Comprehensive Water System Plan

December 2010

Murray, Smith & Associates, Inc.

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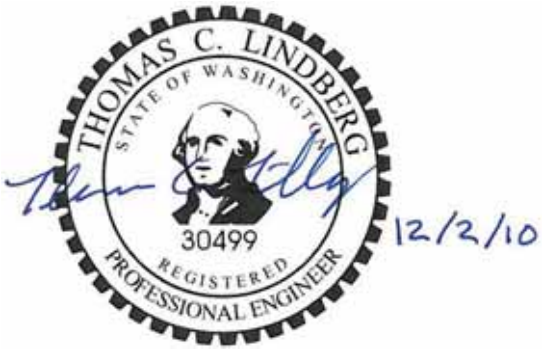
CITY OF EDMONDS

COMPREHENSIVE WATER SYSTEM PLAN

DECEMBER 2010



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Comprehensive Water System Plan
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Executive Summary

OVERVIEW AND PURPOSE

This water system plan is an update to the City of Edmonds June 2002 Water Comprehensive Plan, which received Washington State Department of Health (DOH) approval in November 2002. The City is required to update and submit a water system plan to DOH for review and approval every six years in accordance with current drinking water regulations. The purpose of this updated plan is to meet these regulatory requirements and to provide the City with a useful working document to guide the planning, scheduling, and budgeting of water system improvements. This updated plan will also be used by City staff to help maintain the water system to ensure both existing and future customers are provided with a safe and reliable supply of drinking water and fire protection. The planning period for this water system plan is 20 years.

REGULATORY CHANGES SINCE THE LAST WATER SYSTEM PLAN UPDATE

Several regulatory changes affecting water system plans have occurred since 2002. These include updated drinking water regulations that were published by DOH and codified under WAC 246-290 in 2004 and 2009, updated water system design guidelines that were published by DOH in 2009 under the "Water System Design Manual" title, emergency planning requirements that came out of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, and requirements from the 2003 Municipal Water Law, which include the Water Use Efficiency Rule that was implemented in January 2007.

WATER SYSTEM OVERVIEW

The City's municipal water system started in 1928 and has grown over the years as the City expanded and annexed more areas. The City's water system provides service to approximately 80 percent of the population within the city limits or more than 10,050 customer accounts. The other 20 percent of the City's population receive water service from the Olympic View Water & Sewer District, which is located within the southwest portion of the city limits.

All water supplied to City customers is currently purchased from Alderwood Water and Wastewater District (AWWD) and is conveyed through a single metered connection near the northeast corner of the water system. The City also has the capability to serve a portion of its system with water purchased from Seattle Public Utilities (SPU), but currently maintains this source of supply and the single metered connection on standby. Water purchased from

AWWD originates from the City of Everett Sultan River source. Water supplied by SPU originates from SPUs Tolt River source.

The City's water system has seven pressure zones with two supply stations, 17 pressure reducing valve (PRV) stations, two pressure relief stations, one pump station, more than 139 miles of water main, and nine emergency interties with adjacent water systems. Water storage is provided by four reservoirs that have a combined capacity of 7.5 million gallons (MG).

WATER SUPPLY AND WATER QUALITY

The City's purchase of water from AWWD is on a wholesale basis and subject to the terms and conditions of the water supply agreement that has been in place since 1978. Negotiations for a new agreement are underway at the time of this writing and a final agreement is expected by the end of 2010. The City is also currently negotiating a new agreement with SPU for long-term standby supply through the year 2060.

The City's primary supply of water is produced at the source by the City of Everett, then supplied to the AWWD, and finally supplied to the City of Edmonds. The City of Everett is also the regional supplier of water to a majority of water systems in Snohomish County. Everett's source of water originates from the Sultan River and fills Lake Chaplain, where it is drawn and treated at the Everett Water Filtration Plant. The water also receives chlorine disinfection within the AWWD system prior to being supplied to Edmonds. Water quality is routinely monitored within the City's system and has been good in the past with no water quality concerns.

PAST WATER USAGE AND FUTURE WATER DEMANDS

Total annual water usage within the City's service area peaked in 2003, at a time the City was supplying an average of 3.65 million gallons per day (MGD). Since 2003, total annual water usage has decreased at the same time that the number of water customers has moderately increased. Total water supply to the system averaged 3.07 MGD in 2008. The average per capita water demand within the City's service area from 2003 through 2008 was 104 gallons per day per person. This represents a reduction of more than 6 percent when compared to the average water demand of 111 gallons per day per person that was presented in the City's 2002 Comprehensive Water System Plan for the years 1995 through 2000. The reduction in water usage in terms of both total annual water supply and average day demand per person over the last several years is due to the success of the City's past conservation efforts, replacement of old water mains, and the detection and repair of water main leaks.

Additional reductions in per capita water demand are expected in future years, but not likely at the same rate seen in recent years. Future reductions from water use are expected from ongoing replacements of old water main and the continued implementation of water use efficiency measures (previously referred to as conservation measures), both at the local and

regional levels. Growth of customers within the City's existing service area will have the largest impact on overall water demand during the next 20 years. At the end of the 20-year planning period, the estimated amount of additional water demand from planned growth will represent an increase between approximately 12 and 21 percent, depending on the amount of future water use reductions from the continued water use efficiency program efforts.

OPERATIONS AND MAINTENANCE

The City's Water Division is staffed by several well-qualified personnel that are certified to operate and maintain the water system, as required by law. The City provides ongoing training opportunities for staff to comply with the State's certification requirements and to develop the skills necessary to ensure a dependable supply of high-quality drinking water is available to customers at all times.

The Water Division is currently staffed with eight full-time personnel consisting of five field technicians, one water quality technician, one meter reader and one lead supervisor. The Water and Sewer Manager and Public Works Director both allocate a portion of their time to the Water Division as well. The City's current staffing level is adequate to operate the water system and meet the current regulatory requirements. The City will routinely evaluate staffing needs and add staff in the future, as allowed by the budget, to ensure compliance with regulatory requirements and the increasing operation and maintenance needs of the system. The City plans to add one new staff position in the second half of 2010 to maintain the City's GIS system with one-third of the position being funded by the Water Utility.

WATER SYSTEM IMPROVEMENTS COMPLETED SINCE 2002

The City has completed several water system improvement projects since the last water system plan was completed in 2002. These include an upgrade to the Five Corners Pump Station, seismic and control valve improvements at the reservoir sites, pressure reducing station improvements, and several projects that replaced old and undersized water main.

WATER SYSTEM ANALYSIS AND PLANNED IMPROVEMENTS

The existing water system was analyzed to determine its ability to meet current water system regulations and the City's own policies and design criteria. Several analyses were performed to evaluate all components of the water system under both existing and future water demand conditions. The results of the analyses were used to identify and size improvements for the water system. A summary of the planned improvements follows.

- Improvements to the Alderwood Supply Station are planned to expand its capacity and improve its operation in conjunction with the Five Corners Pump Station.
- Improvements to the Five Corners Pump Station that were underway in 2009 and planned for completion in 2010 will replace old equipment, expand the capacity of the

station, and improve the operation of the station in conjunction with the Alderwood Supply Station.

- The Seaview Reservoir needs ventilation system improvements and new water quality sampling equipment.
- The Yost Reservoir needs ventilation system improvements, access hatch improvements, and new water quality sampling equipment.
- Both the Five Corners 3.0 MG Reservoir and 1.5 MG Reservoir will need to be recoated in the near future.
- A new PRV station is needed near Viewland Way and 12th Avenue to increase fire flow and provide supply redundancy in the 420 Zone.
- Pressure relief improvements are needed to protect the water system from potentially high pressures that could occur during certain events.
- Several of the PRV stations are old and need to be replaced. Other PRV stations need minor improvements to ensure long-term operation and reliability.
- The 24-inch transmission main needs additional isolation valves to minimize impacts to the system during maintenance and repairs.
- A significant portion of the water mains need to be replaced with larger water mains to increase fire flows. A number of water mains are also in need of replacement due to their age and undesirable pipe material. Improvements to resolve these deficiencies are planned under the City's annual water main replacement program, which represents approximately 87 percent of the estimated cost of the total capital improvement program.
- A number of other water system improvements have been identified and scheduled within the 20-year planning horizon, as shown in **Chapter 9**.

FINANCING FOR PLANNED WATER SYSTEM IMPROVEMENTS

The need for improvements to the water system is almost entirely due to infrastructure that has reached the end of its useful service life, is undersized and unable to meet current requirements, or has some other existing system deficiency. The improvements identified in this plan have been sized to meet both current needs and future growth within the system. Improvements identified for the first seven years (2010 through 2016) are estimated to cost approximately $20.1 million, which results in an average expenditure of approximately $2.87 million per year (in 2009 dollars).

A financing plan has been developed for funding the planned improvements and ongoing operations and maintenance, while providing for debt service payments through 2016. The improvements will be funded from capital fund reserves, rate revenues, capital facilities charges, and revenue bonds. Most of the future capital project costs will be funded from the proceeds of new revenue bonds. Water rate adjustments are necessary to provide sufficient revenue to support the ongoing operation and maintenance of the water system.

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Introduction

AUTHORIZATION AND PURPOSE

Murray, Smith & Associates, Inc. (MSA) was authorized by the City of Edmonds (City) in April 2009 to prepare this Comprehensive Water System Plan. This plan must be updated and submitted to the Washington State Department of Health (DOH) every six years in accordance with the regulatory requirements contained in WAC 246-290-100. The purpose of this updated plan is to meet the current regulatory requirements for water system planning and provide useful planning information that will guide the City in operating, maintaining, and improving its water system.

BACKGROUND

The City's existing Comprehensive Water System Plan, dated June 2002, was approved by DOH in November 2002. Several regulatory changes affecting water system plans have occurred since 2002. These include updated drinking water regulations codified under WAC 246-290 that were published by DOH in 2004 and 2008, requirements from the 2003 Municipal Water Law and the subsequent Water Use Efficiency Rule that was implemented on January 22, 2007.

WATER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Edmonds is a municipal corporation that owns and operates a public water system within its corporate boundaries. Water system data on file at the DOH for the City is shown in **Table 1-1**.

Table 1-1
Water System Ownership and Management

Information Type	Description
System Name	City of Edmonds
System Type	Group A-Community-Public Water System
County	Snohomish County
System ID Number	22500
Owner Number	1683
Address	7110 210th Street SW, Edmonds, WA 98026-7219
Primary Contact	425-771-0235
Owner Contact	Jim Waite, Water and Sewer Manager

EXISTING WATER SYSTEM OVERVIEW

The City's municipal water system started in 1928 with the construction of new water facilities and the acquisition of a private water company that was serving central Edmonds for many years. The City's water service area has grown over the years as the City expanded and annexed more areas. In 2008, the City provided water service to more than 10,050 customer accounts within an area of approximately 7.7 square miles.

At the time of this writing, all water supplied by the City is purchased from Alderwood Water and Wastewater District (AWWD) and is conveyed through a single metered connection near the northeast corner of the City's system. The City also has the capability to serve a portion of its system with water purchased from Seattle Public Utilities (SPU) and conveyed through a single metered connection near the southeast corner of the City's system, but currently maintains this source of supply on standby. Water purchased from AWWD originates from the City of Everett Sultan River source and is sold to AWWD on a wholesale basis. Water supplied by SPU originates from SPUs Tolt River source.

The City's water system has seven pressure zones with two supply stations, 17 pressure reducing stations, two pressure relief stations, one pump station, more than 139 miles of water main, and nine emergency interties with adjacent water systems. Water storage is provided by four reservoirs that have a combined capacity of approximately 7.5 million gallons (MG).

SUMMARY OF PLAN CONTENTS

A brief summary of the plan and organization of content is provided below:

- Executive Summary: Summarizes the key elements of this plan.
- Chapter 1 - Introduction: Provides an overview of the City's water system, the objectives of the plan, and the plan organization.
- Chapter 2 - Water System Description: Presents the water service area, describes the existing water system, and identifies the adjacent water purveyors.
- Chapter 3 - Land Use and Population: Presents related plans, land use, and population characteristics.
- Chapter 4 - Water Demands: Presents historical water use patterns, existing water demands, and projected future demands.
- Chapter 5 - Policies and Design Criteria: Presents the City's water service policies, water system operation policies, and water system design criteria.
- Chapter 6 - Water Source and Quality: Describes the City's water source and the results of past water quality monitoring.
- Chapter 7 - Operations and Maintenance: Describes the City's water system operations and maintenance program.

- Chapter 8 - Water System Analyses: Presents the results of the water system analyses and summarizes existing system deficiencies.
- Chapter 9 - Water System Improvements: Describes the water system improvements that resolve existing system deficiencies, estimated costs of improvements, and a schedule for implementation of the improvements.
- Chapter 10 - Financial Plan: Summarizes the financial status of the City's water utility and presents a program for funding the water system improvements.
- Appendices: Additional information and plans that supplement the chapters listed above.

DEFINITION OF TERMS

Definitions for terms used in this plan are provided below.

Consumption: The volume of water used by the water system's customers, based on customer meter records. The volume is measured at each customer's connection to the distribution system.

Cross-Connection: A physical arrangement that connects a drinking water system with anything other than another drinking water system with the potential for a contamination of the drinking water.

Demand: The quantity of water required from a water supply source over a period of time necessary to meet the needs of domestic, commercial, industrial, and public uses, and to provide enough water to supply fire fighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (mgd) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period. Types of demands discussed in this plan include:

- **Average Day Demand (ADD):** The total amount of water delivered to the system in a year divided by the number of days in the year.
- **Peak Day Demand (PDD):** The maximum amount of water delivered to the system during a 24-hour time period of a given year.
- **Peak Hour Demand (PHD):** The maximum amount of water delivered to the system, excluding fire flow, during a one hour time period of a given year. Peak hour demand usually occurs during the same day as the peak day demand.

Distribution System Leakage (DSL): The annual amount of water calculated from the difference between the measured amount of water supplied into the system and the measured amount of water taken out of the system for consumption and other authorized uses. Authorized uses include both metered and unmetered water uses. Water use that is unmetered must be estimated to be classified as an authorized use. Examples of common

unmetered water uses include the use of hydrants for flushing, fire fighting, and construction. The calculated DSL volume consists primarily of water loss through leaks in the water system, but may also include meter inaccuracies, meter reading errors, water theft, and reservoir overflows.

Equivalent Residential Units (ERU's): One ERU represents the amount of water used by one single family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERU's by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Fire Flow: The rate of flow of water required during fire fighting, which is usually expressed in terms of gallons per minute (gpm).

Head: A measure of pressure or force by water. Head is measured in feet and can be converted to pounds per square inch (psi) by dividing feet by 2.31.

Head Loss or Pressure Loss: A reduction in pressure caused by pipeline wall friction, bends, physical restrictions, or obstructions as water moves through a pipeline.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressure pipeline would rise in a vertical open-end pipe.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-310.

Potable: Water suitable for human consumption.

Pressure Zone: A portion of a water system that operates at a common hydraulic elevation.

Purveyor: An agency, subdivision of the State, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, persons, or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

Supply: Water that is delivered to a water system by one or more supply facilities, which may consist of supply stations, booster pump stations, and wells.

Storage: Water that is "stored" in a reservoir to supplement the supply facilities of a system and provide water supply for emergency conditions. Storage is broken down into the following five components that are defined and discussed in more detail in the plan: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage.

Water Service Connection Fee: A one-time fee paid by a property owner when initially connecting to the City's water system. This fee pays for the new customer's equitable share of the cost of the existing system. This fee offsets the costs of providing water to new customers and recognizes that the existing water system was largely built and paid for by the existing customers.

ABBREVIATIONS

The following abbreviations are used in this plan:

ADD:	Average Day Demand
AWWA:	American Water Works Association
AWWD:	Alderwood Water and Wastewater District
CCR:	Consumer Confidence Report
CIP:	Capital Improvement Program
City:	City of Edmonds
DOH:	Department of Health
DSL:	Distribution System Leakage
EPA:	Environmental Protection Agency
ERU:	Equivalent Residential Unit
fps:	feet per second
GMA:	Growth Management Act
gpm:	gallons per minute
MCL:	Maximum Contaminant Level
MG:	Million Gallons
MGD:	Million Gallons per Day
mg/l:	milligrams per liter
PDD:	Peak Day Demand
PHD:	Peak Hour Demand
psi:	pounds per square inch
SDWA:	Safe Drinking Water Act
SPU:	Seattle Public Utilities
WAC:	Washington Administrative Code

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Water System Description

INTRODUCTION

This chapter describes the City of Edmond's existing water system and provides a brief discussion of the water systems that are adjacent to the City's system. Included is a discussion of the water service area, water service agreements, and all existing water system facilities. The evaluation of the existing water system is presented in **Chapter 8**.

WATER SERVICE AREA

City History

The City of Edmonds was incorporated in 1890 with the original town site encompassing approximately 550 acres. The original town site is now occupied primarily by the downtown and adjacent residential areas. The City has expanded in area through annexations to approximately 8.9 square miles. The City continued to grow during the 1940's and 50's, resulting in a more active role of the municipality in providing water, sewer and streets for the residential and commercial expansion. The Port District was formed in 1948 and began waterfront improvements. Commercial and retail businesses within the downtown area provided a wide range of services to the community. Completion of Interstate 5 and increased growth in the Puget Sound region led to a gradual change in the character of Edmonds with more emphasis on residential development and a decline in the retail importance of the downtown. The City is now primarily a residential community.

The rate of population growth has been relatively stable over the years with a major increase between 1950 and 1970 from 8,016 to 23,700 due to annexations. Between 1990 and 2000, the population expanded to 39,515 due to annexations in the southern portion of the City. Since then, the City's population has grown to approximately 40,760 in 2008. Approximately 80 percent of the City's population receives water service from the City. The remaining 20 percent receive water service from the Olympic View Water & Sewer District, which is located within the southwest portion of the City limits.

Water System History

The original water system was established by the Edmonds Water Company in the late 1890's. Water was supplied from local springs and wells. The Edmonds Spring Water Company acquired the Edmonds Water Company shortly thereafter. The first large reservoir, a 300,000 gallon concrete tank, was constructed in 1921 near Ninth Avenue and Main Street. The City started acquiring and building their own municipal water system in 1928, beginning

with a 500,000 gallon steel water tank and two wells. The City struggled with water shortages and poor water quality from their groundwater sources through the 1950's and 1960's. In 1966, the City contracted with the City of Seattle for a new water supply. A transmission main was extended from a new supply meter at the King County – Snohomish County boundary line through the Ballinger area north to the City storage tank near Five Corners. The City also signed a water supply agreement with Alderwood Water & Wastewater District (AWWD) in 1966 to supply water to the City through a metered connection at the intersection of 168th Street SW and 62nd Avenue West. The City abandoned the wells and springs after completion of the new supply sources. The City has increasingly supplied the entire water system with water from AWWD, except during periods of high water demand. This has also reduced the City's water purchase costs, because Seattle's water is more expensive than AWWD water during the summer months.

Topography

The City's water service area is located in a relatively hilly portion of southwest Snohomish County. The highest elevation in the City is in the southeast corner at over 450 feet. The topography of the City's service area generally slopes downward from east to west towards the Puget Sound with the exception of the southeast corner of the service area which also slopes down towards Lake Ballinger.

Retail Water Service Area

The City's retail water service area is within the City limits with the boundary defined by the City limits, except for the southwest portion of the City that is served by Olympic View Water & Sewer District, as shown in **Figure 2-1**, Existing Water System. These limits are generally defined as the area that extends north to Meadowdale Beach Park, south to 244th Street SW along the Snohomish/King County boundary, and west to Puget Sound. The eastern boundary of the City limits generally follows Olympic View Drive, 76th Ave West, and Highway 99 except for a small portion of the City bounded on the west by Highway 99 and Lake Ballinger to the east between 220th Street SW and 244th Street SW.

Satellite System Management

A Satellite Management Agency (SMA) is defined as a person or entity that is certified by the Department of Health to own and/or operate more than one public water system without the necessity for a physical connection between such systems. The City provides water service to all customers in its water service area. Currently, no small water systems exist within the City's water service area. The areas adjacent to the City's water service area boundary are currently served by relatively large, public water systems that are unlikely to become future satellite water systems.

WATER SERVICE AGREEMENTS

The City has entered into separate agreements with the AWWD and Seattle Public Utilities (SPU) for the purchase of water on a wholesale basis. The City also has an agreement with Olympic View Water & Sewer District to supply water to customers within the City limits. A summary of these agreements is presented below and copies are contained in the appendices of this plan.

Water Supply Agreement with Alderwood Water & Wastewater District

The agreement provides for the wholesale supply of water from AWWD to the City of Edmonds. A copy of the original 1978 agreement and new 2010 agreement is contained in **Appendix A**. The agreement consists of several sections that address future facility acquisitions, water supply, storage deficiency demand charge, master metering, area of use, water quality, wholesale water rates, and a number of other elements. The original agreement was to expire in 1988, but was extended by mutual agreement to the year 2010. The new water supply agreement was prepared and in place before the existing agreement expired in September 2010. The new agreement is intended to provide for all of the City's long-term water supply needs up to the year 2055.

1981 Water Supply Agreement with City of Seattle

The 1981 Water Purveyor Contract between the City of Seattle and the City of Edmonds is for the purchase of water from Seattle on a wholesale basis until January 1, 2012. A copy of this agreement is contained in **Appendix A**. The City currently obtains supply from Seattle on an as-needed basis during periods of unusually high water demand only. Negotiations are underway to revise this agreement to provide supply on a standby basis with a projected expiration in the year 2060.

1985 Agreement with Olympic View Water District

This agreement provides for water supply from the Olympic View Water & Sewer District (OVWSD) to customers located within the Edmond's city limits and the boundaries of OVWSD, subject to the terms and conditions as outlined in the agreement. A copy of this agreement is contained in **Appendix A**. Also included in **Appendix A** is a copy of the OVWSD franchise agreement and an interlocal operating agreement between the City and OVWSD.

EXISTING WATER SYSTEM FACILITIES

A description of the City's existing water system facilities is provided in this section. The analysis of these facilities is presented in **Chapter 8**. General water system facility data is summarized on the Department of Health Water Facilities Inventory (WFI) form, which is included in **Appendix B**. More detailed water system facility information is contained in **Appendix C**.

