7 Short-Term Capital Improvements Projects (Escalated Costs)<br>Comprehensive Water Plan<br>City of Auburn | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project | | Cost in Project Year | | | | | |
| | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| S-03 | Well 7 Back-Up Power | $ - | $ - | $ - | $ - | $ 70,000 | $ 240,000 |
| G-05 | M&O Facility Improvements | $ - | $ - | $ - | $ - | $ 300,000 | $ - |
| G-06 | MIT Master Meters | $ - | $ - | $ 130,000 | $ 400,000 | $ - | $ - |
| D-06 | Street Utility Improvements | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 | $ 200,000 |
| G-02 | Rate Study | $ 100,000 | $ 48,000 | $ - | $ - | $ - | $ - |
| S-08 | Water Resources Protection Program | $ - | $ - | $ 21,855 | $ 22,510 | $ 23,185 | $ 23,881 |
| R-03 | Annual Reservoir R&R Program | $ - | $ - | $ 53,045 | $ 54,636 | $ 56,275 | $ 57,964 |
| | **Total Non-Capacity Related Projects** | **$ 4,040,000** | **$ 5,943,000** | **$ 3,285,350** | **$ 4,073,510** | **$ 2,312,215** | **$ 3,381,482** |
| | **Total All Projects** | **$ 4,759,000** | **$ 8,406,000** | **$ 11,491,350** | **$ 4,192,510** | **$ 2,435,215** | **$ 3,508,482** |

# 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 Capital Improvement Program (CIP) identified in Chapter 10. 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 current rate structure with respect to rate adequacy, equity, promotion of water conservation, and customer affordability.

## 11.2 PAST FINANCIAL PERFORMANCE

This section includes a historical (2003 - 2008) summary of financial performance as reported by the City of Auburn on the Statement of Revenues, Expenses and Changes in Fund Equity and the Statement of Net Assets, specific to the water utility.

In general, these statements indicate that, while the utility has been able to generate sufficient revenues to meet its financial obligations, over the past two years (2007 and 2008), revenue collections from water service charges have declined. As a result, the utility's financial performance has gradually eroded resulting in insufficient revenues to meet expenses for the first time in 2008.

### 11.2.1 Comparative Financial Statements

Table 11.1 shows a consolidated Statement of Revenues, Expenses and Changes in Net Assets for the period 2003 – 2008. This table shows that over the past six years, growth in revenues, which is derived primarily from water service charges, has slowed and has not been able to keep pace with growth in operating expenses over the same time period, culminating in an operating loss in 2008.

### 11.2.2 Findings and Trends

As discussed above and as shown in Table 11.1, revenues from operations have not been able to keep pace with expenses. For example, Operating Income, which is a measurement of the difference between revenues and operating expenses, declined from a net income of $662,000 in 2003 to a net operating loss of -$761,000 in 2008. Mirroring this trend, gradual erosion in the utility's key performance indicators over this time frame is also noted and discussed below:

- The *O&M Coverage Ratio* (service revenues divided by operating expenses) declined from 1.10 in 2003 to .91 in 2008. A desired ratio is greater than 1.0.
- The *Operating Ratio* (total operating expenses divided by total operating revenues) has increased from 91% in 2003 to 110% in 2008. 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 operating expenses exceed operating revenues and is indicative of an unsustainable financial condition.
- The *Debt Service Coverage Ratio* (revenues less O&M expenses divided by total annual debt service) increased from 1.2 in 2003 to 1.9 in 2008[1]. This compares to the industry target of 1.25 or greater. A ratio close to or below 1.25 is indicative of a financial condition that has little to no room for new debt service without additional rate increases.

**Table 11.1 Statement of Revenues, Expenses and Changes in Fund Net Assets**
**Comprehensive Water Plan**
**City of Auburn**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| **OPERATING REVENUES:** | | | | | | |
| Charges for services | 7,121,855 | 7,228,778 | 7,230,705 | 8,043,418 | 7,933,931 | 7,664,443 |
| Other Operating Revenue | - | - | 1,820 | - | 210 | - |
| Total Operating Revenues | 7,121,855 | 7,228,778 | 7,232,525 | 8,043,418 | 7,934,141 | 7,664,443 |
| **OPERATING EXPENSES:** | | | | | | |
| Operations and Maintenance | 2,268,234 | 2,421,771 | 2,559,988 | 2,786,780 | 3,019,557 | 3,266,201 |
| Administration | 1,056,563 | 1,333,524 | 1,286,081 | 1,793,289 | 1,627,322 | 2,192,538 |
| Depreciation/Amortization | 2,392,917 | 2,056,472 | 2,045,831 | 1,958,596 | 2,008,907 | 2,098,916 |
| Other Operating Expenses | 741,675 | 753,485 | 775,306 | 850,338 | 844,938 | 867,789 |
| Total Operating Expenses | 6,459,389 | 6,565,252 | 6,667,206 | 7,389,003 | 7,500,724 | 8,425,444 |
| **OPERATING INCOME (LOSS)** | 662,466 | 663,526 | 565,319 | 654,415 | 433,417 | (761,001) |
| **NON OPERATING REVENUE (EXPENSES)** | | | | | | |
| Interest Revenue | 101,127 | 158,678 | 271,590 | 461,431 | 599,673 | 383,491 |
| Other Non-Operating Revenue | 24,270 | 22,048 | 38,232 | 54,987 | 63,902 | 55,348 |
| Interest Expense | (364,245) | (348,457) | (288,757) | (257,342) | (214,721) | (137,855) |
| Other Non-Operating Expenses | (44,657) | - | (7,034) | (1,590) | (157,746) | (1,932) |
| Total Non-Operating Revenue (expenses) | (283,505) | (167,731) | 14,031 | 257,486 | 291,108 | 299,052 |
| **INCOME (LOSS) BEFORE CONTRIBUTIONS AND TRANSFERS** | 378,961 | 495,795 | 579,350 | 911,901 | 724,525 | (461,949) |
| **CAPITAL CONTRIBUTIONS** | 1,619,783 | 1,247,925 | 2,383,059 | 1,683,786 | 5,578,567 | 2,653,883 |
| **TRANSERS IN** | - | - | - | 6,200 | - | - |
| **TRANSFERS OUT** | (51,400) | (126,000) | (198,600) | (143,000) | (50,000) | (50,000) |
| Change in Net assets | 1,947,344 | 1,617,720 | 2,763,809 | 2,458,887 | 6,253,092 | 2,141,934 |
| **TOTAL NET ASSETS BEGINNING OF YEAR** | 40,877,440 | 42,824,784 | 44,442,504 | 47,206,313 | 49,665,199 | 55,918,291 |
| **TOTAL NET ASSETS END OF YEAR** | 42,824,784 | 44,442,504 | 47,206,313 | 49,665,200 | 55,918,291 | 58,060,225 |

Table 11.2 presents the statement of net assets. Total Net Assets, which represent the difference between total assets and total liabilities, has remained steady between 2003 – 2008. Key performance indicators and trends are discussed below.

[1] Total annual debt service includes interest expense and the current portion of outstanding liabilities as shown in the Statement of Net Assets.

(761,001)

### 11.2.3 Findings and Trends

- *Total net assets* – Total net assets, which represent the difference between total assets and total liabilities steadily increased from $57.7 million in 2003 to $66.8 million in 2008.
- *Liquidity Ratio* - The Current Ratio (unrestricted current assets divided by current liabilities) rose from 5.0 in 2003 to 7.4 in 2008. A ratio of 2:1 or higher is considered good in terms of healthy liquidity.
- *Capital Structure Ratio* – The Debt to Equity Ratio (total debt divided by the sum of retained earnings and contributed equity) declined from 33% debt / 67% equity in 2003 to 14% debt / 86% equity in 2008. This reduction in debt indicates that the City has capacity to acquire new debt to help fund the Capital Improvement Program without jeopardizing its debt to equity position. This indicator should be evaluated in context with the debt service coverage ratio discussed above.

## 11.3 FINANCIAL PLAN

The City of Auburn water utility is an enterprise that is responsible to fund all of its related costs. It is not dependent on 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 2009 – 2014. 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 cash uses such as operating expenses, debt service, and reserve contributions, as well as any coverage requirements associated with long-term debt.

**Table 11.2 Statement of Net Assets**
**Comprehensive Water Plan**
**City of Auburn**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| **ASSETS** | | | | | | |
| Current Assets: | | | | | | |
| Cash and Cash Equivalents | 3,747,884 | 4,529,193 | 2,218,734 | 4,222,303 | 5,860,893 | 6,695,075 |
| Investments | 2,801,406 | 3,478,437 | 5,453,594 | 4,477,187 | 4,003,125 | 3,112,826 |
| Restricted Cash | | | | | | |
| Bond Payments | - | - | 1,040,571 | 1,040,103 | 1,028,885 | 1,009,122 |
| Customer Deposits | - | - | 23,780 | 35,460 | 43,665 | 33,745 |
| Other | - | - | 686,858 | 628,896 | 502,043 | 468,199 |
| Restricted Cash, Cash Equivalents and Investments | 1,984,935 | 1,991,160 | - | - | - | - |
| Customer Accounts | 870,231 | 901,232 | 947,500 | 1,225,633 | 749,529 | 768,978 |
| Other Receivables | - | 32,274 | 58,368 | 39,928 | 33,429 | 51,179 |
| Inventories | 90,847 | 99,606 | 101,642 | 160,869 | 223,040 | 242,852 |
| Total Current Assets | 9,495,303 | 11,031,902 | 10,531,047 | 11,830,379 | 12,444,609 | 12,381,976 |
| Non Current Assets | | | | | | |
| Long Term Contracts and Notes | | | - | - | - | - |
| Capital Assets | | | | | | |
| Land | 749,205 | 897,971 | 897,971 | 897,971 | 897,971 | 897,971 |
| Buildings and Equipment | 2,637,523 | 2,697,394 | 2,782,339 | 2,864,439 | 2,902,031 | 3,113,583 |
| Improvements Other Than Buildings | 66,359,613 | 67,356,126 | 69,459,790 | 73,196,435 | 78,679,611 | 81,599,892 |
| Construction in Progress | 312,320 | 477,173 | 2,167,786 | 349,116 | 981,228 | 920,761 |
| Less: Accumulated Depreciation | (21,978,159) | (24,034,632) | (26,080,462) | (28,039,058) | (30,047,965) | (32,146,881) |
| Total Capital Assets (Net of A/D) | 48,080,502 | 47,394,032 | 49,227,424 | 49,268,903 | 53,412,876 | 54,385,326 |
| Other Non Current Assets | | | | | | |
| Deferred Charges | 77,065 | 66,713 | - | - | - | - |
| Total Non-Current Assets | 48,157,567 | 47,460,745 | 49,227,424 | 49,268,903 | 53,412,876 | 54,385,326 |
| **Total Assets** | **57,652,870** | **58,492,647** | **59,758,471** | **61,099,282** | **65,857,485** | **66,767,302** |
| **LIABILITIES** | | | | | | |
| Current Liabilities | | | | | | |
| Current Payables | 164,556 | 442,986 | 364,356 | 475,753 | 375,436 | 477,679 |
| Customer Deposits | 35,054 | 30,987 | 23,780 | 35,480 | 43,665 | 33,745 |
| Interfund Payables | | | | 0 | - | - |
| Loans Payable - Current | 453,469 | 434,194 | 435,568 | 435,568 | 435,568 | - |
| Employee Leave Benefits - Current | 99,036 | 119,016 | 136,003 | 134,958 | 101,807 | 123,306 |
| Revenue Bonds Payable - Current | 699,100 | 737,400 | 772,000 | 813,700 | 855,100 | 896,500 |
| General Obligation Bonds Payble - Current | - | - | - | - | - | - |
| Accured Interest | 384,763 | 342,769 | 296,651 | 248,390 | 198,109 | 138,825 |
| Deposits | 31,323 | 17,720 | - | - | - | - |
| Other Liabilities Payable | 37,343 | 29,763 | 310 | - | - | - |
| Total Current Liabilities | 1,904,644 | 2,154,835 | 2,028,668 | 2,143,849 | 2,009,685 | 1,670,055 |
| Non Current Liabilities | | | | | | |
| Deferred Revenue | - | 42,200 | 42,200 | 42,201 | 42,201 | 42,200 |
| Employee Leave Benefits | 82,050 | 99,268 | 107,467 | 102,708 | 11,849 | 15,208 |
| Deferred Credits | 63,566 | 56,792 | - | - | - | - |
| Loans Payable | 6,975,226 | 6,631,848 | 6,194,905 | 5,759,336 | 5,323,768 | 5,323,768 |
| Revenue Bonds Payable | 5,802,600 | 5,065,200 | 4,178,918 | 3,386,009 | 2,551,701 | 1,655,846 |
| General Obligation Bonds Payable | - | | - | - | - | |
| Total Non Current Liabilities | 12,923,442 | 11,895,308 | 10,523,490 | 9,290,254 | 7,929,519 | 7,037,022 |
| Total Liabilities | 14,828,086 | 14,050,143 | 12,552,158 | 11,434,103 | 9,939,204 | 8,707,077 |
| **NET ASSETS** | | | | | | |
| Invested in Capital Assets, Net of Related Debt | 41,124,091 | 34,525,390 | 37,646,032 | 45,069,193 | 44,246,739 | 54,671,310 |
| Restiricted for: | | | | | | |
| Debt Service | 874,116 | 874,116 | 686,858 | 628,896 | 502,043 | 468,199 |
| Construction | 26,074 | 57 | - | - | - | - |
| Unrestricted | 800,503 | 9,042,941 | 8,873,423 | 3,967,110 | 11,169,509 | 2,920,716 |
| Total Net Assets | 42,824,784 | 44,442,504 | 47,206,313 | 49,665,199 | 55,918,291 | 58,060,225 |
| **Total Liabilities and Net Assets** | **57,652,870** | **58,492,647** | **59,758,471** | **61,099,302** | **65,857,495** | **66,767,302** |

### Utility Fund Structure

Accounting for the City's water operations, capital projects and bond reserves is maintained in separate accounting units. All three accounts are maintained within the City's water fund. The City utilizes the following accounts to manage its utility needs:

- *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 (system development charges, grant proceeds, and debt proceeds) and capital expenditures are paid.
- *Restricted Bond Reserve* – serves as a restricted account set up to comply with revenue bond covenants as discussed above.

Minimum balance thresholds for these accounts are discussed under the next section, Financial Policies.

### Financial Policies

A brief summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program are discussed below:

**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. Common reserves among municipal utilities are operating reserves, capital contingency reserves, and bond reserves. The City currently maintains a form of these reserves:

- *Operating Reserve* – An operating reserve, or working capital reserve, provides a minimum unrestricted fund balance needed to accommodate the short-term cycles of revenues and expenses. These reserves are intended to address both anticipated and unanticipated changes in revenues and expenses. Anticipated changes may include billing and receipt cycles, payroll cycles, and other payables. Operating reserves can be used to meet short-term cash deficiencies due to the timing of annual revenues and expenditures.

  Generally, utilities target a certain number of days of working capital as a beginning cash balance to provide the liquidity needed to allow regular management of payable and payment cycles. Consistent with industry practice, a working capital reserve of between 16% to 25%, or 60 to 90 days of operating and maintenance (O&M)

expenses is targeted. Based upon the City's 2009 budget, this target is equivalent to approximately \$1.4 million to \$2.0 million.[2]

- *Capital Contingency Reserve* – A capital contingency reserve is an amount of cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. Additionally, the reserve could be used for other unanticipated capital needs including capital project cost overruns. There are various approaches to identifying an appropriate level for this reserve, such as 1) identifying a percentage of a utility systems total costs of its fixed assets and, 2) determining the cost of replacing highly critical assets or facilities. For purposes of this analysis, a minimum fund balance equal to 1% of plant in service is targeted.
- *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. This reserve requirement can also be met by using a surety bond. The City maintains a restricted bond reserve in compliance with its bond covenants.