Pressure Zones

The topography throughout the City's water system varies from sea level along the west side bordering Puget Sound to approximately 450 feet near the eastern portion of the City. The terrain generally slopes from east to west toward Puget Sound. This wide range of elevation requires the City to reduce or increase pressure in certain areas to provide sufficient water pressure and fire flow throughout the system. This is has been accomplished by dividing the water system into seven different pressure zones, as shown in **Figure 2-1**. The pressure in each pressure zone is regulated by reservoir levels, pressure reducing station settings, pump station settings, or a combination of these, as illustrated in the hydraulic profile, **Figure 2-2**.

Overview

The 596 Zone is the City's highest and largest pressure zone and is supplied water directly from the City's primary supply facility, the Alderwood Supply Station. All water supply to the system originates in the 596 Zone and is conveyed to lower pressure zones through pressure reducing valve (PRV) stations. A more detailed description of the City's seven pressure zones follows.

596 Zone

The 596 Zone is the City's largest zone with customers in the central and eastern portion of the City. All water supply to the 596 Zone is from the Alderwood Supply Station. The 596 Zone is a closed zone, which is a pressure zone without gravity storage. Pumped water storage is provided for the 596 Zone, utilizing the Five Corners 3.0 MG and 1.5 MG Reservoirs and the Five Corners Pump Station. The 596 Zone can also receive water on an emergency basis from four manually operated emergency interties with the City of Lynnwood, which are located along the eastern boundary of the service area. Ground elevations vary throughout the 596 Zone from approximately 275 to 452 feet.

505 Zone

The 505 Zone supplies water to customers in the central and northern portion of the City. Water to this zone is supplied from the 596 Zone through four PRV stations, which reduce the pressure of the water to maintain adequate pressures in the zone. Ground elevations vary throughout the 505 Zone from approximately 194 to 376 feet.

500 Zone

The 500 Zone supplies water to customers near the northern portion of the City. Water to this zone is supplied from the 596 Zone through two PRV stations. Ground elevations vary throughout the 500 Zone from approximately 162 to 368 feet.

486 Zone

The 486 Zone supplies water to customers in the central and southern portion of the City. The primary supply of water to this zone is from the Five Corners 1.5 MG Reservoir, which floats on the zone and establishes pressures throughout the zone. This reservoir is supplied with water from the 596 Zone through a control valve at the reservoir site. Supplemental water supply to the 486 Zone is provided by two PRV stations, which are supplied by the 596 Zone. These PRV stations are normally not flowing, but are set to supply water during fire flow events and other high demand situations when pressures drop in the 486 Zone. The 486 Zone can also receive water on an emergency basis through three manually operated emergency interties with OVWSD. Ground elevations vary throughout the 486 Zone from approximately 138 to 375 feet.

425 Zone

The 425 Zone is the smallest zone with customers near the north portion of the City. Water to this zone is supplied from the 596 Zone through two PRV stations. Ground elevations vary throughout the 425 Zone from approximately 185 to 300 feet.

420 Zone

The 420 Zone supplies water to customers in the central portion of the City. Water to this zone is supplied from the 596 Zone through one PRV station. Ground elevations vary throughout the 420 Zone from approximately 154 to 250 feet.

325 Zone

The 325 Zone is the second largest pressure zone, which supplies water to customers in the western portion of the City. The primary supply of water to this zone is from the 1.5 MG Seaview Reservoir and 1.5 MG Yost Reservoir. Both of these reservoirs float on the zone and establish pressures throughout the zone. The Seaview Reservoir is supplied with water from the 505 Zone through a control valve at the reservoir site. The Yost Reservoir is supplied with water from the 486 Zone through a control valve at the reservoir site. Supplemental water supply to the 325 Zone is provided by four PRV stations, which are supplied by three different pressure zones, as shown in **Figure 2-2**. These PRV stations are normally not flowing, but are set to supply water during fire flow events and other high demand situations when pressures drop in the 325 Zone. The 325 Zone can also receive water on an emergency basis through a single manually operated emergency intertie with OVWSD. Ground elevations vary throughout the 325 Zone from approximately 15 to 220 feet.

Supply Facilities

Alderwood Supply Station

The City currently supplies the entire system with water purchased from AWWD, which in turn purchases the water from the City of Everett. The supply of wholesale water from the AWWD to the City is provided under the terms of the 1978 Water Supply Agreement and its subsequent amendments, as described earlier in this chapter.

The Alderwood Supply Station, located at the intersection of 168th Street SW and Olympic View Drive, is a below-grade concrete vault with a single 24-inch inlet pipe from the AWWD system and a single 24-inch outlet pipe to the City's 596 Zone. Inside the vault, the mainline piping includes a 10-inch flow meter and 12-inch control valve. The internal bypass piping includes an 8-inch flow meter and 6-inch control valve. The 12-inch control valve is configured to allow the City to operate the facility in either flow control or pressure control mode. Modifications to the station are scheduled in 2010 to improve operation during peak demand periods in conjunction with the Five Corners Pump Station.

Seattle Public Utilities Supply Station

The City has increasingly supplied the entire water system with water from AWWD, due to SPU's higher water rates. In recent years, the SPU Supply Station has been operated in a standby mode for use as an emergency supply or to provide supplemental supply during high demand periods. The supply of wholesale water from SPU to the City is provided under the terms of the 1981 Water Purveyor Contract and its subsequent amendments, as described earlier in this chapter.

The SPU Supply Station is a below-grade concrete vault with a single 20-inch inlet pipe, 20-inch outlet piping, a 12-inch flow meter, and a 12-inch control valve. The control valve enables the City to operate the facility in either flow control or pressure control modes.

Water Treatment

All water purchased by the City is treated before it enters the City's distribution system. The City does not provide additional water treatment. Water purchased from AWWD is treated by the City of Everett at the City's water filtration plant, which is located adjacent to Lake Chaplain. In addition to filtration, Everett also provides chlorination and fluoridation at the filtration plant. Additional chlorination is provided by AWWD at the AWWD reservoir sites.

Water treatment of the Seattle supply is provided by the SPU Tolt Treatment Facility, located near the South Fork Tolt River. Seattle provides filtration, ozonation, chlorination and fluoridation at this facility.

Pumping Facilities

Five Corners Pump Station

The Five Corners Pump Station is at the same site as the Five Corners 1.5 MG and 3.0 MG Reservoirs, which are located on the north side of Bowdoin Way, west of the Five Corners intersection at 212th Street SW and 84th Avenue West. The pump station was constructed in 1978 when the Five Corners 3.0 MG Reservoir was constructed on the same site. The primary purpose of the pump station is to pump stored water from the Five Corners 3.0 MG Reservoir to the 596 Zone to supplement supply from the Alderwood Supply Station during peak demand periods, to supply fire flow, and to provide emergency supply if the Alderwood Supply Station is out of service. Both reservoirs at the Five Corners site store water at elevations too low to gravity flow into the 596 Zone, thereby requiring pumping.

Improvements to the pump station, consisting of pump replacements and control modifications, were constructed in 2009 and 2010 to allow better operation of the pump station in conjunction with the Alderwood Supply Station. The pump station contains two end-suction centrifugal pumps with 60 horsepower motors, each designed to pump 1,195 gpm at 130 feet total head. A third identical pump in the station provides backup for the other two pumps. A standby engine generator at the site provides backup power supply in the event of a power failure to ensure that the pump station is operational at all times.

Storage Facilities

The City's water system has four reservoirs with a total combined storage capacity of approximately 7.5 million gallons. Two reservoirs provide storage to the 325 Zone and the two other reservoirs at the Five Corners site provide storage to other pressure zones. A more detailed description of each reservoir is provided below.

325 Zone 1.5 MG Seaview Reservoir

The 325 Zone 1.5 MG Seaview Reservoir is located south of 184th Street SW at approximately 90th Ave West, which is the site of Seaview Park. The 119-foot square buried concrete reservoir was constructed in 1975 and provides approximately 15 vertical feet of water storage for the 325 Zone with an overflow elevation of 325 feet. The reservoir has 8-inch inlet and 12-inch outlet piping.

325 Zone 1.5 MG Yost Reservoir

The 325 Zone 1.5 MG Yost Reservoir is located at 9537 Bowdoin Way, near the southern end of the distribution system. Similar to the Seaview Reservoir, the Yost Reservoir is also a 119-foot square buried concrete reservoir. The reservoir is located under tennis courts at Seaview Park. It was constructed in 1973 and provides approximately 15 vertical feet of water storage for the 325 Zone with an overflow elevation of 325 feet. The reservoir has 8-inch inlet and 18-inch outlet piping. A chlorination facility is located at this site in a separate building, which was used in the past to boost chlorine residuals when water was supplied on

a regular basis by SPU. The chlorination facility is no longer used by the City as adequate chlorine residual is provided from the AWWD supply source.

Five Corners 1.5 MG Reservoir

The Five Corners 1.5 MG Reservoir is located just west of Five Corners at 8519 Bowdoin Way. The reservoir is an 80-foot diameter welded steel standpipe that was constructed in 1960 and provides approximately 37 feet of water storage with an overflow elevation of 486 feet. The reservoir has separate 10-inch inlet and 10-inch outlet piping. The inlet piping is elevated in order to promote mixing and higher water quality within the reservoir.

Five Corners 3.0 MG Reservoir

The Five Corners 3.0 MG Reservoir is located on the same site as the 1.5 MG Reservoir at Five Corners. The reservoir is a 104-foot diameter welded steel standpipe that was constructed in 1978 and provides approximately 47 feet of water storage with an overflow elevation of 492.5 feet. The reservoir has separate 10-inch inlet and 10-inch outlet piping.

Distribution System

The City's water distribution system consists of approximately 140 miles of water main ranging in size from 4-inches to 24-inches in diameter. **Table 2-1** summarizes the water main in the City's distribution system by diameter and total length of each size.

Table 2-1
Water Main Summary

Diameter (inches)	Total Length (miles)	% of Total
4" & smaller	26.7	19.1%
6	44.0	31.5%
8	47.9	34.3%
10	2.5	1.8%
12	12.0	8.6%
14	0.2	0.1%
16	1.0	0.7%
18	0.3	0.2%
20	1.0	0.7%
24	4.0	2.9%
Totals	**139.6**	**100%**

The City has an ongoing comprehensive leak detection program, which was started in 2002, to identify and eliminate water system leaks. The program involved retaining the services of a specialty firm that checked all water distribution piping in the system with computer-assisted leak detection equipment. All leaks discovered have been repaired. This system-

wide leak detection program will be repeated periodically to ensure that future leaks are promptly repaired. The City's annual water main replacement program has targeted replacement of older water mains, which are typically responsible for most of the leaks. Water main improvements planned by the City are identified in **Chapter 9**.

PRV Stations

Pressure reducing valve (PRV) stations are connections between adjacent pressure zones that allow water to flow from the higher pressure zone to the lower pressure zone by reducing the pressure of the water as it flows through the station to maintain a desired range of pressures in the lower zone. A PRV station is typically a below-grade concrete vault that normally contains two pressure reducing control valves, piping, and other appurtenances. The control valve hydraulically varies the flow of water through the station to maintain a constant pressure on the downstream side of the valve as water flows into the lower pressure zone.

PRV stations are placed in water systems to function in one of two ways. They can function as an active supply facility by maintaining a continuous supply of water into a lower zone that has no other source of supply. The PRV stations that serve the 505 Zone, 500 Zone, 425 Zone, and 420 Zone are this type. The other function of PRV stations is to serve as a standby supply facility, providing fire flow or emergency water supply, where the main supply to the zone is from another facility, typically a supply facility or reservoir. For this type of PRV station, they are normally not supplying water until the zone that they serve experiences a drop in pressure that is significant enough to activate the PRV station. The PRV stations that supply the City's 486 Zone and 325 Zone are this type.

The City's water system has a total of 15 active PRV stations, as shown in plan view in **Figure 2-1** and in profile view in **Figure 2-2**. All of the City's PRV stations are located in below-grade concrete vaults. A listing of all PRV stations and related data is contained in **Appendix C**.

Pressure Relief Facilities

Pressure relief stations are installed in pressure zones that are supplied with water from a higher pressure zone or a high-pressure source. A pressure relief station typically consists of a below-grade vault that houses a pressure relief valve, piping, and other appurtenances. Pressure relief stations protect the zone that it is installed in by discharging water out of the system when pressures in the zone increase beyond the set point of the pressure relief valve, thereby maintaining safe pressures in the zone. The pressure relief valve is normally closed and opens when the pressure in the zone increases beyond the set point of the valve. The valve opens and hydraulically varies the flow rate through the valve to limit the maximum pressure on the upstream side of the valve. A common application for a pressure relief station is to protect a pressure zone from high pressures when a pressure reducing valve in a pressure reducing station fails in the open position and allows high pressure water to enter the lower pressure zone. As an alternative to installing pressure relief stations, pressure relief valves can be installed within PRV stations on the lower pressure zone side of the pressure reducing valve.

The City has two pressure relief stations, each located in the 325 Zone. One is located in the northern part of the zone, the second in the southern part of the zone. The pressure relief facilities protect the 325 Zone from high pressures in the event of a "stuck open" valve failure of any of the 325 Zone PRV stations, since the PRV stations are not equipped with pressure relief valves. None of the City's PRV stations have pressure relief valves. A pressure relief improvement project has been identified in **Chapter 9** to address this issue.

Water System Interties

Water system interties are physical connections between two adjacent water systems that are normally separated by a closed isolation valve or control valve. Interties either function as a normal supply facility or an emergency supply facility. The City's Alderwood Supply Station and SPU Supply Station are considered normal supply interties. Emergency supply interties provide water from one system to another during emergencies situations only. The City's four interties with the City of Lynnwood and four interties with OVWSD are considered emergency interties. These emergency interties are all manually operated, closed valve interties that provide the City with a backup source of water supply in the event that the Alderwood Supply Station or SPU Supply Station is out of service.

Telemetry and Supervisory Control System

The City's telemetry and supervisory control system records water system data and provides automatic control of all supply, storage, and pumping facilities. The City's telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failure, operation problem, or other emergency event in the system.

A summary of the City's telemetry and supervisory control system at each water system facility is provided below. All facilities are linked to the City's master telemetry unit at the operations facility via leased telephone wires.

- **Alderwood Supply Station:** Monitors and records flow rate and pressure. Remote control of the combination pressure reducing/flow control valve settings.
- **Seattle Supply Station:** Monitors and records flow rate and pressure. Remote control of the combination pressure reducing/flow control valve settings.
- **Reservoirs:** Monitors and records water level, chlorine residual, and inflow rate.
- **Five Corners Pump Station:** Monitors and records suction pressure, discharge pressure (596 Zone), and flow rate.

ADJACENT WATER SYSTEMS

The area outside and immediately adjacent to the City's existing water service area is served by several public water systems, as shown in **Figure 2-3**. The following provides a brief description of each adjacent water system.

Alderwood Water & Wastewater District

The Alderwood Water & Wastewater District provides direct retail water service to cities of Brier and Mill Creek, portions of the cities of Bothell and Mukilteo, and unincorporated areas of southwest Snohomish County. Like the City of Edmonds, the AWWD also provides wholesale water service to the cities of Mountlake Terrace and Lynnwood. The AWWD purchases all of its water from the City of Everett. There are no current plans for changes in water service area boundaries between the City and AWWD.

City of Seattle/Seattle Public Utilities

The City of Seattle direct water service area is located to the south of the City of Edmonds. SPU receives its water supply from the Cedar River and Tolt River watersheds. There are no current plans for changes in water service area boundaries between the City of Edmonds and the City of Seattle direct service area.

Olympic View Water & Sewer District

The Olympic View Water & Sewer District is located to the south of the City of Edmonds and provides water service to a population of approximately 12,900 people. The District's service area includes the Town of Woodway, part of the City of Edmonds, and a portion of unincorporated Snohomish County. Most of the District's water supply is purchased from the Seattle Public Utilities. The District also maintains its own sources. The District has five emergency interties with Edmonds. Two are located along 220th Street SW at approximately 7th Ave South and 9th Ave South. One is located near the intersection between Pine Street and Chinook Road. One is located near the intersection of 224th Street SW and 76th Ave South. One is located near the intersection of 216th Street SW and Chinook Place. No other future interties were identified in the District's most recent Comprehensive Water System Plan. However, a potential future emergency intertie could be installed near the intersection of 236th Street SW and Highway 99 where the City extended a 12-inch water main stub to the west side of the highway approximately 10 years ago when the highway was re-paved. There are no current plans for changes in water service area boundaries between the City and the District.

City of Lynnwood

The City of Lynnwood is located to the east of the City of Edmonds and provides water service to a population of more than 35,700 people. The City of Lynnwood purchases all of its water from the AWWD. There are four manually operated emergency interties between Lynnwood's 573 Zone and Edmonds 596 Zone. Due to the similar hydraulic elevations of

the two zones, these emergency interties could potentially benefit either system in an emergency situation. The City of Lynnwood's 2005 Water System Plan did not identify any future interties with the City of Edmonds. There are no current plans for changes in water service area boundaries between the two systems.

City of Mountlake Terrace

The City of Mountlake Terrace is located to the east of the City of Edmonds and provides water service to a population of approximately 21,000 people. The City purchases all of its water from the AWWD. The City of Mountlake Terrace 2009 Comprehensive Water System Plan identified one future emergency intertie with the City of Edmonds. The emergency intertie would be located near the intersection of 226th Place SW and 73rd Place West, providing an emergency supply of water from Edmonds 596 Zone to Mountlake Terrace's 494 Zone. There are no current plans for changes in water service area boundaries between the two systems.

3

Land Use and Population

INTRODUCTION

This chapter demonstrates the compatibility of the City of Edmonds (City) Comprehensive Water System Plan with the City's Comprehensive Plan, identifies designated land uses within the City limits, and presents population data. The City's Comprehensive Plan was completed in 1995, revised in 2004, and updated in December 2008. The Comprehensive Plan was developed to meet the requirements of the State of Washington Growth Management Act (GMA).

COMPATIBILITY WITH OTHER PLANS

The Growth Management Act and the City's Comprehensive Plan were reviewed to ensure that the Comprehensive Water System Plan is consistent with the City's land use policies.

Growth Management Act

The Washington State Growth Management Act (GMA), which was passed in 1990 and amended in years to follow, defined four goals relevant to water system planning:

1. Focus growth in urban areas and reduce sprawl;
2. Consistency between land use and utility plans;
3. Ensure adequate public facilities and services, concurrent with growth;
4. Designate and protect critical areas.

Urban Growth Area

The City of Edmonds is considered an urban growth area in accordance with GMA, per RCW 36.70A.110. The City has coordinated with Snohomish County in designating its urban growth areas.

Consistency

The plans and policies of the City of Edmonds and Snohomish County must be consistent in accordance with GMA, per RCW 36.70A.100. The GMA also requires consistency with the implementation of water system plans and comprehensive plans, per RCW 36.70A.120.

The Municipal Water Law, which became effective in 2003, also requires consistency of water system plans with local plans and regulations. Confirmation of consistency under this law is achieved by means of completing the Consistency Statement Checklist, which must be included with all water system plans. A signed copy of this checklist is included in **Appendix D**.

Concurrency

The GMA requires concurrency, so that adequate public facilities and services are available when growth occurs to ensure health, safety, and a high quality of life. The GMA requires that growth be located in areas already served or readily served by public facilities and services, per RCW 36.70A.110.

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include wetlands, steep slopes, and aquifer recharge areas. **Appendix E** contains a SEPA checklist that was prepared for this Comprehensive Water System Plan that addresses environmental issues.

City of Edmonds Comprehensive Plan

The City updated its Comprehensive Plan in December of 2009. The Comprehensive Plan was originally prepared in 1995 to comply with the requirements of GMA and RCW 35.A.63. The Comprehensive Plan provides policy that is consistent with Snohomish County on land use, housing, capital facilities, transportation, and parks and recreation issues for a 20-year period. The Land Use Element of the Comprehensive Plan includes goals and policies for planning growth and development over the 20-year planning period. The Utilities Element of the Comprehensive Plan includes goals and policies to ensure that new development will be adequately served without impacting existing levels of service.

The Community Sustainability Element is a new section that was adopted by the City as part of the 2009 update to the Comprehensive Plan. The Community Sustainability Element includes goals and policies that address climate change, community health, and environmental quality. In 2010, the City developed the Climate Change Action Plan, which

addresses accomplishments to date and identifies additional efforts being planned by the City to achieve a more sustainable community. Elements of this plan related to the City's water system, include water conservation to reduce per capita water consumption and implementation of capital improvements utilizing energy efficient equipment to reduce power consumption at water system facilities.

At the regional level, the City of Everett has conducted studies to evaluate the impacts of global climate change on its water supply to ensure that the long-term planning of the region's future water supply accounts for the effects of climate change. Edmonds is a member of the Everett Water Utility Committee, which is an advisor to the Water Supply Forum that consists of representatives of public water systems and local governments in the Central Puget Sound region of Washington State. The Water Supply Forum addresses current and future water supply issues facing the region and has documented the projected effects of climate change on the region's water supply situation in the Regional Water Supply Outlook, which was most recently published in 2009.

LAND USE

The land area within the limits of the City is approximately 8.9 square miles (5,700 acres) and includes approximately five miles of marine shoreline along Puget Sound. The City is mostly built-out (approximately 96 percent developed), based on current zoning, but limited infill and redevelopment potential remains.

The City's Comprehensive Plan Map, which is included as **Figure 3-1**, shows the different types of land uses throughout the City. As shown on the map, most of the City is single family residential and includes a smaller portion of multi-family residential, commercial, and other land uses. Approximately 55 percent of the land area within the City is currently designated for single-family residential use; 5 percent is designated for multi-family residential use; 5 percent is designated for commercial use; and the remaining 35 percent is designated for other uses such as public right of ways, parks, schools, and open space.

POPULATION

Household Size Trends

The average household size in Edmonds has declined over the past three decades, which is consistent with the decreasing household size trend of the nation. The average household size in Edmonds, including both single family and multi-family dwellings, declined from 2.41 persons per household in 1990 to 2.32 persons per household in 2000.

Existing and Future Population

Population density in Edmonds increased from 6.4 persons per acre in 1990 to 7.0 persons per acre in 2008, based on Washington State Office of Financial Management (OFM) data. In comparison, Lynnwood had a density of 5.6 persons per acre in 2008 and Mountlake Terrace had a density of 8.2 persons per acre in 2008.