## System Reinvestment Policies

The purpose of system reinvestment funding is to provide for the replacement of aging system facilities to ensure sustainability of the system for ongoing operation. Each year, the utility's 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, which is based on the original cost of the asset over 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, factoring in inflation and construction conditions. Therefore, the added annual replacement liability is even greater than the annual depreciation expense.

Consistent with current City practice, this analysis assumes no system reinvestment funding for the future replacement of system assets. We recommend that the City incorporate a policy of system reinvestment funding through rates as soon as feasible.

## Debt Policies

Bond covenants often establish a minimum debt coverage ratio as a means of protecting an agency against the risk of nonpayment. The City's current bond covenants require a ratio of 1.25 times annual revenue bond debt service.[3]

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[2] City financial policies require a minimum working capital balance of \$1.0 million in each utility fund (combined operations and CIP). This financial analysis is compliant with this fiscal policy.

[3] Per bond covenants for 2005 refunding issue, reserve requirement is defined as the lesser of a) maximum annual debt service on the bonds or b) 125 percent of average annual debt service. As the latter is typically the larger of the two, this study conservatively utilizes this measure as the reserve requirement.

Existing long-term debt includes an $8.35 million 1999 revenue bond issue for the construction of infrastructure necessary to meet growth and provide wholesale water to other communities in need of service. Final debt service payment for the 1999 bonds is scheduled to occur in 2009.

Other existing long-term debt includes a $2.765 million 2005 bond issue for the purpose of refunding 1997 bonds. Debt service payments for this bond issue are scheduled to continue through 2016.

This financial plan includes a planned 2010 bond issue by the City of Auburn in the amount of $6.5 million to support the construction of water and stormwater utility projects. Based upon discussions with City staff, proceeds from this issuance will be split $4.0 million to the water utility and $2.5 million to the stormwater utility. The terms of this bond issuance includes a par value of $6.5 million, an annual interest rate of 5.5% with bi-annual payments spread over a 20 year period.

Existing bond covenants dictate a coverage ratio of 1.25[4].

### 11.3.1 Capital Funding Plan

The CIP developed for this Plan totals 26 separate projects valued at $32.8 million ($34.8 million inflated) over the 2009 - 2014 planning horizon. Costs are stated in 2009 dollars and escalated to the year of planned spending for financing projections at an annual inflation rate of 3%.

Significant projects (presented in inflated dollars) during this planning period include the water supply charges project ($8.1 million), annual distribution improvements program ($4.0 million); annual well inspection and redevelopment program ($3.2 million), well #1 rehabilitation ($2.7 million), New Academy booster pump station ($2.6 million), Lakeland Hills new reservoir ($2.3 million) and Lakeland Hills booster pump station ($2.2 million). These 7 projects total $25.1 million, or 72% of the total estimated value of the CIP.

Table 11.3 summarizes the annual costs associated with the 6-year CIP.

[4] Ibid.

| **Table 11.3** | **2009 – 2014 Water CIP<br>Comprehensive Water Plan<br>City of Auburn** | |
|---|---|---|
| **Year** | **2009 Dollars** | **Escalated** |
| 2009 | $4,759,000 | $4,759,000 |
| 2010 | 8,161,167 | 8,406,002 |
| 2011 | 10,831,698 | 11,491,348 |
| 2012 | 3,836,741 | 4,192,510 |
| 2013 | 2,163,657 | 2,435,215 |
| 2014 | 3,026,447 | 3,508,482 |
| **6-year total** | **32,778,710** | **34,792,557** |

A capital funding plan is developed to determine the total resources available to meet the CIP needs and determine if new debt financing will be required. The utility started 2009 with a cash balance of $8.6 million for its capital program. Future SDC collections are projected at $450,000 annually based on the City's adopted 2009-10 budget. To be conservative, no growth in this revenue source is assumed.

This funding plan includes $4.0 million in proceeds from the planned 2010 bond issue as discussed earlier, $2.7 million in system development charges, $8.5 million in existing cash reserves including interest, and $19.6 million in new revenue bonds. A summary of the 2009 – 2014 capital funding plan is summarized in Table 11.4 below. Figures presented are in inflated dollars.

**Table 11.4 2009 – 2014 Capital Financing Plan**
**Comprehensive Water Plan**
**City of Auburn**

| **Capital Funding** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **Total** |
|---|---|---|---|---|---|---|---|
| **Total Capital Projects** | **$ 4,759,000** | **$ 8,406,002** | **$ 11,491,348** | **$ 4,192,510** | **$ 2,435,215** | **$ 3,508,482** | **$ 34,792,557** |
| City planned 2010 revenue bonds | - | 4,000,000 | - | - | - | - | 4,000,000 |
| New Revenue Bond Proceeds | - | - | 10,846,722 | 3,726,395 | 1,973,562 | 3,046,940 | 19,593,619 |
| Use of System Development Charges | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 | 2,700,000 |
| Use of Capital Fund Balance | 4,309,000 | 3,956,002 | 194,627 | 16,116 | 11,653 | 11,541 | 8,498,939 |
| **Total Funding Sources** | **$ 4,759,000** | **$ 8,406,002** | **$ 11,491,348** | **$ 4,192,510** | **$ 2,435,215** | **$ 3,508,482** | **$ 34,792,557** |

## 11.4 AVAILABLE CIP FUNDING ASSISTANCE AND FINANCING 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 Utility Resources and Outside Resources.

### 11.4.1 Utility Resources

Utility resources appropriate for funding capital needs include accumulated cash in the CIP Funds, bond proceeds and capital revenues, such as system development charges. The first two resources have been discussed in the Financial Policies section. Capital-related revenues are discussed below.

**System Development Charges**

A system development charge (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 in the capital costs incurred to support their addition to the system. 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 11.5 summarizes the City's current SDC schedule.

**Table 11.5 Current System Development Charge Schedule**
**Comprehensive Water Plan**
**City of Auburn**

| Meter Size (inches) | SDC |
|---|---|
| 3/4" or less | $2,424 |
| 1" | $4,048 |
| 1 1/2" | $8,072 |
| 2" | $12,290 |
| 3" | $24,240 |
| 4" | $40,408 |
| 6" | $80,792 |
| 8" | $129,280 |
| 10" | $135,971 |

It should be noted that, as part of a comprehensive rate study started in late 2008, the City will be evaluating its SDC levels based upon the City's planned 20 year CIP. Results are expected by the end of the first quarter 2010.

**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 costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in a rate forecast since 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, the discussion of these charges is included in this chapter, as they are an impact to the new customer of the system.

There are a number of mechanisms that can be considered toward funding local facilities. One of the following scenarios typically occurs:

a. the utility charges a connection fee based on the cost of the local facilities (under the same authority as the SDC);
b. a developer funds extension of the system to their development and turns those facilities over to the utility (contributed capital); or
c. 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 cannot exceed 15 years in duration.

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 Outside 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, the benefit of even the very low-interest loans makes the effort of applying worthwhile. Grants and low cost loans for Washington State utilities are available from the Department of Ecology and the Department of Community Trade and Economic Development. Each includes programs for which the City might be eligible. They are primarily targeted at low-income and/or rural communities.

**Department of Ecology (from the FY 2010-11 Water Quality Financial Assistance Guidelines)**

The Department of Ecology Water Quality Program administers three major funding programs that provide low-interest loans, grants or loans and grant combinations for projects that protect, preserve and enhance water quality in Washington State. These guidelines describe how to apply for funding, meet program requirements, and manage funded projects for the following programs:

- The Centennial Clean Water Program (Centennial)
- The Clean Water Act Section 319 Nonpoint Source Grant Program (Section 319)
- The Washington State Water Pollution Control Revolving Fund (Revolving Fund)

Further detail is available at http://www.ecy.wa.gov/biblio/0810080.html

**Department of Community Trade and Economic Development (from the CTED website)**

The Department of Community Trade and Economic Development has four grant and loan programs that the City might be eligible for:

- Community Development Block Grants (General Purpose Grant)
- Community Economic Revitalization Board Grant and Loan Program
- Public Works Trust Fund Loan Program
- Drinking Water State Revolving Fund Loan Program

Each of these four programs is described in greater detail below.