From 2000 to 2008 the City's water service area population increased almost three percent from an estimated 31,461 people to 32,349 people, as shown in **Table 3-1**. The table also shows past and future projected populations within the entire City limits, which is larger in area than the City's water service area. The City's water service area population at the end of the planning period for this Comprehensive Water System Plan is estimated at 35,743 in the year 2028.

The population projections shown in **Table 3-1** are based on the City's projected population within the City limits for the year 2025. The 6-year population projection for 2014 is based on an interpolation of the City's 2008 and 2025 population numbers. The 20-year population projection for 2028 is based on an extrapolation of the City's 2025 population number.

Table 3-1
Historical Population and Future Projections

Year	Population Within City Limits	Population Within Water Service Area
Historical		
2000	39,544	31,461
2001	39,590	31,467
2002	39,460	31,296
2003	39,580	31,375
2004	39,620	31,374
2005	39,860	31,573
2006	40,360	32,031
2007	40,560	32,190
2008	40,760	32,349
Projected		
2014 (+6 years)	41,998	33,332
2025	44,880	35,212
2028 (+20 years)	45,557	35,743

4

Water Demands

INTRODUCTION

This chapter summarizes past water demands and future projected water demands of the system, which are used in **Chapter 7** to analyze the existing water system facilities and form the basis for sizing future water system improvements described in **Chapter 9**. The different types of demands that were analyzed include: average day demand, peak day demand, peak hour demand, fire flow demand, and future projected demands, both with and without estimated reductions from water conservation efforts. This chapter also summarizes the City's water demand data collection and reporting procedures.

CURRENT POPULATION AND SERVICE CONNECTIONS

The City provided water service to a population of approximately 32,349 in 2008, as shown in **Chapter 3**. The City has categorized all water customers into four different classes for billing purposes. Water was provided to an average of 10,057 metered water service connections in 2008. Of these approximately 8,691 (86 percent) were single family residential accounts, 620 (6 percent) were multi-family residential accounts, 520 (5 percent) were commercial or industrial accounts, and 226 (2 percent) were government or education accounts. The demand analysis in the following section summarizes the past water use of the four water customer classes.

EXISTING WATER DEMANDS

Factors Affecting Water Demands

For any public water system, the total demand of all customers will vary throughout the day and over the course of the year. The following factors have the greatest impact on water demand levels in a public water system: 1) population, 2) weather, and 3) type of customer. Population and weather have the largest impact on water system demands. As population increases, overall demand will also increase for the year. Weather has more of a shorter term impact on demands, which tends to increase as outdoor temperatures increase and outdoor water use increases. Water demand varies among different types of water customers. Single family residential customers typically use more water than multi-family residential customers, primarily due to the outdoor lawn watering and irrigation practices of single family residences. Water demands are also affected by conservation efforts that can reduce demands.

Water Consumption

Water consumption is the amount of water that customers use as measured by their water meters. **Table 4-1** shows past water consumption data from 2003 through 2008. As shown in the table, most of the City's overall water consumption is from single family residential customers. Although more than 86 percent of the City's customers are single family residential, they only use approximately 60 percent of the total water consumed. This is due to the lower amount of usage per single family resident as compared to other types of customers.

Table 4-1
Average Annual Metered Consumption and Service Connections

Year	Customer Class				Totals
	Single Family	Multi-Family	Commercial/ Industrial	Government/ Education	
Average Number of Connections					
2003	8,502	568	491	196	9,757
2004	8,540	584	501	196	9,821
2005	8,621	601	509	210	9,941
2006	8,664	607	514	212	9,997
2007	8,673	621	517	219	10,030
2008	8,691	620	520	226	10,057
Average Annual Consumption (1000 gallons)					
2003	727,684	204,357	171,072	22,165	1,125,279
2004	697,741	199,446	172,327	20,598	1,090,113
2005	616,642	191,982	176,158	29,458	1,014,242
2006	664,374	200,677	175,747	95,337	1,136,136
2007	632,981	187,749	163,911	87,432	1,072,074
2008	586,285	195,651	163,624	32,600	978,160
Average Daily Consumption Per Connection (gal/day/conn)					
2003	234	986	955	310	
2004	224	936	942	288	
2005	196	875	948	384	
2006	210	906	937	1,232	
2007	200	828	869	1,094	
2008	185	865	862	395	
Average	208	899	919	617	

As shown in **Table 4-1**, single family residential customers used an average of approximately 208 gallons per day per connection, which is less than the average consumption of the other customer types. The higher consumption of customers other than single family customers is

expected, since these customers include multi-family residential customers where one connection typically serves several units, and commercial customers that include some of the system's largest water users.

Table 4-2 shows the top 20 water customers that used the most water in 2008. The total water consumption of these customers represents approximately 12 percent of the total consumption in 2008. The table consists mostly of multi-family complexes, municipal facilities, and commercial properties.

Table 4-2
2008 Largest Water Users

Name	Address	Water Use Type	Annual Consumption (gals)
City of Lynnwood	17000 76th Ave W	Domestic	23,234,495
Stevens Hospital	21601 76th Ave W	Domestic	17,204,448
PAQ Properties LLC	7714 196th St SW	Domestic	8,463,460
99 Ranch Market	22511 Highway 99 #104	Domestic	8,140,302
Shop & Save Inc #1111	21558 Highway 99	Domestic	7,653,320
Horizon Park Apartments	7428 208th St SW	Domestic	6,387,616
Top Foods	21900 Highway 99	Domestic	5,443,574
Edmonds School District #15	7600 212th Ave W	Irrigation	3,571,948
Park Ballinger Apts	22924 76th Ave W	Domestic	3,507,616
Highland Park Condominiums	500 Elm Way	Domestic	3,438,795
Edmonds Rehab & Healthcare	21008 76th Ave W	Domestic	3,423,086
Extendicare	21400 72nd Ave W	Domestic	3,121,621
Tawney Jack Athletic Club	160 W Dayton St	Domestic	2,731,886
Anthonys Home Port	456 Admiral Way	Domestic	2,716,177
St Frances Motel	23905 Highway 99	Domestic	2,631,647
Scotts Bar & Grill	8115 Lake Ballinger Way	Domestic	2,574,047
Ballinger Court Apartments	22707 76th Ave W	Domestic	2,449,870
Edmonds Landing Retirement	180 2nd Ave S	Domestic	2,431,169
T&T Seafood Restaurant	22511 Highway 99	Domestic	2,425,185
Port of Edmonds	500 Admiral Way	Domestic	2,173,091
Largest Water Users Total			113,723,353
Water System Total			978,159,600
Percent of Total			12%

Water Supply

Water supply refers to water that is delivered to a water system. Water supply differs from water consumption in that water supply is the amount of water delivered into a water system and water consumption is the amount of water taken out of the system. For any given year, the amount of water supply will be greater than the amount of water consumption, due to

water system leaks that exist in all water systems. For the City of Edmonds, water supply represents water that is purchased from the Alderwood Water & Wastewater District (AWWD) and delivered through the City's Alderwood Supply Station. **Table 4-3** summarizes the total amount of water that was supplied to the City's system from 2001 through 2008, the average population within the City's retail water service area, the average day demand of the system, and the per capita demand for each year.

Table 4-3
Historical Supply and Per Capita Demands

Year	Average Population	Annual Supply (1000 gallons)	Average Day Demand (gpm)	Average Day Demand (MGD)	Average Demand Per Capita (gal/day/capita)
2001	31,467	1,194,386	2,272	3.27	104
2002	31,296	1,297,744	2,469	3.56	114
2003	31,375	1,331,578	2,533	3.65	116
2004	31,374	1,312,077	2,496	3.59	115
2005	31,573	1,162,512	2,212	3.18	101
2006	32,031	1,193,406	2,271	3.27	102
2007	32,190	1,137,938	2,165	3.12	97
2008	32,349	1,121,477	2,134	3.07	95
Average (2003-2008)					104

As shown in the table, per capita demand varied from year to year, but an overall trend of decreasing per capita water demand has occurred since 2003, which is most likely the result of water conservation efforts. The City's average per capita demand of 104 gallons per day is used later in this chapter to forecast water demands in future years, based on the population projections presented in **Chapter 3**.

Table 4-4 shows the average demand of each of the City's pressure zones, based on 2008 water demand data. Almost half of the overall water system demand is within the 596 Zone and almost one-third of the demand is within the 325 Zone.

Table 4-4
2008 Demands by Pressure Zone

Pressure Zone	2008 Annual Supply (1000 gallons)	Average Day Demand (gpm)	Average Day Demand (MGD)	Percent of Total Demand (%)
596	549,454	1,046	1.51	49.0%
505	49,696	95	0.14	4.4%
500	21,940	42	0.06	2.0%
486	88,148	168	0.24	7.9%
425	17,619	34	0.05	1.6%
420	28,603	54	0.08	2.6%
325	366,018	696	1.00	32.6%
Total	1,121,477	2,134	3.07	100%

Authorized Consumption and Distribution System Leakage

Authorized consumption is the amount of water authorized for use, which includes water customers usage and other authorized uses such as water main flushing, street cleaning, and permitted hydrant use. All unauthorized uses and any water that cannot be accounted for is considered distribution system leakage. In other words, distribution system leakage is an unrecorded volume of water that may include water system leaks, inaccurate supply metering, inaccurate customer metering, unknown fire hydrant usage, illegal water service connections, and unknown reservoir overflows.

The Water Use Efficiency Rule, which became effective in January 2007, established a distribution leakage standard that all public water systems must meet by July 1, 2010. Starting with data collected in 2007, distribution leakage must not be more than 10 percent of supply, based on a 3-year rolling average. If the City is not able to meet this requirement in the future, a water loss control action plan must be prepared and implemented. This plan will need to identify steps and timelines for reducing leakage.

The difference between the amount of water supplied to the City and the amount of metered water consumption from 2003 through 2008 is shown in **Table 4-5**. The estimated amount of distribution system leakage in the City's system in 2008 is shown in **Table 4-6**. The estimated amount of authorized uses shown in the table is from City maintenance records. The City will continue to collect data, monitor all uses of water, and report annually the amount of distribution system leakage.

Table 4-5
Metered Supply and Consumption Comparison

Year	Total Supply (1000 gallons)	Total Consumption (1000 gallons)	Net Difference (1000 gallons)	Net Difference as % of Total Supply
2003	1,331,578	1,125,279	206,298	15.5%
2004	1,312,077	1,090,113	221,964	16.9%
2005	1,162,512	1,014,242	148,271	12.8%
2006	1,193,406	1,136,136	57,270	4.8%
2007	1,137,938	1,072,074	65,864	5.8%
2008	1,121,477	978,160	143,318	12.8%
3-Year Rolling Average (2006-2008)				7.8%

Table 4-6
2008 Estimated Distribution System Leakage

Description	Total Amount (1000 gallons)
A. Total Purchased Supply	1,121,477
B. Total Metered Consumption	978,160
C. Estimated Authorized Uses (flushing, street cleaning, permitted hydrant use)	33,644
Distribution System Leakage (A-(B+C))[1]	109,673
Distribution System Leakage as % of Total Purchased Supply	9.8%

1. Amount shown for distribution system leakage may be from water main and water service leaks, meter inaccuracies, meter reading & recording errors, illegal water use, and other uses not identified above.

Equivalent Residential Units

The demand of each customer class can be expressed in terms of equivalent residential units (ERU's) for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single family residence. The number of ERU's represented by the demand of the other customer classes is determined from the total demand of the customer class and the demand per ERU from the single family residential demand data.

Table 4-7 shows the number of ERU's calculated for each customer class from 2003 through 2008. The demands shown are based on supply data that was computed from the consumption of each customer class and the difference between total metered supply and consumption from each year.

Table 4-7
Equivalent Residential Units (ERUs)

Year	Average Number of Connections	Average Annual Demand (1000 gallons)	Average Day Demand per ERU (gal/day/ERU)	Total ERU's
Single Family Residential				
2003	8,502	861,091	277	8,502
2004	8,540	839,812	269	8,540
2005	8,621	706,788	225	8,621
2006	8,664	697,864	221	8,664
2007	8,673	671,869	212	8,673
2008	8,691	672,186	212	8,691
Average (2003-2008)			236	
Multi-Family Residential				
2003	568	241,822	277	2,388
2004	584	240,056	269	2,441
2005	601	220,048	225	2,684
2006	607	210,793	221	2,617
2007	621	199,284	212	2,573
2008	620	224,317	212	2,900
Commercial/Industrial				
2003	491	202,435	277	1,999
2004	501	207,416	269	2,109
2005	509	201,911	225	2,463
2006	514	184,606	221	2,292
2007	517	173,982	212	2,246
2008	520	187,598	212	2,426
Government/Education				
2003	196	26,229	277	259
2004	196	24,793	269	252
2005	210	33,765	225	412
2006	212	100,143	221	1,243
2007	219	92,804	212	1,198
2008	226	37,377	212	483
System-Wide Totals				
2003	9,757	1,331,578	277	13,147
2004	9,821	1,312,077	269	13,342
2005	9,941	1,162,512	225	14,180
2006	9,997	1,193,406	221	14,816
2007	10,030	1,137,938	212	14,689
2008	10,057	1,121,477	212	14,500

The average demand per ERU from 2003 through 2008 was 236 gallons per day. This is below the average single family demand of around 250 gallons per day for water systems in the Puget Sound area. The City's average demand per ERU of 236 gallons per day is used later in this chapter to forecast ERU's in future years, based on estimated future demands.

Average Day Demand

Average Day Demand (ADD) is the total amount of water delivered to the system in a year divided by the number of days in the year. Average day demand is determined from historical water use of a system and is used to project future demands for the system. Average day demand data is used to determine standby storage requirements for water systems. Standby storage is the volume of a reservoir used to provide water supply under emergency conditions when supply facilities are out of service. Water supply records were used to determine the system's average day demand, which is shown in **Table 4-3**.

Peak Day Demand

Peak Day Demand (PDD) is the maximum amount of water used throughout the system during a 24-hour time period of a given year. Peak day demand typically occurs on a hot summer day when outdoor water use for lawn watering and other purposes is occurring throughout much of the system. In accordance with *WAC 246-290-230 - Distribution Systems*, the distribution system shall provide fire flow at a minimum pressure of 20 psi during maximum day demand (i.e., peak day demand) conditions. Supply facilities (i.e., supply stations, pump stations, interties) are typically designed to supply water at a rate that is equal to or greater than the system's peak day demand.

Water supply records and reservoir telemetry reports are typically used to determine a system's peak day demand. However, complete telemetry records of supply and reservoir data were not available to compute the peak day demand of the system. Therefore, the peak day demand was estimated by applying a typical peak day demand/average day demand ratio of 2.00 to the system's actual average day demand amount. This results in an estimated peak day demand of 4,267 gpm for 2008, as shown in **Table 4-8.**

Table 4-8
Peak Day Demands and Peaking Factors

Peak Day Demand Data		
Demand Type	**Date**	**Demand (gpm)**
Average Day Demand (ADD)	2008	2,134
Peak Day Demand (PDD)	Data unavailable Assumed PDD/ADD = 2.0	4,267
Peak Hour Demand (PHD)	Data unavailable Assumed PHD/PDD = 1.8	7,681
Peaking Factors		
Description		**Peaking Factor**
Peak Day Demand/Average Day Demand (PDD/ADD)		2.00
Peak Hour Demand/Peak Day Demand (PHD/PDD)		1.80
Peak Hour Demand/Average Day Demand (PHD/ADD)		3.60

Peak Hour Demand

Peak Hour Demand (PHD) is the maximum amount of water use, excluding fire flow, during a one hour time period of a given year. In accordance with *WAC 246-290-230 - Distribution Systems,* new public water systems or additions to existing systems shall be designed to provide domestic water at a minimum pressure of 30 psi during peak hour demand conditions. Water main sizing and analysis and equalizing storage are typically based on peak hour demand data.

The peak hour demand, like the peak day demand, is typically determined from the combined flow of water into the system from all supply sources and reservoirs. Similar to the peak day demand, sufficient information was not available to calculate the City's peak hour demand based on actual system data. Therefore, the peak hour demand was estimated based on a typical peak hour demand/peak day demand ratio of 1.80, resulting in a peak hour demand of 7,681 gpm for 2008.

The peaking factors shown in **Table 4-8** are based on the demand data shown in the table. These peaking factors are used later in the chapter in conjunction with projected average day demands to project future peak day and peak hour demands of the system.

Fire Flow Demand

Fire Flow Demand is the amount of water required during fire fighting as defined by applicable codes. Fire flow requirements are established for individual buildings and expressed in terms of flow rate (gpm) and flow duration (hours). Fighting fires imposes the greatest demand on the water system because a high rate of water must be supplied over a short period of time, requiring each component of the system to be properly sized and configured to meet the most stringent demand placed on it.

General fire flow requirements were established for the different land use categories to provide a target level of service for planning and sizing future water facilities. The general fire flow requirement for each land use category within the City's service area is shown in **Table 4-9**. The water system analyses presented in **Chapter 7** are based on an evaluation of the water system providing sufficient fire flow in accordance with these general fire flow requirements.

Table 4-9
General Fire Flow Requirements

Land Use Category	Fire Flow Requirement (gpm)	Flow Duration (hours)
Single Family Residential	1,000	2
Multi-Family Residential	3,000	3
Commercial/Business/Mixed Use	3,000	3
Schools	3,000	3
Hospital	5,000	4

FUTURE WATER DEMANDS

Method of Projecting Demands

Future demands were calculated from the projected population data from **Chapter 3** and the per capita demand data from **Table 4-3**. The demand projections were computed with and without a further reduction in water use from conservation. The per capita demand of existing customers (104 gallons per day) was used for all demand projections without water conservation. The future water demand projections with conservation are based on a reduced per capita demand that reflects the City's water use reduction goals, as shown in the City's Water Use Efficiency Program in **Appendix F**.

Future Water Demand Projections

Table 4-10 presents the estimated water demands of the system each year for the next six years and at the end of the 20-year planning period. The actual demand data from 2007 and 2008 is also shown in the table for comparison purposes. The future average day demands were projected based on population estimates for the given years and the estimated per capita demand values. The future peak day and peak hour demands were computed from the projected average day demands and the existing system peaking factors shown in **Table 4-8**. The future demand projections are also shown with and without estimated reductions in water use from achieving the conservation goals described earlier.

The 20-year projected demand data without conservation reductions was used for the evaluation of the planned improvements presented in **Chapter 9** to ensure that the future system will be sized properly to meet all requirements, whether or not additional water use reductions from conservation are achieved.

Table 4-10
Future Water Demand Projections

Description	Historical		Projected						
	2007	2008	2009	2010	2011	2012	2013	2014 (+6 yrs)	2028 (+20 yrs)
Population Data									
Population in Water Service Area	32,190	32,349	32,511	32,674	32,837	33,001	33,166	33,332	35,743
Demand Basis Data (gal/day/capita)									
Avg Day Demand without Conservation	104	104	104	104	104	104	104	104	104
Avg Day Demand with Conservation			100	99	99	98	98	97	96
Average Day Demand (gpm)									
Demand without Conservation	2,165	2,134	2,348	2,360	2,372	2,383	2,395	2,407	2,581
Demand with Conservation			2,258	2,246	2,258	2,246	2,257	2,245	2,383
Average Day Demand (MGD)									
Demand without Conservation	3.12	3.07	3.38	3.40	3.42	3.43	3.45	3.47	3.72
Demand with Conservation			3.25	3.23	3.25	3.23	3.25	3.23	3.43
Peak Day Demand (gpm)									
Demand without Conservation	4,330	4,267	4,696	4,720	4,743	4,767	4,791	4,815	5,163
Demand with Conservation			4,515	4,493	4,515	4,492	4,514	4,491	4,766
Peak Day Demand (MGD)									
Demand without Conservation	6.24	6.15	6.76	6.80	6.83	6.86	6.90	6.93	7.43
Demand with Conservation			6.50	6.47	6.50	6.47	6.50	6.47	6.86
Peak Hour Demand (gpm)									
Demand without Conservation	7,794	7,681	8,453	8,495	8,538	8,580	8,623	8,666	9,293
Demand with Conservation			8,128	8,087	8,127	8,085	8,126	8,083	8,578

2007 and 2008 Peak Day Demand and Peak Hour Demand values are based on actual average day demand amounts for the given year and the City's peaking factors, and may not represent actual peak demands for these years.

Future ERU Projections

Table 4-11 presents the projected number of equivalent residential units (ERU's) of the system for 2014 and 2028. The 6-year and 20-year ERU forecasts are based on the projected water demands from **Table 4-10** and the average demand per ERU that was computed from recent demand data, as shown in **Table 4-7**.

Table 4-11
Future ERU Projections

Description	2014 Projected (+6 yrs)	2028 Projected (+20 yrs)
Demand Data (gpm)		
Avg Day Demand without Conservation	2,407	2,581
ERU Basis Data (gal/day/ERU)		
Demand per ERU without Conservation	236	236
Equivalent Residential Units (ERU's)		
Total System ERU's	14,700	15,700

WATER DEMAND DATA COLLECTION AND REPORTING

Demand Data Collection

The demand data presented in this chapter includes both the supply side and water use side of water demands, which the City has collected and recorded for many years. The supply side data is recorded by a water meter in the Alderwood Supply Station that is connected to the City's SCADA system to provide a continuous recording of the volume and rate of supply into the City's system. The City's other supply station, which provides a standby source of supply from Seattle Public Utilities regional system, is also metered and connected to the City's SCADA system. On the water use side, customer demand data is recorded by meters at all water service connections and collected every other month. Permitted water use from fire hydrants for construction, street cleaning, and water main flushing is estimated and recorded.

Demand Data Reporting

A summary of past water use is reported each year in the City's Annual Water Use Efficiency Performance Report, which is one of the requirements of the Water Use Efficiency Rule that became effective in January 2007. In addition to this annual report, the City will continue to report demand data every six years when updating its water system plan.

5

Policies and Design Criteria

INTRODUCTION

The City of Edmonds (City) strives to provide high quality water service at a reasonable cost to its customers. This is achieved through the guidance of the following laws, policies and design criteria that are applied to operating, maintaining, and planning improvements for the water system.

Federal Regulations

- U.S. Department of Health & Human Services
- U.S. Environmental Protection Agency

State Regulations

- Washington State Department of Health
- Washington State Department of Ecology

County Regulations

- Snohomish County Council

City Regulations and Policies

- Edmonds City Council

Design Criteria

- American Water Works Association

The Edmonds City Council must adopt policies that meet or exceed those established by governments above them. The governmental entities above the City Council include the U.S. Government, Washington State and the Snohomish County Council. The City's policies are documented and implemented through ordinances, operation procedures, engineering and construction standards, and design criteria.

The City's water system policies and design criteria are organized and presented in this chapter under the following sections: water service, water supply, and facility policies and design criteria. The City's financial policies are described in **Chapter 10**.

WATER SERVICE POLICIES

New Water Services

- The City will provide potable water service to all people within its water service area, provided all policies related to service can be met.
- Requests for new water service will be processed by the City's Building Division as part of a Building Division permit. Applications are reviewed to ensure the proposed service is located within the City's retail water service area and will be evaluated to determine fire flow availability, meter size, line size and improvements necessary for adequate water pressure, fire flow, looping or extensions. New water service applications will be processed within the following timeframes:
    - New single family residence: approximately 35 days
    - New commercial building: approximately 60 days
    - New fire connection: approximately 20 days
- Water system improvements and extensions required to provide water service to proposed developments will be reviewed and approved by the City, and must conform to the City's current design criteria, construction standards and specifications, as shown in the City's Water System Construction Standards contained in **Appendix G**. All costs of the improvements and extensions will be paid by the applicant.
- Delays affecting the City's ability to provide new water service are the responsibility of the applicant. Delays resulting from non-technical conditions may include environmental assessments, local ordinances, annexations, and various other issues.
- Disputes received by the City are routed to the appropriate department and resolved. Disputes not resolved by City staff are resolved by the City Council with assistance from the City's legal counsel, as necessary.
- Water service requests for areas outside of the City limits without annexation will be reviewed by the City Council after coordinating with the appropriate adjacent water system and the Department of Health. Water service to areas outside of the City limits shall be in compliance with Snohomish County's adopted land use plan, zoning and development regulations.
- Water system capacity is evaluated every six years as part of the City's update of its water system plan to confirm the system's ability to provide adequate water service to both existing and future water customers.

Annexations

- Areas annexed without existing municipal supply will be served by the City.
- Areas annexed with existing municipal supply must meet the City's water system standards.
- The City will follow state guidelines in the assumption of facilities in annexation areas.
- The City will comply with the existing water supply agreement with Alderwood Water District in assuming portions of adjacent water systems as a result of annexation.

WATER SUPPLY POLICIES

Water Quality

- The City will strive to provide high quality water while complying with all water quality regulatory requirements.
- The City will promptly respond to situations that may adversely affect water quality.

Water Quantity

- The City will provide a sufficient quantity of supply to existing customers and plan for at least 20 years into the future for meeting the needs of the water system.
- The City will size new water system facilities and improvements to existing facilities to have sufficient capacity to meet all needs of the water system.

Water Use Efficiency

- The City will promote the efficient and responsible use of water and will participate in the City of Everett's regional conservation program.
- The City has a water use efficiency program. Documentation from the City's water use efficiency program is contained in **Appendix F**.

Cross-Connection Control

- The City strives to protect its water system from contamination due to cross-connections and has developed a cross-connection control program for eliminating cross-connections. Documentation from the City's cross-connection control program is contained in **Appendix H**.
- The City will comply with the backflow prevention assembly installation and testing requirements as indicated in *WAC 246-290-490* and as published in the manual titled *Cross Connection Control Manual Accepted Procedure and Practice,* Pacific Northwest Section, American Water Works Association (AWWA).
- The City has staff that is certified for backflow prevention and testing.

FACILITY POLICIES AND DESIGN CRITERIA

This section describes policies and design criteria used in planning for water system replacements, extensions, and future improvements.

Water Pressure

- The City will supply water to all customers at a minimum pressure of 30 psi during all demand conditions, except when providing fire flow or during emergency situations.
- During fire flow situations, the City will maintain a minimum pressure of at least 20 psi at all customer meters and throughout the system.
- The City will provide pressure reducing stations to control pressures in the distribution system and avoid high pressures. It is the customer's responsibility to install a pressure reducing valve on the customer side of the water meter to reduce pressures over 80 psi.

Flow Velocities

- All new distribution system water mains will be designed to deliver the required amount of flow at a velocity of 10 feet per second or less. Velocities greater than 10 feet per second are acceptable within short lengths of pipe and within water system facilities.
- All new transmission mains will be designed to deliver the required amount of flow at a velocity of 5 to 10 feet per second or less and will be evaluated for hydraulic surges (transient conditions) using a hydraulic model capable of surge analyses.

Storage Facilities

- A sufficient amount of storage will be provided within the distribution system to facilitate the operation of the water system by maintaining sufficient distribution system pressure and to provide supplemental supply during peak demand periods and emergency events.
- Storage facilities will be sized to provide stored water for the following purposes:
    - Operational storage will be provided to aid in the operation of supply and pump facilities.
    - Equalizing storage will be provided to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the supply facilities. Equalizing storage must be stored above an elevation that provides a minimum pressure of 30 psi at all service connections under peak hour demand conditions.
    - Standby storage will be provided to supply the water system under emergency conditions when supply facilities are out of service. Standby storage must be stored above an elevation that provides a minimum pressure of 20 psi at all service connections under peak hour demand conditions.
    - Fire flow storage will be provided to supply water to the system at the maximum

rate and duration required to extinguish a fire at the building with the highest fire flow requirement in the system. Fire flow storage must be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections under peak day demand conditions.

Transmission and Distribution Mains

- All new transmission and distribution mains will be looped to increase reliability and fire flow capacity, unless the City determines that looping is not practical.
- All new water mains will be designed under the direction of a professional engineer licensed in the State of Washington and will comply with the water quality testing and construction completion requirements of the Department of Health.
- All water system improvements and installation of new water mains shall be in accordance with City standard specifications and details.
- The size of all new distribution water mains will be reviewed and verified by the City based on an analysis using the City's hydraulic model. Water mains less than 6-inch diameter are not allowed.
- Dead-end water mains with fire hydrants shall be at least 8-inch diameter pipe. If approved by the City, short dead-end water mains with fire hydrants, generally less than 50 feet long, may be 6-inch diameter pipe.
- Distribution water mains providing fire flow shall be sized to provide the required fire flow at a minimum residual pressure of 20 psi and maximum pipeline velocity of 10 feet per second under peak day demand conditions.
- All new water mains will be ductile iron pipe with cement mortar lining.
- The following valves shall be installed with the water main:
  - Isolation valves shall be installed at locations along the water main to allow sections to be shut down for repair or installing services. On average, the maximum distance between isolation valves shall be 350 feet. A minimum of three valves shall be provided per cross, and two valves per tee.
  - Zone valves shall be located at all pressure zone boundaries when a water main crosses a pressure zone boundary and connects into each pressure zone.
  - Combination air and vacuum release valves shall be placed at all high points of water main installations.
- All residential water service lines shall be 3/4" or larger and the same size as the meter or larger.
- All new customer service lines shall be installed with a pressure reducing valve on the customer's side of the water meter.

Supply Stations and Pump Stations

- All supply station and pump station improvements shall comply with the following minimum standards:

  - All structures shall be non-combustible, where practical.
  - All buildings shall have adequate heating, cooling, ventilation, insulation, lighting, and interior work space.
  - All sites shall be fenced and locked to prevent unauthorized personnel from entering the water system facilities. Below-grade facilities located in areas that cannot be fenced shall be secured and locked.
  - Each station shall be equipped with a flow meter, pressure gauges, pressure transmitters and all necessary instrumentation to assist personnel in operating and troubleshooting the facility.
  - Backup power capability shall be provided at all pump stations.
- Pumps shall be operated automatically with the ability to operate manually.
- The monitoring of stations and adjustment of control settings shall be capable locally and remotely.
- Stations shall be monitored with alarms for the following conditions:
  - Pump started automatically or manually.
  - Low suction pressure.
  - High discharge pressure.
  - Flooding and fire.
  - Power phase failure.
  - Communication link failure.
  - Intrusion by unauthorized personnel.
- Stations shall have the following data recorded:
  - Flow rate and flow totalizing.
  - Incoming and outgoing pressures.
  - All alarm conditions.

Pressure Reducing Stations

- All pressure reducing stations shall be constructed according to the City's standard plans.
- Below-grade concrete vaults shall drain to daylight or be equipped with a sump pump.
- A pressure relief valve shall be installed on the low-pressure side of the pressure reducing valve to prevent system overpressurizing in case of a pressure reducing valve failure. It may be necessary to place the pressure relief valve in a separate vault.

Fire Hydrants

- The City has established policies for the installation, maintenance and ownership of fire hydrants within the City limits, which includes the water service areas of both the City and Olympic View Water and Sewer District.
- Fire hydrants serving detached single family dwellings or duplex dwellings on individual

lots shall be located not more than 600 feet on center such that all single family lots are within 300 feet from a fire hydrant, as measured along the path of vehicular access.

- Fire hydrants serving any use other than detached single family dwellings or duplex dwellings on individual lots shall be spaced an average of 300 feet apart on center and shall be located so that all structures are located within 150 feet of a hydrant. If dead-end streets, or driveways, singly or in combination, are over 150 feet long, additional fire hydrants shall be installed so that the hydrant spacing is not over 300 feet.
- All fire hydrants shall be installed at street intersections where possible. Fire hydrant spacing shall be measured along vehicle access routes.
- The Edmonds Fire Marshal will review all proposed fire hydrant installations to ensure the correct number and spacing of fire hydrants for each project.
- Additional requirements for fire hydrants are contained in the Fire Code, Chapter 19.25 of the Edmonds Municipal Code, which is in **Appendix I**.

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Water Source and Quality

OVERVIEW

This chapter describes the City's existing water source and current water quality regulations. Also discussed is the City's water quality monitoring program, monitoring requirements and results of past water quality monitoring.

WATER SOURCE

Alderwood Water & Wastewater District Supply

The City currently supplies its entire system through the Alderwood Supply Station with water purchased from Alderwood Water & Wastewater District (AWWD), which in turn purchases the water from the City of Everett. The supply of wholesale water from the AWWD to the City is provided under the terms of the 1978 Water Supply Agreement and its subsequent amendments (see **Appendix A**). The agreement states "The District only warrants the quality in the water delivered to the City to be at least equal to the quality of water delivered to the District by the City of Everett…". Therefore, the quality of water entering the Edmonds system is dependent upon the treatment of the source water and the ability to maintain high quality water through the Everett and AWWD conveyance systems.

The Everett raw water supply originates in the Spada Reservoir created by the Culmback Dam on the Sultan River, approximately 25 miles east of Everett. The basin is protected and patrolled. The raw water passes through the Snohomish County PUD No. 1 Power House prior to entering the Chaplain Reservoir. The water from this reservoir is delivered to the Everett Water Filtration Plant prior to delivery to the City of Everett, AWWD, the City of Edmonds, and several other water systems in Snohomish County.

Until 1983, the supply of water from the City of Everett was limited to treatment consisting of sedimentation, screening, and chlorination due to the good quality of its source. A higher level of treatment eventually became necessary due to more stringent water quality regulations, so a filtration plant was constructed in 1983. In addition to the chlorination and fluoridation of the water at the Everett Water Filtration Plant, the water is also chlorinated by the AWWD at its reservoir sites. This ensures sufficient chlorine residual throughout the distribution system. Source water quality has been good in the past and should continue to meet all of the mandated water quality requirements with the Everett Water Filtration Plant and the disinfection program from the AWWD.

Seattle Public Utilities Supply

The SPU Supply Station is operated in a standby mode for use as an emergency supply or to provide supplemental supply during high demand periods, since all water is now purchased from AWWD. The supply of wholesale water from SPU to the City is provided under the terms of the 1981 Water Purveyor Contract and its subsequent amendments (see **Appendix A**).

The primary source of water that the City receives from SPU is from the Tolt River source at the South Fork Tolt Reservoir, about 15 miles east of Duvall. Water is diverted from the reservoir into the Tolt Regulating Basin, then to the Tolt Treatment Facility, and finally into the Tolt Pipeline No. 1, which transports the water to purveyors that are primarily located north and south of Seattle. SPU's water is delivered to Edmonds from SPU's Richmond Highlands Tank which is supplied by direct pumping either from the Tolt transmission line, the Lake Forest Park Reservoir or the Bitter Lake Pump Station. A 20-inch water main along Fremont Avenue to NE 205th Street at the King County/Snohomish County border transmits SPU water from the Richmond Highlands Tank to the City's SPU Supply Station.

DRINKING WATER REGULATIONS

Overview

The Environmental Protection Agency (EPA) regulates the quality of drinking water in the United States. The EPA is allowed to delegate primary enforcement responsibility for water quality control to each state under provisions of the Safe Drinking Water Act (SDWA). The Department of Health (DOH) is the agency responsible for implementing and enforcing the drinking water regulations in the State of Washington. For the State of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the State must adopt drinking water regulations that are at least as stringent as the federal regulations. To meet these requirements the State, in cooperation with DOH, has published drinking water regulations that are contained in Chapter 246-290 of the Washington Administrative Code (WAC).

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was enacted in 1974 as a result of public concern about water quality. The SDWA sets standards for quality of drinking water and requires water treatment, if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. Implementation of the new regulations was marginally successful and slow, so the SDWA was amended again and re-authorized in August of 1996.

WATER QUALITY MONITORING

Monitoring Requirements

Water quality monitoring requirements are contained in *WAC 246-290-300*. The City of Everett provides source water quality monitoring for its surface water source. The City of Edmonds provides the required water quality monitoring of its distribution system. In accordance with section (2)(b) of *WAC 246-290-300*, Edmonds must comply with the following monitoring requirements because it receives completely treated water from another public water system:

1. Collect coliform samples in accordance with section (3) of *WAC 246-290-300*. In summary, this consists of:
   a) Collecting a minimum of 30 coliform samples per month based on the population served and submitting the samples to a certified laboratory for analysis. Collect and submit additional samples as required when a coliform sample is determined invalid.
   b) Preparing a Coliform Monitoring Plan and update it as necessary.

2. Perform distribution system residual disinfectant concentration monitoring in accordance with section (6) of *WAC 246-290-300*. As a minimum, the residual disinfectant concentration within the distribution system shall be measured at the same time and location that a routine or repeat coliform sample is collected or daily, whichever is greater.

3. Collect disinfectant byproduct samples in accordance with section (6) of *WAC 246-290-300*.

4. Collect samples for lead and copper monitoring in accordance with section (5) of *WAC 246-290-300* and as required under 40 CFR 141.86, 141.87, and 141.88.

If unsatisfactory samples from the above monitoring are detected, the City must follow the procedures in *WAC 246-290-320* for repeat sampling, DOH notification, and customer notification.

The City documents the results of water quality testing and summarizes the results in an annual report to customers to comply with the Consumer Confidence Report requirements that have been in effect since 1998. A copy of the City's latest annual water quality report is included in **Appendix J**.

Monitoring Status

The City has been in compliance with all water quality monitoring requirements for the past several years. A summary of the City's compliance status for the monitoring requirements identified above is presented below.

Coliform Monitoring

The City collects 36 samples each month from different locations throughout the distribution system and submits the samples to a certified laboratory for coliform testing, as shown in the Coliform Monitoring Plan in **Appendix K**.

All coliform monitoring results for the years 2001 through 2008 were satisfactory for the presence of coliforms except for seven samples collected on February 2001. Subsequent repeat sampling had satisfactory results.

Residual Disinfectant Concentration Monitoring

In accordance with *WAC 246-290-662*, the minimum residual disinfectant concentration entering the distribution system shall be at least 0.2 mg/L. Samples taken within the distribution system are required to have a residual disinfectant concentration that is detectable in at least 95 percent of the samples taken each calendar month. The results of the residual disinfectant concentration monitoring must be reported to DOH using DOH approved forms within ten days after the end of each month, unless otherwise directed by DOH.

The samples collected from the City's distribution system for coliform monitoring are also analyzed for residual disinfectant concentration. Samples collected from 2001 through 2008 had a chlorine residual that was typically between 0.5 and 1.04 mg/L. The highest level during the eight-year period was 2.16 mg/L on August 2002 at a location within the 596 Zone, which is the zone that receives the water from the Alderwood Supply Station. The lowest level during the same period was 0.18 mg/L on October 2005, which was detected in 325 Zone.

Disinfectant Byproduct Monitoring

In the past, the City has collected a minimum of one sample every three months for analysis of total trihalomethanes (TTHM). The results of past samples collected from 2001 to 2008 indicate total trihalomethane levels ranging from 0.020 mg/L to 0.060 mg/L. Therefore, the City did not exceed the maximum contaminant level (MCL) of TTHM, which is 0.08 mg/L.

Since the implementation of the Stage 2 Disinfection Byproducts Rule (DBPR) in 2006, the City has been required to perform additional monitoring and reporting of disinfectant byproducts in the distribution system. The Stage 2 DBPR focuses on monitoring and reducing concentrations of two classes of disinfection byproducts, consisting of total trihalomethanes (TTHM) and five haloacetic acids (HAA5). The Stage 2 DBPR requires water systems to determine locations within the distribution system with the highest averages of TTHM and HAA5.

The City prepared a Standard Monitoring Plan as part of the Initial Distribution System Evaluation (IDSE) that outlined the City's approach for collecting one year of TTHM and HAA5 data at a specified frequency and at locations to characterize these contaminants levels in the system. The City has completed sampling under this plan and submitted its IDSE

Report for Standard Monitoring on December 23, 2008. Future monitoring under the Stage 2 DBPR will be conducted quarterly in accordance with the City's Standard Monitoring Plan. Compliance with the Stage 2 DBPR will be achieved if the locational running annual average (LRAA) at each monitoring location for the four most recent quarters is less than or equal to 0.080 mg/L for TTHM and less than or equal to 0.060 mg/L for HAA5.

Lead and Copper Monitoring

The Lead and Copper Rule identifies "action levels" for both lead and copper. The action level for lead is greater than 0.015 mg/L. The action level for copper is greater than 1.3 mg/L. If the 90th percentile concentration of either lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration below the action levels.

The City of Edmonds participates in the City of Everett regional lead and copper monitoring program, which involves the collection of samples by the City of Everett for all water systems that use Everett water. The City of Everett obtained samples from locations throughout the Edmonds water service area in October 2000, October 2003, and November 2006. The results of lead and copper monitoring within the City's water system during the 2000 monitoring period indicated that lead concentration levels ranging from less than 0.001 mg/L to 0.006 mg/L and copper concentration levels ranging from 0.005 mg/L to 0.107 mg/L, all below the action levels. The subsequent round of lead and copper monitoring within the City's water system during the 2003 monitoring period indicated lead concentration levels ranging from less 0.001 mg/L to 0.044 mg/L and copper concentration levels ranging from less than 0.004 mg/L to 0.152 mg/L. One of City's samples in 2003 exceeded the action level of lead. The 2006 monitoring period indicated all of lead concentration levels were less than or equal to 0.002 mg/L and copper concentration levels ranging from 0.020 mg/L to 0.076 mg/L, all below the action levels.

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Water System Analyses

INTRODUCTION

This chapter presents the analysis of the City of Edmonds (City) existing water system. Individual water system components were analyzed under both existing and future water demand conditions to determine their ability to meet policies and design criteria. The City's policies and design criteria are presented in **Chapter 5** and the water demands are presented in **Chapter 4**. A description of the water system facilities and their current operation is presented in **Chapter 2**. Planned water system capital improvements that resolve the deficiencies identified in this chapter are presented in **Chapter 9**. The last section of this chapter presents the existing system capacity analysis that was performed to determine the maximum number of equivalent residential units (ERUs) that can be served by the City's water system.

PRESSURE ZONES

Table 7-1 lists each of the City's seven pressure zones, the highest and lowest elevation served in each zone, and the minimum and maximum distribution system pressures within each zone, based on maximum static water conditions (full reservoirs and no system demands). The City is currently providing water at sufficient pressures throughout the water system, as shown in the table. The highest pressures in the system occur at the lowest elevations of each pressure zone. All new water services with pressures greater than 80 psi must have individual pressure reducing valves to reduce the pressure to 80 psi or less, in accordance with the plumbing code.

Table 7-1
Minimum and Maximum Distribution System Pressures

Pressure Zone	Highest Elevation Served (feet)	Static Pressure at Highest Elevation (psi)	Lowest Elevation Served (feet)	Static Pressure at Lowest Elevation (psi)
596	452 ft	62 psi	275 ft	139 psi
505	376 ft	56 psi	194 ft	135 psi
500	368 ft	57 psi	162 ft	146 psi
486	375 ft	48 psi	127 ft	156 psi
425	300 ft	54 psi	185 ft	104 psi
420	250 ft	74 psi	154 ft	115 psi
325	220 ft	45 psi	15 ft	134 psi

It is the City's policy to provide water service at a pressure of at least 40 psi, which has been accomplished with the design of the system and location of pressure zone boundaries. Due to the challenging topography throughout the system, high pressures do occur in several areas of the service area.

ALDERWOOD SUPPLY STATION

This section evaluates the City's Alderwood Supply Station to determine if it has sufficient capacity to provide water supply to the system at a rate that meets the existing and future demands of the system. In the past, the City operated its water system as two independent operating areas, based on the north operating area being supplied with water from the Alderwood Water & Wastewater District (AWWD) and the south operating area being supplied with water from the Seattle Public Utilities (SPU). The City now operates the system as one operating area with all water supply from AWWD, due to the rising cost of water purchased from SPU. The City's SPU Supply Station remains in service, but operates in a standby mode to provide supplemental supply to the system when needed.

Analysis Criteria

Supply facilities must provide a sufficient quantity of water at pressures that meet the requirements of *WAC 246-290-230* and must be reliable. The capacity of supply facilities in a pressure zone that has adequate storage must be sufficient to provide water at a rate that is equal to or greater than the peak day demand of the zone being served. This approach assumes that demands in excess of the peak day demand will be supplied from the equalizing storage portion of reservoirs. Since the City's Alderwood Supply Station provides supply to pressure zones that can also be supplied from storage for intraday peak demands, the supply requirement for the supply station is equal to the peak day demand of the system.

Analysis Results

The Alderwood Supply Station delivers water to the entire water system. Water is supplied directly into the 596 Zone, meeting customer demands and filling the two reservoirs at the Five Corners site. Water to the remaining lower pressure zones are supplied from the 596 Zone through multiple pressure reducing valve (PRV) stations.