Community Development Block Grants (General Purpose Grants) – These grants are made available to Washington State small cities, towns and counties in carrying out significant community and economic development projects that principally benefit low and moderate income persons.

- Eligible applicants are Washington State cities and towns with a population less than 50,000 and counties with a population less than 200,000 that are non-entitlement jurisdictions or are not participants in a HUD Urban County Entitlement Consortium.
- Eligible projects include public facilities for water, wastewater, storm sewer and streets. Approximately $12 million is expected to be available in 2008 with a maximum single grant amount of $1 million.
- The application period is September through November annually.

Further detail is available at http://www.cted.wa.gov/site/806/default.aspx.

Community Economic Revitalization Board - CERB 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 targeting 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. Traditional construction projects are offered at a maximum dollar limit per project of $1 million. Local match of 25% is targeted.

Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes, and municipal corporations.

The Board's policy is that all loans made by the CERB will be secured by a general obligation pledge of the taxing power of the borrowing entity. Terms do not exceed 20 years including available payment deferral of interest and principal for up to five years. Interest rates match the most current rate of Washington State bonds (not to exceed 10%).

Further detail is available at http://www.cted.wa.gov/site/64/default.aspx.

Public Works Trust Fund – Cities, towns, counties and special purpose districts are eligible to receive loans. Water, sewer, storm, roads, bridges and solid waste/recycling are eligible and funds may be used for repair, replacement, rehabilitation, reconstruction and improvements including reasonable growth (generally the 20-year growth projection in the comprehensive plan).

PWTF loans are available at interest rates of 0.5%, 1% and 2% with the lower interest rates given to applicants who pay a larger share of the total project costs. The loan applicant must provide a minimum local match of funds of 5% towards the project cost to qualify for a 2% loan, 10% for a 1% loan, and 15% for a 0.5% loan. The useful life of the project determines the loan term up to a maximum of 20 years.

Further detail is available at http://www.cted.wa.gov/site/361/default.aspx.

Drinking Water State Revolving Loan Program – The DWSRF is jointly administered by the Public Works Board and the Department of Health. The program is intended to improve drinking water systems and protect public health for both publicly and privately owned systems.

There is no match required, terms are not to exceed 20 years and project completion time is 36 months after loan execution. The loan limit is $3 million, the loan fee is 1% and interest rates range from 0% to 1.5% depending upon the number of households at or below the County's median income. Applications are accepted annually in May.

For more information, see: http://www.doh.wa.gov/ehp/dw/our_main_pages/dwsrf.htm

**Public Debt**

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.

**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 due to the 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 assumes the following funding priority:

1. Available grant funds
2. Accumulated capital cash reserves
3. Annual revenue collections from system development charges (SDCs)
4. Annual transfers of rate-funded capital or excess cash (above minimum balance targets) from operating accounts
5. Interest earnings on CIP Fund balances and other miscellaneous capital resources
6. 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. The analysis incorporates operating revenues, operating and maintenance (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 criteria 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 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.

### 11.5.1 Financial Forecast

The financial forecast is developed from the City's adopted 2009-10 biennial budget documents along with other key factors and assumptions to develop a complete portrayal of the water utility annual financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the forecast:

- Annual customer growth is estimated at 2.0% over the study period based on discussions with City staff.
- The City's 2009-10 budget forms the baseline for revenue and expense forecasts. Included in the 2009-10 budget is a City adopted water rate increase of 6.06% effective January 2009 and a 5.99% rate increase effective January 2010. These increases were applied across-the-board, affecting all rates and customer classes.
- City rate revenues include revenues from water service charges, water applications, and unmetered water sales. Estimated water service charges for 2009 were reconciled to the City's 2007 customer billing data detail and are forecasted incorporating customer growth. Water applications and unmetered water sales total approximately $300,000 over the 2009-10 biennium, or about 1.5% of total revenues.
- Interest earnings assume a rate of 2.5% applied to beginning of year cash balances.
- O&M expenses are escalated from the 2010 budget figures at 4.0% per year for general cost and labor inflation and 6% for employee benefit cost inflation. State taxes are calculated based on prevailing tax rates.
- Existing debt service schedules were provided by the City and include two existing revenue bond issues, an anticipated $6.5 million revenue bond issue in 2010 that will also fund stormwater construction projects[5] and three Public Works Trust Fund loans with varying pay off schedules[6].
- Future debt service has been added as outlined in the capital funding plan. The forecast assumes a revenue bond interest rate of 6%, issuance cost of 2%, and a 20-year term.
- Consistent with current City practice, no annual rate-funded capital (system reinvestment funding) is forecasted.

This financial plan focuses on the planning period of 2009 through 2014. Table 11.6 summarizes the projected financial performance for the 2009 – 2014 planning period based upon the above assumptions.

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[5] Based upon discussions with City staff, the principal amount of this anticipated bond will be split $4.0 million to water and $2.5 million to stormwater.

[6] Existing revenue bonds includes: 1999 revenue bonds (2009 payoff); 2005 revenue refinancing bonds (2016 payoff); and an anticipated 2010 water/stormwater revenue bond (2030 payoff). Existing PWTF loans includes: 1999 and 2001 Corrosion control facilities loans (respective 2019 and 2021 payoff); a 2002 Reservoir protective coating loan (2022 payoff); and the water utility's share of annual lease payments for the City Hall Annex (2029 payoff).

**Table 11.6 Financial Forecast Comprehensive Water Plan City of Auburn**

| Revenue Requirements | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| **Revenues** | | | | | | |
| Rate Revenues Under Existing Rates | $ 8,031,007 | $ 8,584,249 | $ 8,755,934 | $ 8,931,052 | $ 9,109,673 | $ 9,291,867 |
| Non-Rate Revenues | 1,109,193 | 1,160,703 | 1,233,770 | 1,248,028 | 1,262,681 | 1,283,187 |
| **Total Revenues** | **$ 9,140,200** | **$ 9,744,951** | **$ 9,989,704** | **$ 10,179,080** | **$ 10,372,354** | **$ 10,575,053** |
| **Expenses** | | | | | | |
| Cash Operating Expenses | $ 7,924,045 | $ 8,438,599 | $ 8,774,906 | $ 9,120,474 | $ 9,480,490 | $ 9,855,590 |
| Existing Debt Service | 748,354 | 994,690 | 994,430 | 993,726 | 985,177 | 983,881 |
| Debt Service - City planned 2010 revenue bonds | - | 167,372 | 334,744 | 334,744 | 334,744 | 334,744 |
| Debt Service - New Revenue Bond Proceeds | - | - | 1,059,196 | 1,423,083 | 1,615,804 | 1,913,342 |
| Rate Funded System Reinvestment | - | - | - | - | - | - |
| **Total Expenses** | **$ 8,672,400** | **$ 9,600,661** | **$ 11,163,276** | **$ 11,872,026** | **$ 12,416,216** | **$ 13,087,557** |
| **Annual Surplus / (Deficiency)** | **$ 467,801** | **$ 144,290** | **$ (1,173,572)** | **$ (1,692,947)** | **$ (2,043,862)** | **$ (2,512,504)** |
| Debt Service Coverage (target: at least 1.25) | **1.86** | **4.23** | **1.01** | **0.75** | **0.61** | **0.47** |

Table 11.6 shows the forecasted rate revenues under the City's adopted 2009-2010 budget (which incorporated the City's adopted rate increase of 6.06% in January 2009 and a scheduled 5.99% rate increase in January 2010), and the forecasted rate revenues over the remaining 2011-2014 planning period[7]. This financial forecast shows that planned and forecasted water utility service charges under current adopted rates are not sufficient to fund the "total system" cost of the utility. The gap between revenues and expenses is forecasted to increase from a surplus of $468,000 in 2009 to a deficit of $2.5 million by 2014 as growth in expenses outpace revenues. In addition, as a result of the resource deficiency, debt service coverage is forecasted to fall below the minimum threshold as prescribed by the City's bond covenants starting in 2011.

The City recognizes that forecasted water utility service charge revenues under existing rates are insufficient to meet its forecasted financial obligations. A comprehensive rate study is underway to evaluate the forecasted financial needs of the utility over the 2009 – 2014 planning horizon and identify the level of water rate increases necessary to fully fund its financial obligations. Results from this rate study are anticipated by the end of the first quarter 2010.

## 11.5.2 City Funds and Reserves Balances

Table 11.7 shows a summary of the projected ending City operating and capital reserve balances through 2014 based on the rate forecasts presented herein[8]. As shown below, as forecasted revenues are unable to keep pace with the forecasted growth in expenses, the operating fund is projected to fall into a deficit position starting in 2012. The capital fund balance is forecasted to decline to about $460,000 starting in 2011 reflecting the annual

[7] City Ordinance #6204, adopted September 2008.

[8] Beginning 2009 fund balance for the water utility is $11,318,967 and includes resources for operations, capital, and debt reserves.

collection of system development charge revenues and associated interest earnings. The debt reserve balance is set by covenant and is in compliance with coverage requirements.

**Table 11.7 Cash Balance Summary
Comprehensive Water Plan
City of Auburn**

| Ending Fund Balances | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| Operating Fund | $2,467,801 | $2,612,091 | $1,427,758 | ($298,797) | ($2,405,176) | ($4,978,836) |
| Capital Fund | $4,488,418 | $644,627 | $466,116 | $461,653 | $461,541 | $461,539 |
| Debt Reserves | $1,472,240 | $1,472,240 | $2,531,436 | $2,895,323 | $3,088,044 | $3,385,582 |
| Total | $8,428,459 | $4,728,958 | $4,425,310 | $3,058,179 | $1,144,409 | ($1,131,715) |

# 11.6 RATE STRUCTURES AND CONSERVATION FEATURES

## 11.6.1 Existing Retail Rates

The City's existing retail water rates for inside City customers is comprised of nine rate classes. The retail rate schedule for the single-family residential customer class consist of a base monthly charge and a three-tiered inclining block volume rate structure based upon the amount of water consumed as measured in 100 cf 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. In addition, the City also has wholesale contracts to provide water service to several surrounding communities and include the City of Algona, Water District #111 and the City of Covington.

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[9]. 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[10].

Table 11.8 presents the City's existing retail water rate schedule for each customer classification.

The City's water rate structure appears adequate in terms of customer equity (class-specific rates) and contains typical conservation features for the single family residential class (increasing block volume charges).

[9] AMC 13.06.360.

| **Table 11.8** | **Existing Retail Water Rates<br>Comprehensive Water Plan<br>City of Auburn** | | |
|---|---|---|---|
| | | **Current Rates** | |
| | | **Jan 1 2009** | **Jan 1 2010** |
| **Inside City** | | | |
| Single Family Residential | | | |
| Base Rate | | $9.08 | $9.62 |
| Tier 1 Volume Rate (per ccf; 0-7 ccf) | | $1.80 | $1.91 |
| Tier 2 Volume Rate (per ccf; 7-15 ccf) | | $2.21 | $2.34 |
| Tier 3 Volume Rate (per ccf; >15 ccf) | | $2.50 | $2.65 |
| Multifamily Residential | | | |
| Base Rate | | $27.06 | $28.68 |
| Volume Rate (per ccf) | | $1.89 | $2.00 |
| Commercial | | | |
| Base Rate | | $27.06 | $28.68 |
| Volume Rate (per ccf) | | $2.15 | $2.28 |
| Manufacturing / Industrial | | | |
| Base Rate | | $27.06 | $28.68 |
| Volume Rate (per ccf) | | $1.75 | $1.85 |
| Schools | | | |
| Base Rate | | $27.06 | $28.68 |
| Volume Rate (per ccf) | | $2.04 | $2.16 |
| City Accounts | | | |
| Base Rate | | $27.06 | $28.68 |
| Volume Rate (per ccf) | | $2.50 | $2.65 |
| Irrigation Only | | | |
| Base Rate | | $9.08 | $9.68 |
| Volume Rate (per ccf) | | $2.50 | $2.65 |
| Wholesale - Algona | | | |
| Base Rate | | $42.77 | $45.33 |
| Volume Rate (per ccf) | | $1.40 | $1.48 |
| Wholesale - WD #111 and Covington | | | |
| Base Rate | | $175.00 | $175.00 |
| Volume Rate (per ccf, up to 1.5 mgd 'take or | [a] | $0.91 | $0.93 |
| Summer (per ccf over 1.5mgd) | [a] | $1.17 | $1.21 |
| Winter (per ccf over 1.5mgd) | [a] | $0.91 | $0.93 |
| **Low Income discount: 50%** | | | |
| **Outside City multiplier: 1.5** | | | |

[a] prior year rate x CPI

### 11.6.2 Projected Retail Rates

As discussed above, a rate study is presently underway to assess the level of retail water rate increases necessary to fully fund utility financial obligations. Potential equity and conservation enhancements to the rate structure will also be evaluated.

## 11.7 AFFORDABILITY

A common affordability benchmark for utility rates is to test the monthly median income equivalent against the existing and projected monthly utility rates. The typical threshold

[10] AMC 13.24 and 13.24.030.

used to assess relative affordability is 1.5% of the median household income. In the case of the City of Auburn's water utility, utility billings should not exceed $814.10 over the course of a year or $67.84 on a monthly basis. Based upon the City's existing rates for 2010, assuming usage of 7.5ccf per month which is the typical level of usage for a single-family residential account based upon current City billing statistics, a typical water service billing is $289.92 per year or $24.16 per month, both of which are well within the affordability benchmark as outlined above.

Table 11.9 below presents the results of the affordability test.

**Table 11.9 Affordability Test**
**Comprehensive Water Plan**
**City of Auburn**

| | |
|---|---|
| 1999 Median Household Income | $39,208 |
| Assumed Annual growth in MHI | 3.00% |
| Estimated 2010 Median Household Income | $54,273 |
| Affordability Benchmark | 1.50% |
| Maximum affordable billing | |
| - Annual | $814.10 |
| - Monthly | $67.84 |
| Actual billing at 7.5ccf per month | |
| - Annual | $289.92 |
| - Monthly | $24.16 |

Rate affordability should be evaluated for future years following completion of the rate study.

## 11.8 CONCLUSION

This financial plan indicates that the City's adopted rates will not be sufficient to fund utility financial obligations. The City is aware of this financial situation and had therefore initiated a comprehensive water rate study to determine the appropriate level of adjustment to water rates over the 2009-2014 planning period. This study is presently underway with results expected by the end of the first quarter 2010.

# 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 RESPONSIBILITY, AUTHORITY, AND ORGANIZATION STRUCTURE

### 12.2.1 Mission Statement

The mission statement of the City's Water Utility department is to provide for the efficient, environmentally sound and safe management of the existing and future water system within Auburn's service area.

### 12.2.2 Department Overview

The Water Utility is responsible for providing potable water to Auburn'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 Utility will also continue to enhance its customer service through public education and information. A primary responsibility of the Utility is implementing the Comprehensive Water 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 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) |
| American Public Works Association | (APWA) |
| 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 Public Works Director. The Public Works Department is responsible for planning, design, construction, operation, maintenance, quality control and management of the water system. Within the Public Works Department, the Utilities Section is responsible for comprehensive water system planning, development of a Capital Improvement Program (CIP), as well as programming and coordinating the design, construction and inspection of projects related to the water system.