Table 7-2 summarizes the evaluation of the City's Alderwood Supply Station to determine if it has sufficient capacity to meet the existing and future demands of the system. The existing system evaluation is based on the current state of the existing facility, which has a maximum supply capacity of approximately 5,500 gpm. The capacity of the existing facility is limited to flow through the larger mainline portion of the station only, which includes a 10-inch turbine meter and 12-inch control valve. The existing facility also contains 8-inch bypass piping with an 8-inch turbine meter and 6-inch control valve, but is not setup to operate automatically in conjunction with the larger mainline when needed during high demand periods. The evaluation of the supply station with future year 2028 demands is based on improvements to the facility that enables flow through both the mainline and bypass portions of the station, thereby enabling the station to supply at a higher flow rate up to approximately

7,000 gpm, as shown in the table. These improvements were initiated in 2010 and are discussed further in **Chapter 9**.

The results of the evaluation, as shown in **Table 7-2**, indicate the City's Alderwood Supply Station has sufficient capacity to meet the existing and future supply requirements of the system through the year 2028. While the existing supply station has sufficient capacity for the existing and future demands of the system, the City is proceeding with improvements to expand the capacity of the station to improve system operation during peak demand periods when the Five Corners Pump Station is operating in conjunction with the supply station.

Table 7-2
Alderwood Supply Station Capacity Evaluation

Description	Existing System Year 2008 (gpm)	Future System Year 2028 (gpm)
Required Supply Capacity (gpm)		
Peak Day Demand (PDD)	4,267	5,163
Available Supply Capacity (gpm)		
Alderwood Supply Station	5,500	7,000
Surplus Supply Capacity (gpm)		
Surplus Capacity	1,233	1,837

FIVE CORNERS PUMP STATION

This section evaluates the Five Corners Pump Station to determine if it has sufficient capacity to meet the existing and future demands of the system.

Analysis Criteria

The primary purpose of the pump station is to pump stored water from the Five Corners 3.0 MG Reservoir to the 596 Zone to supplement supply from the Alderwood Supply Station during peak demand periods, to provide supplemental fire flow, and to provide emergency supply if the Alderwood Supply Station is out of service by utilizing standby storage from the Five Corners 3.0 MG Reservoir.

The criteria for evaluating the capacity of the Five Corners Pump Station is based on the most stringent condition where the system is experiencing peak hour demands and a simultaneous fire flow in the 596 Zone, based on the largest fire flow requirement of 5,000 gpm. Supply to the system during this condition is provided by the Alderwood Supply Station, Five Corners Pump Station, and SPU Supply Station, which is configured to automatically activate during this type of an event. The analysis is based on the pump station with improvements that were underway in 2009 and completed in 2010, as described in **Chapter 9**.

Analysis Results

The results of the evaluation, as shown in **Table 7-3**, indicate the Five Corners Pump Station has sufficient capacity to serve its purpose in providing supplemental supply to the system, based on both the existing and future supply requirements of the system.

Table 7-3
Five Corners Pump Station Capacity Evaluation

Description	Existing System Year 2008 (gpm)	Future System Year 2028 (gpm)
Required Supply (gpm)		
System Peak Hour Demand (PHD)	7,681	9,293
Maximum Fire Flow Requirement	5,000	5,000
Total Required Supply	12,681	14,293
Available Supply (gpm)		
Alderwood Supply Station Capacity	5,500	7,000
SPU Supply Station Capacity	5,500	5,500
Total Supply Capacity	11,000	12,500
Required Supply from Five Corners Pump Station (gpm)		
Required Supply from Pump Station	1,681	1,793
Available Supply from Five Corners Pump Station (gpm)		
Five Corners Pump Station Capacity	2,400	2,400
Surplus Pump Station Capacity (gpm)		
Surplus Pump Station Capacity	**719**	**607**

STORAGE FACILITIES

This section evaluates the City's four existing water storage facilities to determine if they have sufficient capacity to meet the existing and future storage requirements of the system.

Analysis Criteria

Water storage is provided in a public water system for different purposes and can be represented by the following components: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage. A description of each storage component and the criteria used to evaluate the capacity of the City's reservoirs is provided below.

Operational Storage

Operational storage is the upper portion of the reservoir that is used to supply the water system under normal demand conditions. Operational storage is the average amount of draw down in the reservoir during normal operating conditions, which represents a volume of storage that will most likely not be available for other purposes. The operational storage in all four of the City's reservoirs is the volume of storage between the average water level of the reservoirs and the maximum water level (i.e., overflow elevation) of the reservoirs.

Equalizing Storage

Equalizing storage is the portion of the reservoir below operational storage that is used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. The criteria for determining the equalizing storage requirements for the City's system, which is supplied continuously from the Alderwood Supply Station, is based on the Department of Health (DOH) formula that considers the difference between peak hour demand and supply capacity.

Standby Storage

Standby storage is the portion of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service. Considering the City's historically reliable supply from AWWD, standby supply from SPU, and eight emergency interties with two adjacent water systems, the need for a large amount of standby storage is not warranted. Therefore, the standby storage requirement is based on a sufficient volume to provide all water supply to the system for one day during an average day demand condition when the Alderwood Supply Station is out of service and no other supply is provided by other facilities.

Fire Flow Storage

Fire flow storage is the portion of the reservoir with sufficient volume to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. The magnitude of the fire flow storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement. The required volume of fire flow storage for the 325 Zone is based on a 3,000 gpm fire flow for a 3-hour duration. The required volume of fire flow storage for the remaining pressure zones is based on a 5,000 gpm fire flow for a 4-hour duration.

Both standby storage and fire flow storage are considered emergency storage components. The City has elected to nest these two storage components, which results in the larger of the two individual components being used for both standby and fire flow purposes.

Dead Storage

Dead storage is the bottom portion of the reservoir that cannot be used because water is stored at an elevation that is too low to pump or flow by gravity to provide sufficient

pressure. This unusable storage occupies the lower portion of most ground-level standpipe style reservoirs.

Analysis Approach

The storage analysis is based on an evaluation of the existing reservoirs providing water to the two operating areas that they serve. The Five Corners 3.0 MG Reservoir and 1.5 MG Reservoir provide storage to an operating area that includes all pressure zones, except for the 325 Zone. The 1.5 MG Yost Reservoir and 1.5 MG Seaview Reservoir provide storage for the 325 Zone.

Existing Storage Analysis Results

The results of the storage analysis for the existing system indicate that the existing storage facilities have sufficient capacity to meet existing demands, as shown in **Table 7-4**. The two Five Corners reservoirs have approximately 0.81 MG of excess storage for the pressure zones that they serve. The Yost Reservoir and Seaview Reservoir have approximately 0.58 MG of excess storage for the 325 Zone.

Table 7-4
Existing Storage Capacity Evaluation

Description	All Zones except 325 Zone (MG)	325 Zone (MG)	Total System (MG)
Usable Storage (MG)			
Maximum Storage Capacity	4.50	3.00	7.50
Dead (Non-usable) Storage	-0.38	0.00	-0.38
Total Usable Storage	4.12	3.00	7.12
Required Storage (MG)			
Operational Storage	1.02	1.31	2.33
Equalizing Storage	0.22	0.11	0.33
Standby & Fire Flow Storage	2.07	1.00	3.07
Total Required Storage	3.31	2.42	5.73
Surplus Storage	**0.81**	**0.58**	**1.39**

Future Storage Analysis Results

The future storage analysis was performed to determine the adequacy of the City's existing reservoirs to meet the future storage requirements, based on projected demands for the year 2028. The demands used in this analysis are projected demands without reductions from conservation efforts. The results of the future storage analysis indicate that the existing storage facilities have sufficient capacity to meet the future demands of the system in 2028, as shown in **Table 7-5**. Therefore, additional storage capacity is not required within the 20-year planning period. A number of improvements to the existing reservoirs, not related to capacity, are planned by the City and identified in **Chapter 9**.

Table 7-5
Future Storage Capacity Evaluation

Description	All Zones except 325 Zone (MG)	325 Zone (MG)	Total System (MG)
Usable Storage (MG)			
Maximum Storage Capacity	4.50	3.00	7.50
Dead (Non-usable) Storage	-0.38	0.00	-0.38
Total Usable Storage	4.12	3.00	7.12
Required Storage (MG)			
Operational Storage	1.02	1.31	2.33
Equalizing Storage	0.23	0.11	0.34
Standby & Fire Flow Storage	2.50	1.21	3.72
Total Required Storage	3.75	2.64	6.39
Surplus Storage	**0.37**	**0.36**	**0.73**

DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates the City's existing distribution and transmission water mains to determine if they are sized and looped adequately to provide the necessary flow rates and pressures to meet the existing and future requirements of the system.

Analysis Criteria

The criteria used to evaluate the City's distribution and transmission system is contained in *WAC 246-290-230 Distribution Systems*. The pressure analysis criteria states that the distribution system "…shall be designed with the capacity to deliver the design peak hour demand quantity of water at 30 psi under peak hour demand flow conditions measured at all existing and proposed service water meters". It also states that if fire flow is to be provided, "… the distribution system shall also provide maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system".

Hydraulic Model

A hydraulic computer model of the City's water system was used to evaluate the existing system and identify proposed improvements to resolve deficiencies. The hydraulic model was also used to evaluate the system to demonstrate that the proposed improvements will eliminate the identified deficiencies and meet the future demand requirements. A description of the hydraulic model and settings used for the analyses follows.

Description

The City's existing water system was modeled with InfoWater version 7.0, a GIS based modeling program developed by MWH Soft. All existing facilities and water mains in the City's water system were modeled, including recent improvements.

Demand Data

The hydraulic model contains average day demands of the existing system, based on 2008 demand data. A global demand factor was used to adjust the demands to reflect future 2028 demand levels. Demand peaking factors from **Chapter 4** were used to adjust demand levels to peak day demand for the fire flow analyses and peak hour demand for the pressure analysis.

Facility Data

The hydraulic model of the existing system for the pressure analysis contains all active existing system facilities with settings that correspond to peak hour demand events. The Alderwood Supply Station was operating in pressure control mode to maintain pressures in the 596 Zone. The Five Corners Pump Station was modeled to reflect the recent pump replacement improvements. The reservoirs were modeled with water levels that reflect full utilization of operational and equalizing storage. All active pressure reducing stations were modeled as being in service and at their normal set points.

The hydraulic model of the existing system for the fire flow analyses contains all active existing system facilities with settings that correspond to peak day demand events. The Alderwood Supply Station was operating in pressure control mode to maintain pressures in the 596 Zone. The Five Corners Pump Station was modeled to operate according to recent pump replacement improvements. The reservoirs were modeled with water levels that reflect full utilization of operational, equalizing and fire flow storage. The depletion of fire flow storage for the analyses in all pressure zones, except the 325 Zone, was based on a maximum fire flow requirement of 5,000 gpm for a 4-hour duration. The depletion of fire flow storage for the analyses in the 325 Zone was based on a maximum fire flow requirement of 3,000 gpm for a 3-hour duration. All active pressure reducing stations were modeled as being in service and at their normal set points.

The hydraulic model of the proposed system in the year 2028 contains all active existing system facilities and planned system improvements that are identified in **Chapter 9**. The settings for all active existing and proposed facilities were set to correspond to the future peak day demand events for the fire flow analysis of the proposed water system. Otherwise, facility settings were the same as in the existing system analyses.

Calibration

Hydraulic model calibration is the process of using field pressure and flow data to improve the accuracy of the hydraulic model so that it can be used to accurately simulate operation of the actual water system. Initial calibration was accomplished by adjusting water main roughness coefficients based on a compilation of pipe material and year data. Additional

calibration of the model was achieved using field flow and pressure data, which was collected from flow tests that the City performed throughout the system for this task.

Hydraulic Analyses Results

Several hydraulic analyses were performed to determine the capability of the system to meet the pressure and flow requirements identified in **Chapter 5** and contained in *WAC 246-290-230*. The first analysis was performed to evaluate pressures throughout the system under existing (i.e., 2008) peak hour demand conditions. The results of this analysis were used to identify locations of low and high pressures. To satisfy the minimum pressure requirements, the pressure at all water service locations must be at least 30 psi during these demand conditions. The results of this analysis indicated that all areas of the system have pressures greater than 30 psi.

Fire flow analyses were performed throughout the system to determine the capability of the existing water system to provide adequate fire flow under peak day demand conditions. A separate fire flow analysis was performed for each node in the hydraulic model to determine the available fire flow at a minimum residual pressure of 20 psi. For each node analyzed, the resulting fire flow was compared to its target fire flow requirement, which was assigned according to the land use classification that it is located within, as summarized in **Table 4-9**. A summary of the results of the analyses for representative locations with the lowest fire flow in each pressure zone is shown in **Table 7-6**. The available fire flow shown in the table represents the lowest flow in the area from a single fire hydrant location. The available fire flow from other nearby hydrants that would also be used to fight an actual fire is greater than the amounts shown in the table. Multiple fire hydrants are generally used to extinguish a fire in order to generate higher flows and simultaneously fight the fire from multiple locations. The single hydrant modeling approach is used primarily for planning purposes only in order to locate areas in the system that should be improved to ensure sufficient fire flow is available in each area of the system.

The results of the fire flow analyses were used to identify improvements for water mains that are undersized or not looped adequately to provide sufficient fire flow. Upon completion of the existing system fire flow analyses, proposed water main improvements were included in the model and fire flow analyses were performed throughout the system to demonstrate that the improvements eliminate the existing system deficiencies and meet the future requirements of the system. These analyses were modeled under future year 2028 demand conditions without planned reductions from conservation to ensure that the improvements are sized sufficiently to meet the most stringent requirements anticipated in the future.

The results of the fire flow analyses with planned improvements are summarized in **Table 7-6**. These results show that fire flows are significantly increased with the proposed water main improvements. A description of the planned improvements and a figure that shows their location is presented in **Chapter 9**.

Table 7-6
Fire Flow Analysis Summary

Description	Approximate Location	Pressure Zone	Available Fire Flow (gpm) at 20 psi		Target Fire Flow (gpm)
			Existing System [1]	Future System with Improvements [1]	
Single Family Residential Area	172nd St & 67th Ave	596	390	1,570	1,000
Seaview Elementary School	188th St & 86th Pl	596	390	3,530	3,000
Single Family Residential Area	Sierra Dr & 81st Pl	596	390	1,570	1,000
Multi Family Residential Area	212th St & 81st Pl	596	1,180	3,700	3,000
Stevens Hospital	212th St & 76th Ave	596	4,300	6,000	5,000
Stevens Hospital	216th St & 76th Ave	596	4,520	5,870	5,000
Commercial Area	212th St & 72nd Ave	596	2,630	5,490	3,000
Single Family Residential Area	Lake Ballinger Way	596	820	1,570	1,000
Maplewood School	200th St & 84th Ave	596	1,600	4,370	3,000
Commercial Area	244th St SW	596	1,500	2,440	3,000
Commercial Area	Edmonds Way & Hwy 99	596	2,250	4,140	3,000
Single Family Residential Area	192nd St & 93rd Pl	505	390	1,570	1,000
Single Family Residential Area	164th St & 72nd Ave	500	390	1,570	1,000
Single Family Residential Area	9th Ave & Sea Vista Pl	486	480	1,740	1,000
Single Family Residential Area	76th Ave & Braemar Dr	425	870	1,560	1,000
Single Family Residential Area	176th St & Sound View Dr	425	880	1,570	1,000
Single Family Residential Area	Viewland Way & 12th Ave N	420	400	3,860	1,000
Single Family Residential Area	Olympic Ave & Glen St	420	800	1,590	1,000
Single Family Residential Area	Sea Lawn Dr	325	880	1,570	1,000
Single Family Residential Area	Northern Ocean Ave	325	390	1,570	1,000
Commercial Area	Daley St & 3rd Ave N	325	2,760	3,100	3,000
Multi Family Residential Area	Glen St & 6th Ave N	325	2,320	4,730	3,000
Holy Rosary School	Daley St & 8th Ave N	325	1,400	4,960	3,000
Commercial Area	Main St & Railroad Ave	325	880	2,440	1,000
Commercial Area	Erben Dr & 4th Ave S	325	1,000	4,110	3,000

1. Fire flows shown are from a single fire hydrant. Higher flows are commonly available from nearby hydrants. See page 7-9 for more information.

SYSTEM CAPACITY

System capacity analyses were performed to determine the maximum number of equivalent residential units (ERUs) that the system can serve, based on an independent evaluation of each component of the City's water system. A separate analysis was performed for the existing system with 2008 demand levels and the future system with year 2028 projected demand levels. The results of these analyses provide the City with information to ensure sufficient capacity is available when reviewing applications for new connections to the water system.

Determining Adequate Water Supply for New Buildings

By law, governments cannot issue a building permit until water is available for the applicant's property. The requirement for providing evidence of an adequate water supply was codified in 1990 under Title 19.27.097 of the Revised Code of Washington (RCW) in the Building Code Section. To assist governments with implementing these requirements,

the Department of Health has developed a handbook titled *Guidelines for Determining Water Availability for New Buildings*. A public water system will issue a "Certificate of Water Availability" or similar document during the building permit review process when there is sufficient water supply to meet the domestic water service and fire flow requirements of the applicant's proposed project.

Analysis Criteria

The capacity of the City's water system and ability to serve additional customers is based on the limiting capacity of either supply or storage, whichever facility has the least capacity. The capacity analysis for supply was computed from the Alderwood Supply Station capacity and the system's peak day demand per ERU. The capacity analysis for storage was computed from the total usable capacity of the storage facilities and the storage requirement per ERU. The storage requirement per ERU was determined from the existing storage requirement presented in this chapter and existing ERUs presented in **Chapter 4**.

Existing System Capacity Analysis Results

The results of the existing system capacity analysis, as shown in **Table 7-7**, indicate that the existing system has sufficient capacity to serve an additional 2,276 ERUs. The Alderwood Supply Station is the limiting facility of the system, as shown in the table.

Table 7-7
Existing System Capacity Analysis

Demands Per ERU Basis	
Average Day Demand Per ERU (gal/day)	236
Peak Day Demand Per ERU (gal/day)	472
Peak Hour Demand Per ERU (gal/day)	850
Supply Capacity	
Limiting Supply Rate - AWWD Supply Station (gal/day)	7,920,000
Peak Day Demand Per ERU (gal/day)	472
Maximum Supply Capacity (ERUs)	16,776
Storage Capacity	
Maximum Storage Capacity (gal)	7,118,725
Storage Requirement Per ERU (gal)	395
Maximum Storage Capacity (ERUs)	18,011
Maximum System Capacity	
Based on Limiting Facility - Supply	16,776
Available System Capacity	
Maximum System Capacity (ERUs)	16,776
Existing (2008) ERUs	14,500
Available System Capacity (ERUs)	**2,276**

Future System Capacity Analysis Results

The results of the 20-year projected system capacity analysis, as shown in **Table 7-8**, indicate that the water system in the year 2028 will have sufficient capacity to serve an additional 1,783 ERUs. Whereas supply was the limiting facility for the existing system capacity analysis, storage is the limiting facility for this analysis. This is due to the increased capacity of the City's Alderwood Supply Station upon completion of planned improvements for this facility, which is discussed in **Chapter 9**.

Table 7-8
20-Year Projected System Capacity Analysis

Demands Per ERU Basis	
Average Day Demand Per ERU (gal/day)	236
Peak Day Demand Per ERU (gal/day)	472
Peak Hour Demand Per ERU (gal/day)	850
Supply Capacity	
Limiting Supply Rate - AWWD Supply Station (gal/day)	10,080,000
Peak Day Demand Per ERU (gal/day)	472
Maximum Supply Capacity (ERUs)	21,351
Storage Capacity	
Maximum Storage Capacity (gal)	7,118,725
Storage Requirement Per ERU (gal)	407
Maximum Storage Capacity (ERUs)	17,483
Maximum System Capacity	
Based on Limiting Facility - Storage	17,483
Available System Capacity	
Maximum System Capacity (ERUs)	17,483
Projected (2028) ERUs	15,700
Available System Capacity (ERUs)	**1,783**

8

Operations and Maintenance

INTRODUCTION

This chapter summarizes the operations and maintenance activities of the City's Water Division, including a brief description of the personnel and their duties for operating and maintaining the water system.

WATER SYSTEM MANAGEMENT AND PERSONNEL

Management Structure

The City of Edmonds Water Division functions under the direction of the Public Works Director. The Water and Sewer Manager is responsible for management of the water system and reports to the Public Works Director. The daily operation of the water system functions under the direction of the Water Division Lead. The Water Division Lead, Water Quality Technician and Meter Reader report to the Water and Sewer Manager, as shown in **Table 8-1**.

The Water Maintenance Technicians are responsible for the daily operation and maintenance of the water system. Their tasks include routine operation and preventive maintenance, record keeping, inspection, testing, installation, and repair of system facilities, and maintenance required in response to emergencies.

The City's water system must be operated by one or more certified operators in accordance with Washington State Law (*WAC 246-292*). In addition, specialty certification is required for backflow device testing. **Table 8-2** shows the current certifications of the City's water operations and maintenance staff. Five certified crew members in the Sewer Division also assist the Water Division staff on an as-needed basis. The City maintains well qualified, technically trained staff and provides opportunities for ongoing training, certification, and membership in professional organizations.

Personnel Responsibilities

The key responsibilities of the water operations and maintenance staff are summarized below:

Public Works Director: Manages administration, budget formulation and utility rates.

Water & Sewer Manager: Responsible for the day-to-day operation of the water and sewer utility systems. Supervises the implementation of programs, and oversees the budgeting process for water system operations and maintenance.

Water Division Lead: Supervises all maintenance personnel in the Water Division. Supports the Water and Sewer Manager in the day-to-day operation of the water system. Participates in the decision making process during system troubleshooting, emergency response situations and implementation of system upgrades. Coordinates preventative maintenance, water quality monitoring, and cross-connection control activities. The Water Division Lead is the field foreman during system troubleshooting and emergency response situations.

Water Quality Technician: Responsible for all tasks related to maintaining and testing water quality throughout the distribution system and responds to water quality complaints.

Water Maintenance: Directly involved in maintenance of the water system, monitoring of facilities, daily operations, inspection and repair, testing, response to complaints, emergency response, and cross connection control.

Meter Reader: Responsible for reading all customer meters and recording the data.

Table 8-1
Water System Operations and Maintenance Organization Chart

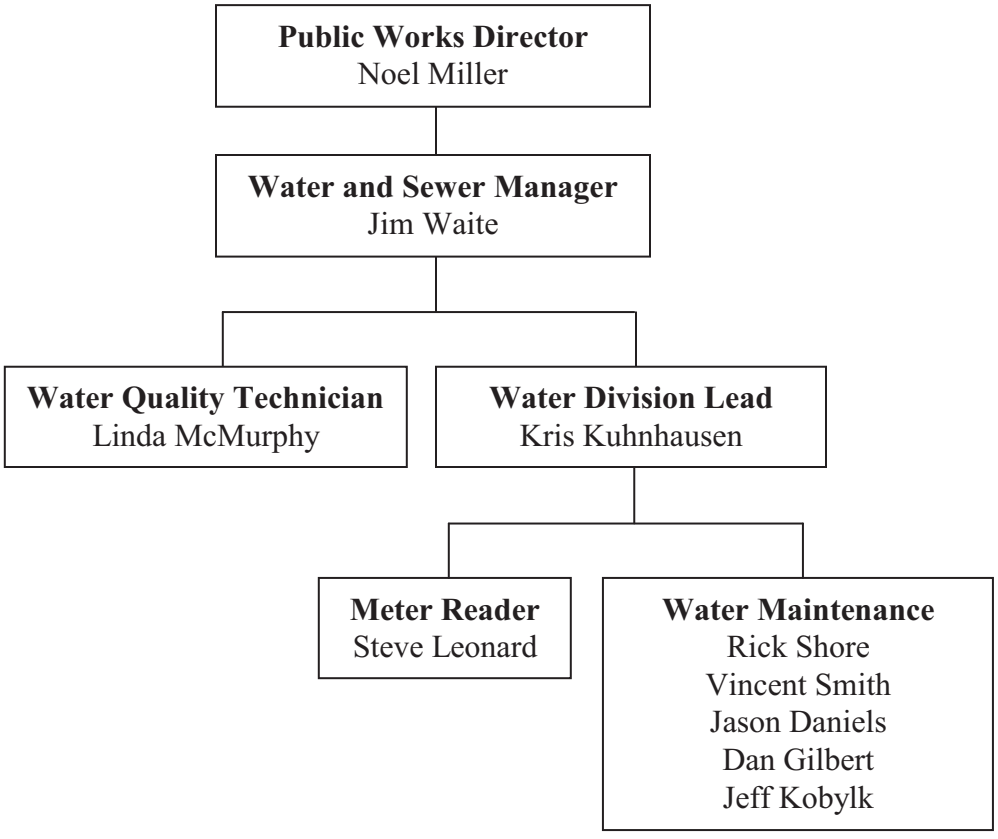

Table 8-2
Personnel Certification

Name	Position	Certification No.	Certification Type
Jim Waite	Water and Sewer Manager	3763	WDM4, WDS, CCS, BAT, WTPOIT
Kris Kuhnhausen	Water Division Lead	5199	WDM3, WDS, CCS
Linda McMurphy	Water Quality Technician	3256	WDM2, MDS, CCS, BAT
Rick Shore	Water Maintenance II	5411	WDM1, WDS, CCS
Vincent Smith	Water Maintenance II	6887	WDS, CCS
Jason Daniels	Water Maintenance II	8002	WDS
Dan Gilbert	Water Maintenance II	10939	WDS, CCS
Jeff Kobylk	Water Maintenance II	11735	WDS

Certification Definitions
WDM - Water Distribution Manager
WDS - Water Distribution Specialist
CCS - Cross Connection Control Specialist
BAT - Backflow Assembly Tester
WTPOIT - Water Treatment Plant Operator In Training

NORMAL OPERATIONS

Available Equipment

The City owns and regularly uses a variety of equipment for daily routine operation and maintenance of the water system. The equipment and supplies needed for normal operation and maintenance of the water system is stored at the City's Public Works Facility. The City will also rent additional equipment, as needed, or contract with a local contractor for additional services. The following equipment and supplies are maintained by the City:

- Repair bands, couplers and replacement pipe for all sizes and types of water mains found in the system to be used for the repair or replacement of leaking or broken water mains.
- Spare service saddles, corporation stops, service lines, meter setters, meters and boxes to be used for the repair of service connections from leaking, structural damage or frost damage.
- A complete hydrant assembly to be used for the repair or replacement of a leaking or damaged hydrant.
- Spare parts for facilities found in the distribution system, including gate valves, pressure reducing valves and air release valves.
- An adequate supply of dry chlorine is kept on hand. Chlorine is the only treatment chemical kept in stock.

- Vehicles that include three crew trucks, one dump truck, one flat bed track, one meter reading vehicle and one backhoe. All vehicles are equipped with communications equipment to ensure a reliable method of communication within the organization.

Routine Operations

Routine operations involve the planning and implementation of procedures to ensure that the water system is functioning properly and providing reliable, high-quality water to all customers at all times. Routine operations also involve planned maintenance activities and reading of customer meters.

Routine Water Quality Sampling

The City routinely samples water throughout the distribution system to ensure the water is safe for its customers use, as required by law. The Department of Health (DOH) has adopted federal regulations that specify minimum sampling requirements for water systems. The sampling requirements are contained in *WAC 246-290-300* and depend on the population served, source type, and treatment provided. Water quality monitoring is discussed further in **Chapter 6**, the City's latest Water Quality Report in **Appendix J**, and the City's Coliform Monitoring Plan in **Appendix K**.

Cross Connection Control

The City adopted a cross connection control program that complies with *WAC 246-290-490* for the protection of its potable water from contamination due to cross connections. Backflow prevention devices are required at any service connection where a potential for contamination exists, as defined by City ordinance (Chapter 7.20 Backflow Prevention). The premise where the backflow prevention device is installed is placed on a yearly inspection list that is maintained by the Water Division.

The City routinely reviews building permit applications for potential cross connection situations. Several Water Division staff have the Cross Connection Specialist certification as shown in **Table 8-2** and are capable of implementing the cross connection control program. Information from the City's cross connection control program is contained in **Appendix H**.

Customer Complaint Response Program

The City maintains a log of complaints received from water customers. Depending on the nature of the complaint, a Water Division employee may be contacted by radio or mobile phone to respond immediately if a public health issue is apparent. If not of immediate urgency, a work order will be completed, and staff will respond as soon as feasible.

The City dedicates one full-time employee to distribution system water quality. One of responsibilities of this position is to address water quality complaints and inquiries. A computerized maintenance management system is used to document and track this activity.

Recordkeeping and Reporting

Regulations for recordkeeping and reporting are contained in *WAC 246-290-480*. The City maintains all records in its Information and Management System (IMS). All water system operating records are kept for an indefinite period. Records and reports maintained by the City include, but are not limited to the following:

- Water quality monitoring
- Water quality complaints
- Actions taken to correct MCL violations
- Variances or exemptions
- Public notifications
- Flushing activities
- Backflow prevention devices and customer notices
- Maintenance and construction records
- System charts and drawings
- O&M manuals
- Personnel and legal records

The required retention periods of critical records required by DOH are as follows:

- Bacteriological analysis results: 5 years
- Chemical analysis results: for as long as the system is in operation
- Daily source meter readings: 10 years
- Other records of operation and analyses as may be required by DOH: 3 years
- Documentation of actions to correct violations of primary drinking water standards: 3 years after last corrective action
- Records of sanitary surveys: 10 years
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility

The notification and reporting requirements of DOH are as follows:

- The City must report the following to DOH:
    - Within one business day: a backflow incident per *WAC 246-290-490 (8)f*.
    - Within 48 hours: a failure to comply with the primary standards or treatment technique requirements specified in *WAC 246-290*.
    - Within 48 hours: a failure to comply with the monitoring requirements specified in *WAC 246-290*.
    - Within 48 hours: a violation of a primary maximum contaminant level (MCL).

- The City must submit to DOH all applicable reports required by *WAC 246-290*. Monthly reports are due by the 10th day of the following month, unless otherwise specified.
- Daily source meter readings and total annual source meter readings must be made available to DOH on request.
- Water facilities inventory form (WFI) must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system.
- The City must notify DOH of the presence of:
    - Coliform in a sample within 10 days of notification by the testing laboratory.
    - Fecal coliform or E. coli in a sample by the end of the business day that the City is notified by the testing laboratory.
- 6. When a coliform MCL violation is determined, the City must:
    - Notify DOH within 24 hours of determining acute coliform MCL violations.
    - Notify DOH before the end of the next business day when a non-acute coliform MCL is determined.
    - Notify water customers in accordance with *WAC 246-290-495*.
- Any reports or communications related to monitoring waivers must be submitted to DOH during each monitoring period or as required.

Public Notification

In accordance with *WAC 246-290-495*, the City must notify water system customers if any of the following conditions occur:

- Failure to comply with monitoring requirements under *WAC 246-290*.
- Failure to comply with a primary MCL described under *WAC 246-290-310*.
- Failure to comply with a surface water treatment technique.
- Failure to comply with testing requirements.
- Failure to comply with a DOH order.
- Failure to comply with a variance or exemption schedule from DOH.
- If the system is operating under a variance or exemption.
- If system is identified as a source of waterborne disease outbreak.
- If DOH issues the system a category red operating permit.
- If DOH issues an order.

The City will comply with public notification content requirements, notice distribution requirements, and time limit requirements specified in *WAC 246-290-495*. More information on the City's public notification procedures is contained in the Coliform Monitoring Plan in **Appendix K**.

Safety Procedures and Equipment

The City provides ongoing safety education for its staff to ensure a safe working environment. The American Water Works Association publishes a manual titled, *Safety Practices for Water Utilities (M3),* that describes safety programs and provides guidelines for safe work practices and techniques for a variety of water utility work situations. The City has implemented several safety rules related, but not limited to, the following:

- Climbing tanks or standpipes.
- Entering manholes, vaults, or open trenches.
- Operating heavy equipment or handling chemicals.

All employees in the Water Division have basic first aid training. All Water Division vehicles are equipped with first aid kits. First aid kits are also maintained at the Public Works Facility.

A copy of Material Safety Data Sheets (MSDS) for the chemicals used in the operations and maintenance of the water system are kept on file at the Public Works Department. The data sheets identify the chemical name, hazardous ingredients, physical data, fire and explosion hazard data, health hazards, spill and disposal procedures, user protection information, handling and storage precautions, as well as other information about the product.

EMERGENCY OPERATIONS

The Water Division staff are trained and equipped to respond to emergency events. The water system has been designed and constructed to operate under emergency conditions. A brief discussion of the capabilities of the water system infrastructure and its operation during emergency events follows.

Multiple Supply Sources

The City has the capability to maintain water service to its customers if its primary supply facility, the Alderwood Supply Station, is out of service. The City's standby supply facility, the SPU Supply Station, could be used to supply the system during an emergency event. The City also has multiple emergency interties with adjacent water systems that could be used during this type of event. The City has four emergency interties with City of Lynnwood and five emergency interties with the Olympic View Water District.

Multiple Reservoirs

The City has multiple reservoirs that provide redundancy to the operating areas they serve, should one of the reservoirs be out of service. The reservoirs include a 3.0 MG steel standpipe and 1.5 MG steel standpipe at the Five Corners site, a 1.5 MG buried concrete reservoir at the Yost Park site, and a 1.5 MG buried concrete reservoir at the Seaview Park site.

Distribution System

The City has installed water mains with multiple connections to other water mains and created looped water mains where possible. This enables the City to maintain service to customers and minimize the number of customers taken out service during maintenance and repairs to the distribution system.

Emergency Telephone Calls

Emergency calls during business hours are handled through the City switchboard. Calls during non-business hours are handled through the Snohomish County Emergency Communication System (Sno-Com). One Water Division employee is on-call 24-hours a day.

On-Call Personnel

The City's "on-call" person is equipped with a service vehicle and can respond promptly to any emergency calls. A list of emergency telephone numbers is provided to each "on-call" employee.

Employee Cross-Training

The City's public works operations and maintenance employees are trained in all areas of the City-owned utilities. This enables the City to draw from a larger pool of workers that are qualified to deal with water related issues in the event of an emergency. This places the City in a position of readiness where they are able to effectively deal with almost any problem that arises.

Emergency Response Program

The City of Edmonds Disaster Plan prepared by the City identifies procedures that would be carried out in the event of a serious emergency or disaster situation. The City has also prepared an Emergency Response Plan and a Vulnerability Assessment Plan of the water system, which includes contingency plans for responding to potential emergency conditions. Copies of these are kept on file at the Public Works Facility.

PREVENTIVE MAINTENANCE

The Water Division has developed a preventive maintenance program to ensure all critical components of the water system are properly functioning and regularly maintained for long-term performance and reliability. The following schedule is used for the City's preventive maintenance program.

- Valves: annually operate, inspect, clean and maintain.
- Fire hydrants: semi-annually operate, inspect, clean and maintain.
- Water mains: semi-annually flush water mains using fire hydrants and blow-off assemblies to discharge flushing water.

- PRV stations: annually exercise, inspect, clean and maintain all equipment; rebuild control valves every five years.
- Supply stations: annually exercise, inspect, clean and maintain all equipment; rebuild control valves every five years.
- Reservoirs: daily inspect facility site and security; annually inspect exterior coating.
- Pump station: daily inspect facility site and security; annually inspect, clean and maintain all equipment; rebuild control valves every five years.

STAFFING

The Water Division is currently staffed with eight full-time personnel consisting of five field technicians, one water quality technician, one meter reader and one lead supervisor. The Water and Sewer Manager allocates approximately 50 percent of his time to the Water Division. The Public Works Director oversees all Public Works activities, so a much smaller portion of his time is available to the water system.

The City's current staffing level is adequate to operate the water system and meet the regulatory requirements for public water systems. The City will routinely evaluate staffing needs and add staff in the future, as allowed by the budget, to ensure compliance with regulatory requirements and the increasing needs of the system. The City plans to add one new staff position in the second half of 2010 to maintain the City's GIS system with one-third of the position being funded by the Water Utility.

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Water System Improvements

INTRODUCTION

This chapter presents water system improvements that the City plans to implement within the 20-year planning period to resolve existing system deficiencies and meet the future demands of the water system. The water system improvements were identified from the results of the water system analyses presented in **Chapter 7** and have been sized to accommodate the projected demands shown in **Chapter 4**. This chapter also presents criteria used for prioritizing the capital improvements, planning level project cost estimates, and an implementation schedule for the improvements.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of capital improvements that have been completed since the last water system plan was prepared in 2002 and provides a brief description of the currently planned capital improvements. The water system improvements are shown schematically in **Figure 9-1** and summarized in a table near the end of this chapter.

The water system improvements are grouped into the following categories and briefly described following the discussion of recently completed improvements:

- Water Main Improvements
- PRV Station and Pressure Relief Improvements
- Facility Improvements
- Other Improvements

Water System Improvements Completed Since 2002

The City has completed several water system improvements that were identified in the 2002 Comprehensive Water System Plan. These include an upgrade to the Five Corners Pump Station, seismic and control valve improvements at the reservoir sites, pressure reducing station improvements, and replacement of old and undersized water main. A summary of water system improvements completed since 2002 is shown in **Table 9-1**.

Table 9-1
Water System Improvements Completed Since 2002

2002 WSP CIP No.	Project Description	Length
T-1	South Perrinville Area Water Main Improvements	4,470 LF
T-2	Seaview Area Water Main Improvements	4,140 LF
T-3	Alderwood Master Meter Improvements	N/A
T-4	Chase Lake Area Water Main Improvements	4,560 LF
T-5	North Ballinger Water Main Improvements	2,345 LF
T-6	77th Place W Water Main Improvements	2,000 LF
T-7	South Ballinger Area Water Main Improvements	4,760 LF
T-8	College Place Area Water Main Improvements	5,610 LF
T-9	80th Place W Water Main Improvements	640 LF
T-11	Cory Road Water Main Improvements	250 LF
T-12	81st Place W Water Main Improvements	1,340 LF
T-15	215th Street SW Water Main Improvements	200 LF
T-15	215th Place SW Water Main Improvements	300 LF
T-15	92nd Place W Water Main Improvements	350 LF
SC-1	Five Corners Pump Station Improvements	N/A
SC-2	Seismic Improvements for Reservoirs	N/A
SC-3	Reservoir Security Study & Improvements	N/A
SC-4	Chlorine Residual Analyzers	N/A
SC-5	Miscellaneous PRV Improvements	N/A

Water Main Improvements

The following water main improvements were identified from the results of the distribution system analyses presented in **Chapter 7** and from the City's list of planned projects.

CIP WM1: Annual Water Main Replacement Program

Deficiency: Most of the water mains to be replaced within this ongoing program are aging, undersized water mains that do not provide adequate fire flow to meet current requirements. Much of this water main is older cast iron pipe and some areas have had occurrences of leaks or breaks. Water main improvement projects previously identified in the City's CIP program in 2006, 2007 and 2008 have been carried forward and are included within this CIP project.

Improvement: Replace existing water main with new ductile iron water main in accordance with the City's construction standards. The individual water main improvements grouped under this project are shown in **Figure 9-1**. Information on the individual projects, including proposed water main size, location and project cost estimate is presented later in this chapter in **Table 9-6**. The selection of specific projects will be accomplished annually during the City's budget development process and will be guided by the prioritization presented later in this chapter. This provides the City with the flexibility to coordinate these projects with other projects that may occur within the same area. The fire hydrant portion of the new water main installations has been separated from this project and grouped under project CIP M1 for cost allocation purposes.

CIP WM2: 24-inch Transmission Main Isolation Valves

Deficiency: The existing 24-inch transmission main provides water from the Alderwood Supply Station to the 596 Zone and does not have enough valves to shut down and isolate portions of the transmission main for maintenance or repairs.

Improvement: Install up to approximately six isolation valves along the 24-inch transmission main. The total number of valves and valve locations will be determined during design.

CIP WM3: BNSF Crossings Water Main

Deficiency: The City's existing water main crossings beneath BNSF's right of way are not adequate for BNSF's future second track.

Improvement: Upgrade the existing 12-inch diameter water main crossings beneath BNSF's right of way at Main Street and Dayton Street by installing 18-inch diameter steel casings that will house the City's 12-inch diameter water mains. The project will also replace an existing water main at Brackett's Landing North Park and add a new water main in James Street between Sunset Avenue and Railroad Street to improve fire flow service.

CIP WM4: Shell Valley Access Road Water Main

Deficiency: The existing 8-inch diameter water main in Pioneer Way is a dead-end service.

Improvement: Install approximately 300 feet of new 8-inch diameter water main from Main Street to the existing valve on the water main in Pioneer Way. The new water main will eliminate the dead-end main on Pioneer Way and improve the water system. The water main will be installed during construction of the Shell Valley Access Road improvements.

PRV Station and Pressure Relief Improvements

The following PRV station improvements and pressure relief improvements include new facilities, abandoning old facilities, and improvements to existing facilities.

CIP PRV1: New 596/420 Zone Pressure Reducing Station

Deficiency: Water supply to the 420 Zone is conveyed from the 596 Zone through one pressure reducing station, thereby lacking supply redundancy. Without a second supply connection and sufficient water main looping, the single PRV station does not provide adequate fire flow into the 420 Zone.

Improvement: Install a new PRV station near the intersection of Viewland Way and 12th Avenue. The size of the control valves and exact location of the station will be determined during design.

CIP PRV2: PRV Station 11 Abandonment (184th St & 84th Ave)

Deficiency: This existing PRV station has been off-line for several years and is no longer needed.

Improvement: Abandon the PRV station to eliminate any future maintenance requirements of this facility.

CIP PRV3: PRV Station 12 Abandonment (Olympic View Drive & Sunset Way)

Deficiency: This existing PRV station has been off-line for a several years and is no longer needed.

Improvement: Abandon the PRV station to eliminate any future maintenance requirements of this facility.

CIP PRV4: System-Wide Pressure Relief Improvements

Deficiency: The existing water system does not have sufficient pressure relief facilities in all pressure zones to protect the system from excessively high pressures that would occur if a control valve fails in the open position in one of the pressure reducing stations or supply stations.

Improvement: Install new pressure relief stations or modify existing pressure reducing stations to include a pressure relief valve. A system-wide evaluation will be performed during the preliminary design phase of the project to determine the size, location, and recommended improvements to provide pressure relief to the entire water system.

CIP PRV5: Annual PRV Station Improvements Program

Deficiency: Several of the existing PRV stations are old and have reached the end of their useful service life. Other PRV stations are in need of minor improvements to ensure long-term operation and reliability.

Improvement: Annually improve or replace PRV stations throughout the system. The City will evaluate needs and select one or more PRV stations to be improved each year.

Facility Improvements

The following water system facility projects consist of improvements to existing facilities to improve operation, increase capacity, or to ensure long-term performance of the facility.

CIP F1: Alderwood Supply Station Improvements

Deficiency: The supply station is not setup to operate correctly with the Five Corners Pump Station and requires manual operation during high demand periods. The station also lacks sufficient integration with the City's SCADA system.

Improvement: Implement improvements to expand the capacity of the station to improve system operation during peak demand periods when the Five Corners Pump Station is operating in conjunction with the supply station, including improvements to properly integrate the station with the City's SCADA system.

CIP F2: Seaview Reservoir Improvements

Deficiency: The existing reservoir vents are not secure and could allow stormwater to enter the reservoir. Better monitoring of water quality is needed at the reservoir site.

Improvement: Replace the existing reservoir vents with new vents and install water quality sampling improvements.

CIP F3: Yost Reservoir Improvements

Deficiency: The existing reservoir vents are not secure and could allow stormwater to enter the reservoir. Better monitoring of water quality is needed at the reservoir site. Access into the reservoir for inspection or maintenance purposes is difficult through the existing manhole structure, located at the outer edge of the Yost Park tennis court.

Improvement: Replace the existing reservoir vents with new vents and install water quality sampling improvements. Replace the existing access manhole cover with a new locking access hatch.

CIP F4: Five Corners Pump Station Improvements

Deficiency: The pump station has insufficient capacity and control capabilities to properly operate in conjunction with the Alderwood Supply Station and meet the supply requirements of the 596 Zone.

Improvement: Replace the existing pumps with new pumps and VFDs (variable frequency drives). Install piping, control valve, and SCADA improvements. These improvements were underway in 2009 and completed in 2010.

CIP F5: Five Corners 3.0 MG Reservoir Recoating

Deficiency: The last interior and exterior coating of the steel reservoir was completed in 1994. The reservoir should be recoated every 15 to 20 years, based on the typical life of coating on steel reservoirs.