The Water Division of the Public Works Department is responsible for the day-to-day management of the Utility and is under the direction of the Public Works Director, the City Engineer/Assistant Public Works Director, the Maintenance and Operations Manager, the Water Distribution Manager and the Water Operations Manager. The Water Division operates and maintains the water system, performing daily operation and inspection, water quality monitoring (as required by Washington State Department of Health) and line management of the Utility.

The Maintenance and Operations (M&O) Manager is designated as manager of the Water Distribution Manager and Water Operations Manager. The Water Division Managers are designated as the individuals responsible for the water system M&O staff. The organization of the Water Utility is shown on Figure 12.1 and the water division technical support in Table 12.1. The responsibilities of each of the water division technical support staff are summarized below:

- <u>Utilities Engineer and Water Utility Engineer:</u> They are primarily responsible for development of technical specifications, “as-built” drawings, designs, standards and specifications utilized in the construction of water systems facilities. They also provide technical computations, water modeling and other analysis required to support system operation. Additional responsibilities include project engineering, consultant contracts, capital projects and customer assistance with City code, drawings and permits.

- <u>Water Quality Programs Coordinator:</u> Provides assistance with the Water Quality and Water Conservation Programs.

- <u>Project Engineers</u>: They are involved with capital projects, consultant contracts and “as-built” drawings. Additional responsibilities include maintenance and issuance of the City’s Design and Construction Standards.

- <u>Utilities Technician</u>: 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.

- <u>Development Engineer</u>: 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 and maps and statistics to staff within the Public Works Department.

Personnel lists for M&O staff are shown on Table 12.2 and 12.3.

Auburn has a mayor-council form of government, therefore, the Public Works Director reports to the Mayor. A Public Works Committee, comprised of three City Council members, provides oversight of the Water Utility regarding policy, planning and management of the water system.

**Table 12.1 Technical Support**
**Comprehensive Water Plan**
**City of Auburn**

| Title | Department | Division |
|---|---|---|
| Utilities Engineer | Public Works | Engineering |
| Water Utility Engineer | Public Works | Engineering |
| Water Quality Programs Coordinator | Public Works | Engineering |
| Project Engineers | Public Works | Engineering |
| Utilities Technician | Public Works | Engineering |
| Development Review Engineer | Public Works | Engineering |
| GIS Database Staff | Information Services | GIS |

### 12.2.5 Operations - Tasks and Responsibilities

**Table 12.2 Operations Staff**
**Comprehensive Water Plan**
**City of Auburn**

| Position | Primary Function(s) | Certification(s)[1] | Certificate Number |
|---|---|---|---|
| Water Operations Manager | Management | CCS<br>BTO<br>WDM-3<br>BAT | 9698<br>9698<br>9698<br>B3817 |
| Cross Connection Control Specialist | Cross Connection Control<br>Backflow Assembly Tester | CCS<br>BAT<br>WDM-2 | 9439<br>B5032<br>9439 |
| Cross Connection Control Specialist | Cross Connection Control<br>Backflow Assembly Tester | CCS<br>BAT<br>WDM-1 | 10503<br>B4690<br>10503 |
| Distribution Specialist | Distribution<br>Operations<br>Maintenance | WDM-4<br>WDS<br>CCS | 3969<br>3969<br>3969 |
| Distribution Specialist | Distribution<br>Operations<br>Maintenance | WDM-4<br>WTPO-1<br>BAT | 6961<br>6961<br>B3821 |
| Maintenance Worker II | Operations<br>Maintenance | N/A | N/A |
| Maintenance Worker II | Operations<br>Maintenance | N/A | N/A |

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-1 = Water Treatment Plant Operator 1
BTO = Basic Treatment Operator

### 12.2.6 Distribution - Tasks and Responsibilities

**Table 12.3 Distribution Staff**
**Comprehensive Water Plan**
**City of Auburn**

| Position | Primary Function(s) | Certification(s)[1] | Certificate Number |
|---|---|---|---|
| Water Distribution Manager | Management | WDM-3<br>CCS<br>BAT/BTO | 7216<br>7216<br>B4450 |
| Field Supervisor | Management | WDM-3<br>CCS | 005651 |
| Maintenance Worker II | Construction<br>Maintenance | WDM-2 | N/A |
| Maintenance Worker I | Maintenance | WDM-1 | 011964 |
| Maintenance Worker II | Construction<br>Maintenance | N/A | N/A |
| Maintenance Worker II | Construction<br>Maintenance | WDM-1 | 9873 |
| Maintenance Worker I | Construction<br>Maintenance | WDM-1 | 011286 |
| Maintenance Worker I | Maintenance<br>Worker I | WDM-1 | 011962 |
| Maintenance Worker II | Construction<br>Maintenance | WDM-1 | 011626 |
| Maintenance Worker II | Unidirectional<br>Flushing Dead End<br>Flushing<br>Valve Exercising | N/A | N/A |
| Maintenance Worker II | Unidirectional<br>Flushing Dead End<br>Flushing<br>Valve Exercising | WDM-1 | N/A011600 |

Notes:
(1) 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
BTO = Basic Treatment Operator

### 12.2.7 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 the majority of personnel carry combination cellular phones and radio units. 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, combination cell phone/radio during their off hours and they are remunerated on an hourly basis. 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 Distribution Manager, the Water Operations Manager, or the Field Supervisor. If contact is not made, the operator will contact the designated Standby Public Works Maintenance and Operation Supervisor. There are nine staff 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 nine staff on the Standby List are as follows:

- Water Operations Manager
- Water Distribution Manager and Field Supervisor
- Sanitary Sewer Manager and Field Supervisor
- Storm Drainage Manager and Field Supervisor
- Streets Manager and Field Supervisor

There are also 3 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 dialer system. SCADA alarm is the first to call standby staff. If no one responds within 30 minutes, then the auto dialer calls the Water Operations standby employee. If the call is not picked up, the dialer will call one of the other six Operations employees that are not on standby. The system will continue to cycle through the roster of seven employees until contact is made.