Improvement: Recoat the interior and exterior of the reservoir to prevent premature corrosion of the facility. Inspect and sample the interior and exterior reservoir coatings approximately one year prior to commencement of the project to determine the properties of the existing coatings and requirements for the project.

CIP F6: Five Corners 1.5 MG Reservoir Recoating

Deficiency: The last interior and exterior coating of the steel reservoir was completed in 1994. The reservoir should be recoated every 15 to 20 years, based on the typical life of coating on steel reservoirs.

Improvement: Recoat the interior and exterior of the reservoir to prevent premature corrosion of the facility. Inspect and sample the interior and exterior reservoir coatings approximately one year prior to commencement of the project to determine the properties of the existing coatings and requirements for the project.

Other Improvements

CIP M1: Fire Hydrant Improvements

Deficiency: The City has identified approximately 12 fire hydrants that are old and have reached the end of their useful service life. Fire hydrants on water mains to be replaced under the Annual Water Main Replacement Program (CIP WM1) are old and will not be reused on the new water mains.

Improvement: Replace the 12 old fire hydrants with new fire hydrants. This project also includes the fire hydrant portion of the new water main installations planned under CIP WM1.

CIP M2: AMR Meter Evaluation Study

Deficiency: The City's existing water customer meters will eventually reach the end of their useful service life and need replacing. New automatic meter reading (AMR) technologies are available that offer improved metering accuracy, reduced labor requirements, and capabilities that support water conservation efforts.

Improvement: Conduct a study that evaluates the different AMR technologies and costs, potential benefits to the City, and provides recommendations for meter replacements and implementation of a long-term metering system.

CIP M3: Telemetry System Improvements

Deficiency: The telemetry system will need to be upgraded on a regular basis to maintain up-to-date equipment to ensure reliable and continuous operation, with a major system upgrade anticipated in approximately 2020.

Improvement: Upgrade the hardware and software, as necessary, to keep the system up-to-date. Replacement of major components is anticipated in approximately 2020.

CIP M4: Comprehensive Water System Plan Update

Deficiency: The City is required to update its Comprehensive Water System Plan every six years and submit to the Department of Health for review and approval. Drinking water regulations are continuously changing and must be addressed in the City's Comprehensive Water System Plan.

Improvement: Update the Comprehensive Water System Plan every six years to meet the requirements that are in effect at the time of the update and to provide the City with an updated plan for implementing water system improvements.

PROJECT COST ESTIMATES

Project costs were estimated for each of the planned improvements and are presented in 2009 dollars. The planning level project cost estimates include the estimated construction cost and indirect costs. The construction cost estimate portion includes all construction related costs, sales tax and a 10 percent contingency. The indirect cost portion is estimated at 35 percent of the construction cost and includes engineering (preliminary design, final design, and construction management services), surveying, permitting, legal, and administrative services.

Water Main Cost Estimates

Construction costs for water main projects were estimated using the water main unit costs (i.e., cost per foot length) shown in **Table 9-2**. The unit cost of construction for each water main size is based on estimates of all construction-related improvements, which include materials and labor for the water main installation, water services, fittings, valves, connections to the existing system, trench restoration, full-width roadway asphalt overlay, and other work for a complete installation. The indirect cost component is not included in the water main unit costs.

Table 9-2
Water Main Unit Costs for Construction

Water Main Diameter (inches)	Construction Cost per Foot Length (2009 $$/LF)
8	$230
12	$280

Costs related to the fire hydrant portion of the water main improvements are included in the unit costs shown in **Table 9-2**, but have been removed from project CIP WM1 and shown separately under project CIP M1 in **Table 9-7** near the end of this chapter.

PRIORITIZING IMPROVEMENTS

The planned improvements were prioritized using established criteria to help guide the City with scheduling and budgeting water system improvement projects in future years. A description of the criteria is provided below.

Prioritizing Water Main Improvements

Table 9-3 shows the criteria used for prioritizing the water main improvements. The criteria are based on the existing water main deficiencies, as determined by the categories shown in the table. Each category is assigned a weight factor that reflects the relative importance of each category compared to the others. The *Existing Water Main Fire Flow Capability* category ranks the water main improvements based on the ability of the existing water mains to provide the required fire flow, as determined from the results of the hydraulic analyses presented in **Chapter 7**. The *Occurrence of Leaks or Breaks* category ranks the water main improvements based on the amount of leaks or breaks incidents and maintenance required in the past. The *Existing Water Main Year of Installation* and *Existing Water Main Material* categories rank the water main improvements based on the existing pipe age and material.

The water main priority ranking criteria was applied to each water main improvement project, which resulted in a total ranking score for each project. The results of the priority ranking are summarized in **Table 9-4**. **Table 9-5** presents the results in an order that is sorted according to total ranking points.

Table 9-3
Water Main Improvements Priority Ranking Criteria

Points	Category	Weight Factor	Weighted Points
	Existing Water Main Fire Flow Capability		
3	Available Fire Flow is 69% or Less of Target Fire Flow	4	12
2	Available Fire Flow is 70% or 80% of Target Fire Flow	4	8
1	Available Fire Flow is 90% or 100% of Target Fire Flow	4	4
	Occurrence of Leaks or Breaks		
2	Frequent Reports of Leaks or Breaks	4	8
1	Occasional Reports of Leaks or Breaks	4	4
	Existing Water Main Year of Installation		
3	1929 - 1949	3	9
2	1950 - 1969	3	6
1	1970 & after	3	3
	Existing Water Main Material		
3	Steel	2	6
2	Cast Iron	2	4
1	HDPE or Ductile Iron	2	2

Table 9-4
Water Main Improvements Priority Ranking – Sorted by CIP Number

	Priority Ranking Points				
CIP No.	Fire Flow	Leaks/ Breaks	Pipe Year	Pipe Material	Total Points
1	11	0	6	3	20
2	12	0	8	4	24
3	10	0	5	3	18
4	8	0	8	4	20
5	8	0	3	4	15
6	8	0	3	2	13
7	8	0	6	2	16
8	6	0	2	2	10
9*	8	0	5	3	16
10	8	0	3	4	15
11	12	0	3	6	21
12	12	0	6	4	22
13	12	0	3	4	19
14	9	0	3	3	15
15	8	0	3	2	13
16	11	0	4	3	18
17	12	0	3	2	17
18	9	0	3	3	15
19	8	0	3	4	15
20	12	0	5	4	20
21	8	0	5	4	17
22	12	0	3	2	17
23	12	0	3	2	17
24	8	0	3	4	15
25	4	0	6	4	14
26	8	0	3	4	15
27	8	0	6	4	18
28	8	0	3	2	13
29	8	0	3	4	15
30	8	0	3	4	15
31	12	0	6	3	21
32	8	0	6	4	18
33	8	0	3	2	13
34	8	0	6	4	18
35	8	0	6	2	16
36	8	0	3	2	13
37	10	0	3	2	15
38	8	0	6	4	18
39	8	0	3	4	15
40	8	0	3	2	13
41	9	0	5	3	17
42	8	0	3	2	13
43	8	0	6	4	18
44	8	0	3	4	15
45*	12	0	3	4	19
46	10	0	3	3	16
47	12	0	3	4	19
48	12	0	3	2	17
49	8	0	3	2	13
50	4	0	5	2	11
51	12	0	4	3	19
52	12	0	9	4	25
53	8	0	3	2	13
54	8	0	6	4	18
55	8	0	6	4	18
56	8	0	3	4	15
57	8	0	3	4	15
58	8	0	5	4	17
59	12	0	6	4	22
60	12	0	2	3	17
61	12	0	3	3	18
62	12	4	3	2	21
63	8	4	3	4	19

Table 9-4
Water Main Improvements Priority Ranking – Sorted by CIP Number (continued)

	Priority Ranking Points				
CIP No.	Fire Flow	Leaks/ Breaks	Pipe Year	Pipe Material	Total Points
64	11	4	3	2	20
65	10	4	3	3	21
66	8	0	3	4	15
67	8	0	5	2	15
68	8	8	3	4	23
69	12	0	6	4	22
70	8	0	3	2	13
71	12	0	3	4	19
72	12	0	5	3	20
73	8	0	3	3	14
74	4	0	3	4	11
75	12	0	3	3	18
76	8	0	3	4	15
77	0	0	2	2	4
78	0	0	0	0	0
79	0	0	3	4	7
80	0	0	6	6	12
81	0	0	3	4	7
82	0	0	3	4	7
83	0	0	3	4	7
84	0	0	3	4	7
85	0	0	0	0	0
86	0	0	0	0	0
87	0	0	0	0	0
88*	0	0	3	4	7
89*	0	0	3	4	7
90*	0	0	3	4	7
91*	0	0	9	6	15
92*	0	0	6	4	10
93*	0	0	3	4	7
94*	0	0	3	4	7
95*	6	0	5	5	16
96*	0	0	3	6	9
97*	0	0	0	0	0
98*	0	0	0	0	0
99*	12	0	6	6	24
100*	0	0	0	0	0
101*	0	8	9	4	21
102*	12	4	6	4	26
103*	12	0	3	4	19
104*	0	0	3	4	7
105*	8	0	0	0	8
106	0	0	0	0	0
107	0	0	0	0	0
108	0	0	9	4	13
109	0	0	9	4	13
110	0	0	9	4	13
111	0	0	9	4	13
112	0	0	9	4	13
113	0	0	9	4	13
114	0	0	9	4	13
115	0	0	9	4	13
116	0	0	9	4	13
117	0	0	9	4	13
118	0	0	9	4	13
119	0	0	9	4	13
120	0	0	9	4	13
121	0	0	9	4	13
122	0	0	9	4	13
123	0	0	9	4	13
124	0	0	9	4	13
125	0	0	9	4	13
126	0	0	9	4	13

* 2006-2008 CIP projects carried forward

Table 9-5
Water Main Improvements Priority Ranking – Sorted by Total Points

	Priority Ranking Points				
CIP No.	Fire Flow	Leaks/ Breaks	Pipe Year	Pipe Material	Total Points
102*	12	4	6	4	26
52	12	0	9	4	25
99*	12	0	6	6	24
2	12	0	8	4	24
68	8	8	3	4	23
12	12	0	6	4	22
59	12	0	6	4	22
69	12	0	6	4	22
11	12	0	3	6	21
31	12	0	6	3	21
62	12	4	3	2	21
101*	0	8	9	4	21
65	10	4	3	3	21
20	12	0	5	4	20
64	11	4	3	2	20
1	11	0	6	3	20
4	8	0	8	4	20
72	12	0	5	3	20
13	12	0	3	4	19
45*	12	0	3	4	19
47	12	0	3	4	19
63	8	4	3	4	19
71	12	0	3	4	19
103*	12	0	3	4	19
51	12	0	4	3	19
3	10	0	5	3	18
16	11	0	4	3	18
27	8	0	6	4	18
32	8	0	6	4	18
34	8	0	6	4	18
38	8	0	6	4	18
43	8	0	6	4	18
54	8	0	6	4	18
55	8	0	6	4	18
61	12	0	3	3	18
75	12	0	3	3	18
60	12	0	2	3	17
17	12	0	3	2	17
22	12	0	3	2	17
23	12	0	3	2	17
41	9	0	5	3	17
48	12	0	3	2	17
21	8	0	5	4	17
58	8	0	5	4	17
7	8	0	6	2	16
9*	8	0	5	3	16
35	8	0	6	2	16
46	10	0	3	3	16
95*	6	0	5	5	16
5	8	0	3	4	15
10	8	0	3	4	15
18	9	0	3	3	15
19	8	0	3	4	15
26	8	0	3	4	15
29	8	0	3	4	15
30	8	0	3	4	15
37	10	0	3	2	15
39	8	0	3	4	15
44	8	0	3	4	15
56	8	0	3	4	15
57	8	0	3	4	15
66	8	0	3	4	15
76	8	0	3	4	15

Table 9-5
Water Main Improvements Priority Ranking – Sorted by Total Points (continued)

	Priority Ranking Points				
CIP No.	Fire Flow	Leaks/ Breaks	Pipe Year	Pipe Material	Total Points
91*	0	0	9	6	15
14	9	0	3	3	15
24	8	0	3	4	15
67	8	0	5	2	15
25	4	0	6	4	14
73	8	0	3	3	14
70	8	0	3	2	13
6	8	0	3	2	13
15	8	0	3	2	13
28	8	0	3	2	13
33	8	0	3	2	13
36	8	0	3	2	13
40	8	0	3	2	13
42	8	0	3	2	13
49	8	0	3	2	13
53	8	0	3	2	13
108	0	0	9	4	13
109	0	0	9	4	13
110	0	0	9	4	13
111	0	0	9	4	13
112	0	0	9	4	13
113	0	0	9	4	13
114	0	0	9	4	13
115	0	0	9	4	13
116	0	0	9	4	13
117	0	0	9	4	13
118	0	0	9	4	13
119	0	0	9	4	13
120	0	0	9	4	13
121	0	0	9	4	13
122	0	0	9	4	13
123	0	0	9	4	13
124	0	0	9	4	13
125	0	0	9	4	13
126	0	0	9	4	13
80	0	0	6	6	12
74	4	0	3	4	11
50	4	0	5	2	11
92*	0	0	6	4	10
8	6	0	2	2	10
96*	0	0	3	6	9
105*	8	0	0	0	8
79	0	0	3	4	7
81	0	0	3	4	7
82	0	0	3	4	7
83	0	0	3	4	7
84	0	0	3	4	7
88*	0	0	3	4	7
89*	0	0	3	4	7
90*	0	0	3	4	7
93*	0	0	3	4	7
94*	0	0	3	4	7
104*	0	0	3	4	7
77	0	0	2	2	4
78	0	0	0	0	0
85	0	0	0	0	0
86	0	0	0	0	0
87	0	0	0	0	0
97*	0	0	0	0	0
98*	0	0	0	0	0
100*	0	0	0	0	0
106	0	0	0	0	0
107	0	0	0	0	0

* 2006-2008 CIP projects carried forward

Prioritizing Other Improvements

All other improvements were prioritized based on project need, maintenance requirements, existing deficiencies, capacity requirements, and reliability considerations. The results of the priority ranking of the water main and all other improvements were used to schedule the improvements, as presented in the section that follows.

SCHEDULE OF IMPROVEMENTS

All water main projects are shown in **Table 9-6**, which includes a breakdown of each project along with the proposed pipe size, location, and estimated project cost. The estimated project costs are based on 2009 dollars and include all costs (engineering, construction and other costs).

The selection and implementation of the water main projects will be accomplished annually by the City, utilizing both the priority ranking information presented earlier in this plan and other information to ensure projects representing the greatest need are completed first. For example, water main projects in an area with low fire flow are a high priority and will be scheduled before projects in a low priority area. Examples of additional information that would be used to establish the annual project list include but are not limited to; upcoming City and private sector utility projects and City or State transportation projects to be constructed in the same rights-of-way as water main projects. The process would also consider the effect that water main improvements installed as part of private property development projects would have on fire flows, which may change the priorities of projects on the annual list of water main replacements. This approach provides the City with the flexibility to coordinate water main projects with other projects planned for the same area to capture efficiencies and reduce project costs.

The water main projects will be implemented under the Annual Water Main Replacement Program, which is identified as project WM1 in **Table 9-7**. An annual budget allowance has been established for this ongoing program, as shown in the table.

The implementation schedule shown in **Table 9-7** includes the previously described water main improvements and all other improvements described earlier in this chapter that are planned in the next 20 years. The implementation schedule will be used by the City to assist in the planning and budgeting of capital improvement projects for the Water Utility.

The project cost estimates shown in the table are based on 2009 dollars for all years shown. These cost estimates will be adjusted by the City at the time of project implementation to include an escalation factor that represents inflation and the construction market conditions anticipated at the actual time of construction. The financial program in **Chapter 10** describes in more detail the escalation factor to be used for future project cost adjustments.

Table 9-6
Water Main Improvement Projects

CIP No.	Size		Description			Estimated Project Cost
	Length	Dia	In	From	To	
1	340	8	Pine St	B Ave	8th Ave	$106,000
	350	8	Fir St	C Ave	9th Ave	$109,000
	300	8	Pine St	C Ave	8th Ave	$93,000
	330	8	Fir St	B Ave	8th Ave	$102,000
	300	8	Fir St	7th Ave	B Ave	$93,000
	670	8	B Ave	Fir St	Pine St	$208,000
	315	8	Pine St	8th Ave	C Ave	$98,000
2	535	8	Sea Vista Pl	C Ave	9th Ave	$166,000
	260	8	C Ave	Fir St	Sea Vista Pl	$81,000
	650	8	C Ave	Pine St	Fir St	$202,000
	510	8	C Ave	8th Ave	C Ave	$158,000
3	330	8	172nd St	67th Ave	68th Ave	$102,000
	420	8	172nd St	Olympic View Drive	67th Ave	$130,000
	570	8	68th Ave	172nd St	Dead-end	$177,000
	510	8	67th Ave	172nd St	Dead-end	$158,000
4	305	8	Aloha Way	Daley St	Glen St	$95,000
	810	8	Aloha Way	Glen St	Dead-end	$252,000
5	510	8	81st Ave	206th St	Dead-end	$158,000
6	570	8	Sea Lawn Dr	171st St	Dead-end	$177,000
7	1980	8	Lake Ballinger Way	76th Ave	Dead-end	$615,000
8	1010	8	Walnut St	9th Ave	8th Ave	$314,000
	300	8	Walnut St	8th Ave	7th Ave	$93,000
9*	390	8	217th St	96th Ave	95th Ave	$121,000
	940	8	217th St	95th Ave	92nd Ave	$292,000
	400	8	95th Ave	217th St	218th Pl	$124,000
	410	8	218th Pl	95th Ave	93rd Pl	$127,000
	620	8	95th Ave	218th Pl	220th St	$193,000
10	60	8	Spruce St	9th Ave	-	$19,000
	1240	8	Spruce St	9th Ave	96th Ave	$385,000
11	760	8	Hillcrest Pl	Main St	Dead-end	$236,000
12	420	8	192nd St	93rd Pl	94th Ave	$130,000
13	490	8	Sierra Dr	80th Ave	81st St Pl	$152,000
	590	8	81st St Pl	Sierra Dr	Dead-end	$183,000
14	560	12	82nd Ave	208th Pl	Dead-end	$212,000
	680	12	81st Pl	212th St	Dead-end	$257,000
	720	8	208th Pl	82nd Ave	80th Ave	$224,000
	735	8	208th Pl	82nd Ave	80th Ave	$228,000
15	1440	12	83rd Ave	84th Ave	82nd Ave	$544,000
	380	12	84th Ave	212th St	83rd Ave	$144,000
16	465	12	SR 104	Hwy 99	-	$176,000
	195	12	-	SR 104	242nd St	$74,000
	825	12	242nd St	-	McAleer Way	$312,000
	680	12	McAleer Way	242nd St	Lake Ballinger Way	$257,000
	1210	8	Lake Ballinger Way	Hwy 99	McAleer Way	$376,000
17	460	12	242nd St	Mathat Ballinger Park	78th Pl	$174,000
	330	12	242nd St	78th Pl	77th Pl	$125,000
	455	12	77th Pl	242nd St	Dead-end	$172,000
18	970	8	Braemar Dr	76th Ave	Dead-end	$301,000
	870	8	175th St	76th Ave	Dead-end	$270,000
	375	8	176th St	76th Ave	Sound View Way	$116,000
	270	8	Sound View Way	176th St	Sound View Dr	$84,000
19	470	8	76th Ave	175th St	Braemar Dr	$146,000
	240	8	76th Ave	175th St	176th St	$75,000
	105	8	76th Ave	176th St	175th St	$33,000
20	850	12	215th St	76th Ave	73rd Pl	$321,000
	495	12	73rd Pl	216th St	215th St	$187,000
	270	12	216th St	Stevens Hospital	73rd Pl	$102,000
	680	12	Stevens Hospital	-	-	$257,000
	690	12	Stevens Hospital	-	-	$261,000
21	50	12	220th St	-	-	$19,000
	830	12	76th Ave	215th St	212th St	$314,000
	300	12	76th Ave	-	216th St	$113,000
	275	12	76th Ave	216th St	-	$104,000
	200	12	76th Ave	215th St	-	$76,000
	400	12	76th Ave	218th St	-	$151,000
	325	12	76th Ave	218th St	219th St	$123,000
	325	12	76th Ave	219th St	220th St	$123,000

Table 9-6
Water Main Improvement Projects (continued)