# Public Works Department

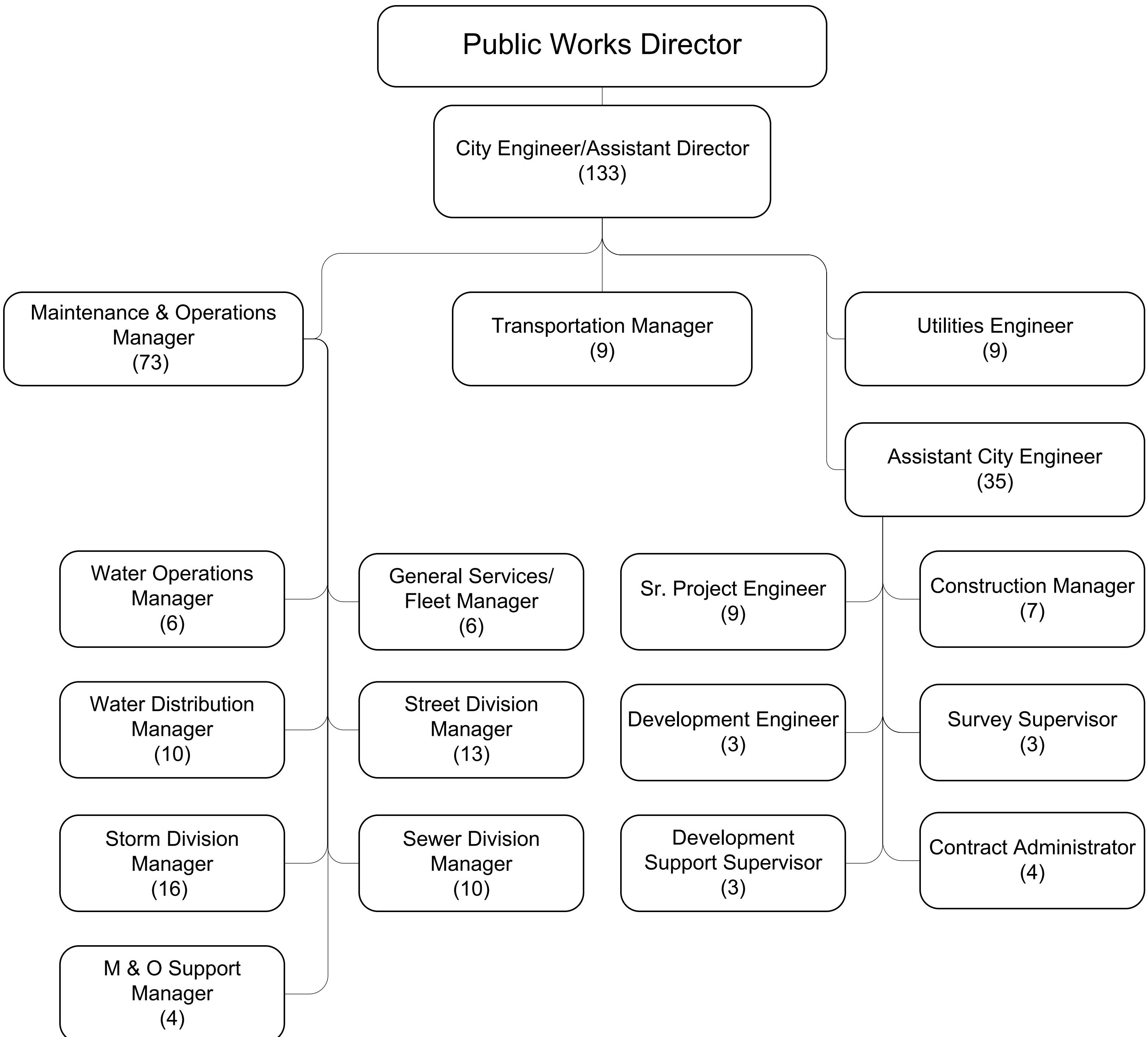


**Figure 12.1**
**Auburn Water Utility Organization**
**COMPREHENSIVE WATER PLAN**
CITY OF AUBURN

(Staff)

## 12.3 CERTIFICATION, EDUCATION, AND TRAINING

### 12.3.1 Operator Certification

The State regulation (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 gives time-off 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 Environmental Training Resource Center (WETRC) at Green River Community College. Water Division Staff and their certifications are listed in Table 12.2 and Table 12.3 for Operations and Distribution, respectively.

### 12.3.2 Supplemental Education and Training

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 are 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 are 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 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 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 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 Cities SCADA system is located in the Public Works-Maintenance and Operations Building, 1305 C ST SW and responsibility for the system falls under the Water Operations 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 dedicated phone lines and information regarding customer demand is used to determine system activation. The SCADA system includes logic programming which automates the process, however, Operations staff can manually over-ride most computer decisions if necessary. The alarm infrastructure is linked to an automatic dialer system 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 Information Services 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 server drive service. Access and control of the system is relegated to two dedicated computer terminals at the Maintenance and Operations Building.

The SCADA system was first put into operation approximately 21 years ago and a project to replace it with a more modern version was contracted out to an engineering consultant firm in March 2007. Completion of the SCADA study is scheduled for summer 2009 and installation/operation is anticipated before the end of 2009. An additional facet planned for the SCADA project involves a focus on enhanced security features in accordance with the recommendations outlined in the Water Utility's Vulnerability Assessment.

### 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 Manager as summarized in Table 12.4. The inspection process serves a number of needs as follows and is a full-time commitment for two staff:

- 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.

**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 | 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 | Jannsens Addition 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 | Coal Creek Springs - Gas | X | |
| Chlorination Station | West Hill Springs - Gas | X | |
| Chlorination Station | Well 1 – Gas (portable: when well is in operation) | X (when on) | X (when off) |
| 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) |

**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 |
|---|---|---|---|
| Chlorination Station | Well 4 - Gas | X | |
| Chlorination Station | Fulmer Field Corrosion Control Facility – Onsite Generated Hypochlorite (treats Well 2, 6, and 7 sources) | 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 | |
| Reservoir | Reservoir 1 | X | |
| Reservoir | Reservoir 2 | X | |
| Reservoir | Lea Hill Reservoirs (2 storage tanks) | X | |
| Reservoir | Academy Reservoir (2 storage tanks) | X | |
| Reservoir | Lakeland Reservoir | X | |
| Reservoir | Braunwood Reservoir | X | |
| Spring | Coal Creek Springs | X | |
| Spring | West Hill Springs | X | |
| Treatment Facility | Well 5B (treats iron and manganese) | X (when on) | X (when off) |
| Well | Well 1 (usually off) | X (when on) | X (when off) |
| Well | Well 2 | X | |
| Well | Well 3A (usually off) | X (when on) | X (when off) |
| Well | Well 3B (usually off) | X (when on) | X (when off) |

| Table 12.4 Water Operations - Facility Inspection Schedule<br>Comprehensive Water Plan<br>City of Auburn | | | |
|---|---|---|---|
| **Type of Facility** | **Facility Name** | **Daily Inspection 5 Day Workweek** | **Weekly Inspection** |
| Well | Well 4 | X | X |
| Well | Well 5 | X | X |
| Well | Well 5A (usually off during winter and fall months) | X (when on) | X (when off) |
| Well | Well 5B (usually off) | X (when on) | X (when off) |
| Well | Well 6 | X | |
| Well | Well 7 | X | |
| Well | Braunwood Satellite | X | |

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. 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 and miscellaneous small improvement projects.

### 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 Division began a rigorous reservoir maintenance program in 1997 and it has evolved into an annual routine function. Each year, 2 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 Operations Manager 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.

### 12.4.4 Utility Locating Service

One Water Division staff is designated as the Utility Locator for all City utilities (Water, Storm Drainage, and Sanitary Sewer) and one additional staff must 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 Locator reports to the M&O Manager, but location requests may be made indirectly by the Water, Sanitary Sewer, or Storm Drainage Supervisor as necessary. The Location position and flagging assistance is entirely funded through the Water Utility budget and no repayment protocol has been established to cover services rendered to Storm Drainage or Sanitary Sewer. Resolution of this issue is under discussion.

### 12.4.5 Hydrant Inspection

In 1999 a Hydrant Inspection goal was initiated. The intent was to inspect, repair and test at least half 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 year 2001 to treat water purged from hydrant stubs. The Water Distribution Supervisor has made Hydrant Inspection a routine task of Water Utility operations during the spring and summer months of each year. This commitment draws off the efforts of one staff member from the Water Distribution division for approximately 6 months. Secondary maintenance of the hydrants (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.

The program is based on flushing all of the system dead ends at least once per year; however, there are some dead ends that require flushing at least once per month. It takes a crew of two approximately four months to flush all of the system dead ends. Two additional Water Distribution maintenance staff have been hired to assist with Dead End Flushing, Unidirectional Flushing and Valve Exercising.

### 12.4.7 Unidirectional Flushing

The Water Distribution Division is responsible for a Unidirectional Flushing program to maintain Water Quality. It is an extremely effective tool to scour water mains of sediment, bio-films, and corrosion and it is endorsed by the AWWA. Flushing also fulfills two other important maintenance and operations requirements: (1) it serves as a valve exercising program and (2) provides static pressure measurement information. As noted in the dead end flushing section above, a program improvement to hire additional staff in the Water Distribution Division was passed and a unidirectional flushing program is anticipated to be implemented in 2009-2010.

### 12.4.8 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 sixteen inch and larger.

The Water Utility's Valve Exercising Program has been initiated and will be continued in concert with the unidirectional flushing program. Hydrant foot valves are exercised as part of the Hydrant Inspection process but distribution valves have only been exercised on a limited and sporadic basis. It would take an estimated 3,200 man-hours, based on a field test audit, to exercise the year 2007 count of 4,499 valves. The average Water Division employee works approximately 1,726 hours per year when absences such as vacation, sick leave, holidays, jury duty, etc. are taken into account. An annual Valve Exercising Program alone, without the additional work involved with Unidirectional Flushing, would consume the total yearly work load of approximately two employees. It should also be noted that in some instances, safety measures such as traffic or water diversion control would require the presence of more than two staff members.

Opening and closing valves by hand is a repetitive, ergonomically unsafe and time consuming task. The purchase of a valve exercising machine to eliminate the noted drawbacks is a fundamental component of the Valve Exercising program. The City is considering the purchase of a portable but powerful vacuum device to speed up removal of debris that collects in the bottom of valve boxes. The man-hours noted above are just an approximation of the exercising portion of the program. There is a good possibility that some valves will require repair or replacement. The costs and man-hours associated with those two activities have not been determined.

### 12.4.9 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 and takes approximately 15 workdays to complete. 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. 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.

### 12.4.10 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 each year as part of the System Loss Program. The calibration process is performed by an outside contractor under the direction of the Water Operations Manager and if a meter cannot be calibrated properly, it is replaced with a new one.

### 12.4.11 Meter Replacement Program

The Water Distribution Division has been replacing manual read meters with radio read meters since late 2005. A February 2007 audit revealed that 13,166 service meters are within the water utility service area. 103 of the meters are three inches or larger and fall under the definition of "Large Meter". Approximately 18 of the large meters and 632 of the City's small meters have to be retrofitted with radio reads. The Meter Replacement Program dictates that: 1) radio read installation is mandatory for all new installations or meters requiring repair, 2) a minimum of 150 manual read, small meters, regardless of their condition, should be converted to radio read each year and 3) a minimum of 12 manual read large meters, regardless of their condition, should be converted to radio read each year.

The Program goals for radio read conversion for new meters, meter requiring repair and large meters is reasonable but the conversion formula for small meters is not very ambitious. It will take approximately 83 years to replace all small manual read meters with radio read based on this Program Goal. The underlying reason for the extended schedule is due to funding and available man-hours. Most of the small meters are 5/8 inch by 3/4 inch and the 2007 price for one radio read meter is approximately $137. A radio read head can be installed on an existing meter for approximately $96, but the internal components for measuring consumption belong to the body of the original meter. Water Division decided that it would be more advantageous to the Utility to install a complete new meter based on calibration accuracy and reliability. Component costs to replace the City's inventory of existing small manual read meters have been estimated to be in excess of $1,800,000. Labor costs for said replacements would cost approximately $300,000 and an estimated 9,600 man-hours would have to be allocated to the task.

### 12.4.12 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.

### 12.4.13 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 103 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. Approximately 15 workdays per year are committed to this program and if a meter cannot be calibrated, it is replaced with a new one.

## 12.5 WATER QUALITY PROGRAM

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 Public Works - Water Quality Programs Coordinator.

The City's Water Quality Monitoring Program is detailed in a manual entitled "City of Auburn Public Water System Water Quality Monitoring Plan". The Plan complies with the DOH regulations for Group A Public Water Systems. Regulations governing Group A Public Water System monitoring are found in Chapter 246-290 of the Washington Administrative Code (WAC) and in Code of Federal Regulation (CFR) Protection of Environment Sections and Subsection of Title 40 Parts 141 and 143.

Raw water samples for Coliform detection are taken from the water sources and distribution system on a scheduled basis. The sampling is based on an approved Coliform Monitoring Plan (CMP) that documents the City's bacteriological sampling and testing program.

Sampling to detect inorganic chemicals, volatile organic chemicals, trihalomethanes, lead, and copper is also conducted on an annual basis. Additional sampling also occurs based on special requests by of the DOH or by customers concerned about water quality issues involving unusual taste, odor, or color.

The Water Division maintains hard copies of their 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 is familiar with the Follow-Up Action Requirements of WAC 246-290-320 whenever Water Quality results exceed a prescribed level. The 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 is also 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 laboratories:

AM-Test Incorporated
4900 9th Avenue NW
Seattle, Washington
206-783-4700

Laucks Testing Laboratories, Inc.
940 South Harney
Seattle, Washington 98000
206-767-5060

## 12.6 EMERGENCY RESPONSE PROGRAM

The City of Auburn Public Works Department 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 Plan 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 Maintenance and Operations Building, the second copy resides in City Hall with the Public Works Director and the third is located at the Valley Regional Fire Authority, Station 31.

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 Emergency Operations Plan. The material in the Operations Plan provides guidance to the Emergency Management Organization for mitigation, preparedness, responsibilities, recovery operations, training and community education activities. The Plan 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 Maintenance and Operations Building and the Valley Regional Fire Authority, Station 31.

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 of Auburn. 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 Maintenance and Operations Building, the second copy resides in City Hall with the Public Works Director and the third is located at the Valley Regional Fire Authority, Station 31.

The City has also 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 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. The Manual is too lengthy to include in this document but the table of contents is included as Appendix O to illustrate the material covered. A copy is on file with the Emergency Preparedness Manager.

### 12.6.1 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 United States Environmental Protection Agency (USEPA) on November 15, 2004. The primary focus of the VA was an intentionally created contamination event sponsored by terrorists or like-minded individuals. A Water System Security Improvement Plan (WSSIP) was also prepared in conjunction with the VA to prevent or significantly lessen the impact of the noted event and other intrusive activities.

Most of the recommendations noted in the WSSIP could not be addressed at the time of publication due to the lack of available funds. However, adoption of some of the suggestions are planned for 2009/2010 based on details discussed in the "System Operation" section of this chapter.

Auburn was also required to submit an Emergency Response Plan Certification verifying inclusion of the City's Vulnerability Assessment Security Improvement Plan within the Public Works Emergency Response Manual. The Certification was submitted to the USEPA.

## 12.7 CROSS CONNECTION CONTROL PROGRAM

The City of Auburn's Cross Connection Control Program (provided in Appendix P) 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 Manager. The specialists are responsible for identification and elimination of potential and actual cross connections and contamination hazards within the public water system.

## 12.8 CUSTOMER SERVICE & RECORDS DOCUMENTATION

One Water Division staff is assigned as a Customer Service Representative. This individual reports directly to the Water Distribution Manager and 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, is currently experiencing a major transition in record control and documentation. The shift is based on the purchase of an asset management software system developed by a company called "CarteGraph".

CarteGraph software has the ability to revolutionize the City's business practice if used to its full potential. Implementation began in mid 2006. Complete adaptation of the process is anticipated by end of year 2009. 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.

The majority of records that Water Division collected in the past, and partially at this point in time, are based on hard copy paper forms. This includes forms that track maintenance and inspection records used to for pumps, valves, meters, reservoirs, hydrants, operating equipment, etc. A portion of the integration process with CarteGraph involves 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. The program includes training and use of wireless laptop computers for most of the maintenance and operations staff. There are a few Water Division records that have been electronically recorded for many years as follows:

<u>Cross Connection Control Program</u>

Cross Connection Control documentation has been managed with "Tokay" software since 1999. Tokay software is tailored specifically for Cross Connection Control, is simple to use and very comprehensive. The CarteGraph system contains a specific module for water related matters but it does not include a dedicated sub-module for Cross Connection Control. Staff were told by CarteGraph that unique programming could be added to the base program but it would fairly expensive; so a decision was reached to retain Tokay. The City pays an annual maintenance fee to CarteGraph to cover helpdesk questions, patches or version modifications. CarteGraph is continually updating their software based on emerging technologies, customer requests and enhanced design. If a Cross Connection

Program is ever included in a revised version, the City will reconsider its present use of Tokay software.

<u>Water Meter Consumption</u>

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.

<u>Supervisory Control and Data Acquisition (SCADA)</u>

The SCADA system monitors, records and controls Water Division system operations at various facilities. The records are electronically recorded by a computer server maintained by the Information Services 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 Water Operations Tasks and Responsibilities Section of this chapter.

<u>Water Meter Reading</u>

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 Division 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.

## 12.9 OPERATIONS AND MAINTENANCE IMPROVEMENTS

### 12.9.1 Distribution System Corrosion Inspection

One program that the Water Distribution Division would like to activate, if additional funds and manpower was available, is Distribution System Corrosion Inspection. 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 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 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.