CIP No.	Size		Description			Estimated Project Cost
	Length	Dia	In	From	To	
22	570	12	Seaview Elementary	188th St	Dead-end	$215,000
23	140	12	Maplewood School	200th St	-	$53,000
	310	12	Maplewood School	-	-	$117,000
	550	12	Maplewood School	-	-	$208,000
	320	12	Maplewood School	-	-	$121,000
	120	12	Maplewood School	-	200th St	$45,000
24	340	8	72nd Ave	174th St	173rd St	$106,000
	330	8	72nd Ave	173rd St	172nd St	$102,000
	710	8	172nd St	72nd Ave	74th Ave	$220,000
	290	8	173rd St	72nd Ave	73rd Pl	$90,000
25	490	8	176th St	72nd Ave	Dead-end	$152,000
	230	8	176th St	-	Dead-end	$71,000
26	510	8	179th St	72nd Ave	Dead-end	$158,000
27	750	12	80th Pl	212th St	Dead-end	$284,000
28	1010	8	80th Pl	200th St	Dead-end	$314,000
29	480	8	86th Pl	Maplewood Ln	Dead-end	$149,000
30	505	8	198th Pl	Maplewood Ln	Dead-end	$157,000
31	390	8	217th St	-	Dead-end	$121,000
	390	8	217th St	88th Ave	-	$121,000
32	450	8	12th Pl N	12th Ave	-	$140,000
33	335	8	185th Pl	92nd Ave	Dead-end	$104,000
34	535	8	186th Pl	92nd Ave	Dead-end	$166,000
35	425	8	-	184th St	Dead-end	$132,000
36	560	8	182nd Pl	88th Ave	Dead-end	$174,000
37	700	8	74th Pl	Meadowdale Beach Road	Dead-end	$217,000
	570	8	74th Pl	Meadowdale Beach Road	-	$177,000
38	465	8	164th Pl	72nd Ave	Dead-end	$144,000
39	850	8	192nd Pl	80th Ave	Dead-end	$264,000
40	620	8	Main St	Olympic Ave	-	$193,000
41	330	8	9th Ave N	Glen St	Daley St	$102,000
	1250	8	Daley St	Olympic Ave	9th Ave	$388,000
	640	8	Glen St	Olympic Ave	10th Ave	$199,000
42	1235	8	Sprague St	Olympic Ave	9th Ave	$383,000
	1280	8	Edmonds St	Olympic Ave	9th Ave	$397,000
43	370	8	179th Pl	Talbot Rd	Dead-end	$115,000
44	350	8	Wharf St	Sound View Pl	Olympic View Dr	$109,000
	515	8	Sound View Pl	Wharf St	Dead-end	$160,000
45*	510	8	72nd Ave	164th St	162nd St	$158,000
46	480	8	Water St	Sound View Dr	Ocean Ave	$149,000
	580	8	Ocean Ave	Water St	Dead-end	$180,000
47	770	8	Northstream Ln	9th Ave	Dead-end	$239,000
48	680	8	Puget Ln	8th Ave	Dead-end	$211,000
49	320	8	Brookmere Dr	8th Ave	Dead-end	$99,000
50	580	8	-	3rd Ave	Daley St	$180,000
	1045	8	3rd Ave	Caspers St	-	$324,000
51	670	8	Daley St	Brookmere Dr	8th Ave	$208,000
	635	8	Daley St	9th Ave	8th Ave	$197,000
	570	8	8th Ave	Edmonds St	Daley St	$177,000
52	665	8	Aloha St	Brookmere Dr	-	$206,000
	1200	8	Aloha Pl	Daley St	Aloha St	$373,000
53	490	8	High St	183rd Pl	Dead-end	$152,000
54	950	8	79th Ave	186th St	185th Pl	$295,000
55	700	8	79th Ave	186th St	185th St	$217,000
56	500	8	86th Pl	188th St	Dead-end	$155,000
57	520	8	170th Pl	Olympic View Dr	Dead-end	$161,000
58	200	8	177th St	72nd Ave	Sound View Ln	$62,000
	650	8	Sound View Dr	Sound View Ln	Dead-end	$202,000
59	340	8	182nd Pl	72nd Ave	Dead-end	$106,000
60	910	12	192nd St	80th Ave	83rd Ave	$344,000
	450	12	196th St	80th Ave	81st Pl	$170,000
	270	12	196th St	81st Pl	82nd Pl	$102,000
	570	12	196th St	82nd Pl	84th Ave	$215,000
61	670	12	196th St	84th Ave	86th Ave	$253,000
	665	12	196th St	86th Ave	88th Ave	$251,000
	670	12	88th Ave	196th St	194th St	$253,000
	600	12	194th St	88th Ave	89th Pl	$227,000
62	465	8	Homeland Dr	5th Ave S	Dead-end	$144,000
	665	8	Holly Dr	5th Ave S	Dead-end	$206,000

Table 9-6
Water Main Improvement Projects (continued)

CIP No.	Size		Description			Estimated Project Cost
	Length	Dia	In	From	To	
63	345	12	5th Ave S	Pine St	Forsyth Ln	$130,000
	610	12	5th Ave S	Forsyth Ln	Elm Way	$231,000
64	230	12	5th Ave S	Holly Dr	Howell Way	$87,000
	250	12	5th Ave S	Holly Dr	Walnut St	$95,000
	180	12	6th Ave S	Homeland Dr	Howell Way	$68,000
	280	12	5th Ave S	Homeland Dr	Hemlock Way	$106,000
	540	12	5th Ave S	Hemlock Way	Pine St	$204,000
65	660	8	4th Ave S	Howell Way	Erben Dr	$205,000
	350	8	4th Ave S	Erben Dr	Pine St	$109,000
	270	12	Howell Way	-	4th Ave S	$102,000
	290	12	Pine St	4th Ave S	5th Ave S	$110,000
	890	12	4th Ave S	Dead-end	Pine St	$336,000
	70	12	Howell Way	5th Ave S	-	$26,000
	70	12	Pine St	5th Ave S	-	$26,000
66	695	8	69th Pl	174th St	176th St	$216,000
67	1510	8	Sunset Ave	Edmonds St	Caspers St	$469,000
	580	8	Sunset Ave	Edmonds St	-	$180,000
68	650	8	Cedar St	9th Ave	8th Ave	$202,000
69	400	8	Sierra Pl	12th Ave	Dead-end	$124,000
70	340	8	200th St	89th Pl	88th Ave	$106,000
	420	8	200th St	Maplewood Dr	89th Pl	$130,000
	560	8	Maplewood Dr	Casecade Dr	200th St	$174,000
	390	8	Cascade Dr	Maplewood Dr	12th Pl	$121,000
	610	8	92nd Ave	Sierra St	Cascade Dr	$189,000
71	520	8	87th Ave	202nd St	204th St	$161,000
72	70	12	186th St	80th Ave	81st Ave	$26,000
	330	12	186th St	80th Ave	81st Ave	$125,000
73	510	12	76th Ave	-	228th St	$193,000
	110	12	-	Hwy 99	76th Ave	$42,000
	840	12	76th Ave	Hwy 99	224th St	$318,000
74	325	8	Fir St	6th Ave S	A Ave	$101,000
	325	8	Fir St	A Ave	7th Ave S	$101,000
75	205	8	216th St	73rd Pl	-	$64,000
	310	8	217th St	0	0	$96,000
	380	8	Private Property	212th St	213th Pl	$118,000
	315	8	213th Pl	72nd Ave	Private Property	$98,000
	915	8	72nd Ave	213th Pl	216th St	$284,000
76	650	12	12th Ave N	Main St	Maple St	$246,000
77	310	8	Skyline Dr	Dead-end	Dead-end	$96,000
	210	8	Skyline Dr	Dead-end	Dead-end	$65,000
	600	8	205th Pl	Skyline Dr	Maplewood Dr	$186,000
	400	8	Main St	Skyline Dr	Park Rd	$124,000
78	40	12	Maple St	10th Ave	-	$15,000
	300	12	9th Ave	Dayton St	Main St	$113,000
	300	12	9th Ave	Maple St	Dayton St	$113,000
	580	12	9th Ave	Main St	Edmonds St	$219,000
79	735	12	Maple St	12th Ave N	10th Ave	$278,000
	620	12	Maple St	10th Ave	9th Ave	$234,000
80	640	12	184th St	80th Ave	Sound View Dr	$242,000
81	630	8	Puget Way	8th Ave	9th Ave	$196,000
82	460	8	10th Ave	Carol Way	Mountain Ln	$143,000
	660	8	10th Ave	Brookmere St	Mountain Ln	$205,000
	620	8	Puget Way	9th Ave	10th Ave	$193,000
	320	8	10th Ave	Viewland Way	Brookmere St	$99,000
	360	8	10th Ave	Puget Way	Viewland Way	$112,000
83	300	8	12th Ave N	Emerald Hills Dr	Main St	$93,000
84	240	8	77th Pl	195th St	196th St	$75,000
85	680	8	72nd Ave	162nd St	North Meadowdale Rd	$211,000
86	1150	8	72nd Ave	North Meadowdale Rd	157th St	$357,000
87	950	8	172nd St	72nd Ave	69th Pl	$295,000
88*	1200	8	Highland Dr	12th Ave N	Main St	$373,000
89*	500	8	Cascade Ln	Olympic Ave	10th Ave	$155,000
90*	400	8	Cary Road	Caspers St	Dead-end	$124,000
91*	340	8	Carol Way	6th Ave N	Dead-end	$106,000
92*	1400	8	81st Pl	200th St	196th St	$435,000
93*	640	8	ForsythLn	5th Ave S	6th Ave S	$199,000
94*	200	8	Fir Pl	4th Ave S	Dead-end	$62,000

Table 9-6
Water Main Improvement Projects (continued)

CIP No.	Size		Description			Estimated Project Cost
	Length	Dia	In	From	To	
95*	1700	8	Dellwood Dr	76th Ave	80th Ave	$528,000
	400	8	78th Ave	Dellwood Dr	Dead-end	$124,000
96*	325	8	92nd Pl	Bowdoin Way	Dead-end	$101,000
97*	150	8	Spruce Pl	96th Ave	Dead-end	$47,000
98*	250	8	Spruce Pl	8th Ave	Dead-end	$78,000
99*	220	8	215th St	96th Ave	Dead-end	$68,000
100*	220	8	215th St	98th Ave	Dead-end	$68,000
101*	1300	8	Maple St	5th Ave N	7th Ave N	$404,000
102*	330	8	Erben Dr	4th Ave S	3rd Ave S	$102,000
	450	8	Erben Dr	3rd Ave S	City Park	$140,000
	45	8	Erben Dr	3rd Ave	-	$14,000
103*	1150	8	2nd Ave S	Elm St	Pine St	$357,000
	350	8	Elm St	2nd Ave S	3rd Ave S	$109,000
104*	260	8	10th Pl S	Spruce St	Dead-end	$81,000
105*	250	8	Private Property	81st Pl	80th Pl	$78,000
106	1130	8	76th Ave	Olympic View Dr	188th St	$351,000
107	460	8	Puget Way	3rd Ave N	Brookmere Dr	$143,000
108	300	8	8th Ave N	Edmonds St	Bell St	$93,000
	300	8	8th Ave N	Bell St	Main St	$93,000
	660	8	Bell St	8th Ave N	9th Ave N	$205,000
109	610	12	Main St	9th Ave N	8th Ave N	$231,000
	660	12	Main St	8th Ave N	7th Ave N	$249,000
110	1300	12	Main St	7th Ave N	5th Ave S	$491,000
111	1330	12	Dayton St	7th Ave N	5th Ave S	$503,000
112	310	12	7th Ave S	Bell St	Main St	$117,000
	300	12	7th Ave S	Main St	Dayton St	$113,000
	280	12	7th Ave S	Dayton St	Maple St	$106,000
	290	12	7th Ave S	Maple St	Alder St	$110,000
	290	12	7th Ave S	Alder St	Walnut St	$110,000
	300	12	7th Ave S	Walnut St	Cedar St	$113,000
	80	12	7th Ave S	Cedar St	Howell Way	$30,000
113	230	12	7th Ave S	Howell Way	Spruce St	$87,000
	580	12	7th Ave S	Spruce St	Laurel St	$219,000
114	300	12	5th Ave S	Holly Dr	Alder St	$113,000
	290	12	5th Ave S	Alder St	Maple St	$110,000
	290	12	5th Ave S	Maple St	Dayton St	$110,000
	330	12	5th Ave S	Dayton St	Main St	$125,000
115	290	8	6th Ave N	Daley St	Sprague St	$90,000
	230	8	6th Ave N	Sprague St	Edmonds St	$71,000
	350	8	6th Ave N	Edmonds St	Bell St	$109,000
	500	8	Sprague St	6th Ave N	4th Ave N	$155,000
116	670	8	Bell St	7th Ave N	6th Ave N	$208,000
	450	8	Bell St	6th Ave N	5th Ave N	$140,000
117	420	8	5th Ave S	Edmonds St	Bell St	$130,000
	420	8	5th Ave S	Bell St	Main St	$130,000
118	320	8	4th Ave N	Edmonds St	Bell St	$99,000
	820	8	4th Ave N	Bell St	Main St	$255,000
119	830	8	3rd Ave N	Edmonds St	Main St	$258,000
	140	8	3rd Ave N	Edmonds St	Daley St	$43,000
	640	8	3rd Ave N	Daley St	Glen St	$199,000
120	820	8	2nd Ave N	Edmonds St	Main St	$255,000
121	840	8	Sunset Ave	Edmonds St	Main St	$261,000
122	310	8	Edmonds St	Sunset Ave	2nd Ave N	$96,000
	320	8	Edmonds St	2nd Ave N	3rd Ave N	$99,000
	320	8	Edmonds St	3rd Ave N	4th Ave N	$99,000
	320	8	Edmonds St	4th Ave N	5th Ave N	$99,000
123	1640	8	2nd Ave N	Edmonds St	Caspers St	$509,000
124	250	12	Main St	Railroad Ave	Sunset Ave	$95,000
	330	12	Main St	Sunset Ave	2nd Ave N	$125,000
	310	12	Main St	2nd Ave N	3rd Ave N	$117,000
	330	12	Main St	3rd Ave N	4th Ave N	$125,000
	310	12	Main St	4th Ave N	5th Ave N	$117,000
125	1020	8	Sunset Ave	Dayton St	Main St	$317,000
126	1360	8	Railroad Ave	Dayton St	Main St	$422,000
Total - Water Main Improvements						**$46,265,000**

* 2006-2008 CIP projects carried forward

Table 9-7
Planned Improvements Implementation Schedule

CIP No.	Description	Estimated Cost (2009 $$)	20-Year Schedule of Improvements Planned Year of Project and Estimated Cost in 2009 $$ (x 1000) 2010	2011	2012	2013	2014	2015	2016	2017-22	2023-29
Water Main Improvements											
WM1	Annual Water Main Replacement Program	$44,501,000	$1,800	$2,260	$2,260	$2,260	$2,260	$2,260	$2,260	$13,560	$15,581
WM2	24-inch Transmission Main Isolation Valves	$100,000			$100						
WM3	BNSF Crossings Water Main	$620,000	$620								
WM4	Shell Valley Access Road Water Main	$25,000		$25							
Total - Water Main Improvements		**$45,246,000**	**$2,420**	**$2,285**	**$2,360**	**$2,260**	**$2,260**	**$2,260**	**$2,260**	**$13,560**	**$15,581**
PRV Station & Pressure Relief Improvements											
PRV1	New 596/420 Zone PRV Station	$125,000		$125							
PRV2	PRV Station 11 Abandonment	$8,000		$8							
PRV3	PRV Station 12 Abandonment	$8,000		$8							
PRV4	System-wide Pressure Relief Improvements	$500,000			$25	$225	$250				
PRV5	Annual PRV Station Improvements Program	$1,500,000		$125	$125	$125	$125	$125	$125	$750	
Total - PRV Station & Relief Improvements		**$2,141,000**	**$0**	**$266**	**$150**	**$350**	**$375**	**$125**	**$125**	**$750**	**$0**
Facility Improvements											
F1	Alderwood Supply Station Improvements	$215,000	$215								
F2	Seaview Reservoir Improvements	$56,000	$56								
F3	Yost Reservoir Improvements	$131,000	$131								
F4	Five Corners Pump Station Improvements	$223,000	$223								
F5	Five Corners 3.0 MG Reservoir Recoating	$630,000						$630			
F6	Five Corners 1.5 MG Reservoir Recoating	$400,000							$400		
Total - Facility Improvements		**$1,655,000**	**$625**	**$0**	**$0**	**$0**	**$0**	**$630**	**$400**	**$0**	**$0**
Other Improvements											
M1	Fire Hydrant Improvements*	$1,764,000	$51	$96	$96	$96	$96	$96	$96	$549	$588
M2	AMR Meter Evaluation Study	$50,000		$50							
M3	Telemetry System Improvements	$430,000		$10	$10	$10	$10	$10	$10	$300	$70
M4	Comprehensive Water System Plan Update	$515,000	$65					$75	$75	$150	$150
Total - Other Improvements		**$2,759,000**	**$116**	**$156**	**$106**	**$106**	**$106**	**$181**	**$181**	**$999**	**$808**
TOTAL - ALL IMPROVEMENTS		**$51,801,000**	**$3,161**	**$2,707**	**$2,616**	**$2,716**	**$2,741**	**$3,196**	**$2,966**	**$15,309**	**$16,389**

* M1 Includes 12 fire hydrant replacements first six years of CIP and fire hydrant portion of Annual Water Main Replacement Program.

10

Financial Plan

INTRODUCTION

The objective of the water system 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 its short-term (6-year) and long-term (20-year) Capital Improvement Programs (CIPs). 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.

PAST FINANCIAL PERFORMANCE

The City of Edmonds legally owns and operates a combined utility fund that includes water, sewer, and stormwater utilities. Therefore, standard financial statements are not readily available for the water utility alone. Financial information regarding an individual utility is available in the form of utility accounting reports at a sub-account level of detail. Using these reports and detailed utility financial data provided by City staff, we tried to construct a simple financial report mimicking income and cash flow statements.

Table 10-1 summarizes the water utility's historical revenues, operating expenses, and transfer and debt service payments.

Table 10-1
Historical Financial Performance; 2004 - 2009

	2004	2005	2006	2007	2008	2009
Meter Water Sales	$ 3,723,583	$ 3,556,909	$ 3,699,146	$ 3,626,368	$ 3,778,231	$ 3,917,613
Hyrdant Revenue	-	-	-	-	-	256,650
Subtotal: Rate Revenues	**$ 3,723,583**	**$ 3,556,909**	**$ 3,699,146**	**$ 3,626,368**	**$ 3,778,231**	**$ 4,174,263**
Water Utility Tax Collections	214,103	204,546	212,712	217,656	226,690	518,778
Miscellaneous Revenues	193,350	205,819	237,376	164,904	205,597	162,893
TOTAL REVENUES	**$ 4,131,035**	**$ 3,967,274**	**$ 4,149,235**	**$ 4,008,927**	**$ 4,210,518**	**$ 4,855,934**
OPERATING EXPENDITURES						
Salaries and Wages	$ 564,631	$ 589,581	$ 626,742	$ 681,746	$ 645,806	$ 596,155
Benefits	150,105	164,170	182,881	212,077	231,916	229,884
Water Purchased for Resale	1,329,114	1,221,154	1,340,265	1,256,697	1,218,234	1,470,888
Supplies	146,468	81,135	109,514	178,041	248,868	182,298
Services	408,492	406,082	453,977	412,210	425,955	424,424
Intergovernmental Services	233,234	211,817	239,963	250,893	251,221	544,717
Building, Machinery, & Equipment	12,633	26,725	-	1,470	-	-
Interfund Services & Rentals	444,788	372,358	415,569	433,300	403,409	375,010
TOTAL OPERATING EXPENDITURES	**$ 3,289,465**	**$ 3,073,021**	**$ 3,368,911**	**$ 3,426,434**	**$ 3,425,409**	**$ 3,823,376**
OPERATING SURPLUS / (DEFICIT)	**$ 841,571**	**$ 894,253**	**$ 780,323**	**$ 582,494**	**$ 785,109**	**$ 1,032,558**
Debt Service Interest	$ 276,417	$ 95,821	$ 91,098	$ 88,178	$ 83,285	$ 78,583
Total Operating Expenses and Debt Interest	**$ 3,565,882**	**$ 3,168,842**	**$ 3,460,010**	**$ 3,514,612**	**$ 3,508,694**	**$ 3,901,959**
Surplus / (Deficit)	**$ 565,153**	**$ 798,433**	**$ 689,225**	**$ 494,316**	**$ 701,824**	**$ 953,975**
Interfund Transfer Out for Capital	$ 744,416	$ 700,000	$ 700,000	$ 400,000	$ 700,000	$ 500,000
Operating Expenses, Debt Interest, & Interfund Transfers	**$ 4,310,298**	**$ 3,868,842**	**$ 4,160,010**	**$ 3,914,612**	**$ 4,208,694**	**$ 4,401,959**
Surplus / (Deficit)	**$ (179,263)**	**$ 98,433**	**$ (10,775)**	**$ 94,316**	**$ 1,824**	**$ 453,975**
Debt Service Principal	$ 1,125,000	$ 157,862	$ 165,047	$ 167,778	$ 151,795	$ 128,294
TOTAL CASH OUTLAY	**$ 5,435,298**	**$ 4,026,704**	**$ 4,325,057**	**$ 4,082,390**	**$ 4,360,489**	**$ 4,530,252**
Surplus / (Deficit)	**$ (1,304,263)**	**$ (59,430)**	**$ (175,822)**	**$ (73,462)**	**$ (149,971)**	**$ 325,682**

The water utility's rate revenues from metered water sales fluctuated between $3.5 million and $3.9 million in last six years. The main determining factor in the amount of water sold, and hence revenues collected, has been weather patterns. Historically, the City's growth rate has been low, and the only rate adjustments in the last six years have been inflationary; one in January 2007 (3%), and another one in January 2008 (3%).

In 2009, to comply with the State Supreme Court's ruling on Lane v. Seattle, the City started charging its General Fund for fire protection costs, and increased the City utility tax rate for the water utility from 10% to 18.7% to generate the necessary revenues for the General Fund. The revenue generated from the incremental tax increase (8.7%) has been paid by the City's General Fund to the water utility for fire protection services. The hydrant revenue shown in 2009 ($256,650) represents this transfer from the General Fund. Parallel to this change, water utility tax collections and corresponding payments to the General Fund (Intergovernmental Services line under operating expenditures) increased significantly in 2009.

Miscellaneous revenues have also been steady ranging from $165,000 to $206,000. On average, the utility earned approximately $195,000 miscellaneous revenues in the last six years.

Total operating expenditures increased from $3.1 million in 2005 to $3.8 million in 2009. The large increase in 2009 (almost $400,000 compared to 2008) mostly stemmed from the increase in City utility taxes (as explained earlier) and water purchase costs.

Water purchase costs constitute the largest portion of the utility's operating costs. Similar to revenues from metered water sales, water purchases for resale (from the Alderwood Water and Wastewater District) have been steady, fluctuating between $1.2 million and $1.5 million. This expenditure line item represents approximately 42% of the total operating costs (excluding City utility taxes), and around 35% of the rate revenues have been spent to purchase the water.

Salary and benefits costs represent approximately 24% of the total operating expenditures. Salaries and wages increased steadily from 2004 to 2007. The average annual increase was 6%. In the last two years, this expenditure line item dropped considerably (5% in 2008, and 8% in 2009). Due to the recent economic downturn and associated budgetary problems in local governments, the City implemented a series of furlough days. The decreases in salary and benefits expenses seen in 2009 are a result of this policy.

As a result of the steep increases in health care costs observed in recent years, the utility's labor benefits costs increased considerably; from $150,000 in 2004 to $230,000 in 2009 (despite furloughs). The average rate of increase in the last five years is 9%, and the total percentage increase between 2004 and 2009 is 53%.

Other operating and maintenance expenditure line items have been steady over the last 6 years, and they did not change significantly.

Over the last six years, the utility posted operating surpluses ($820,000 on average). These surpluses have been used to make debt service payments (principal and interest), and transferred to the capital construction fund for funding the utility's capital projects.

In 2004, the City refinanced its outstanding revenue bonds. Ignoring 2004, the utility's interest payments on its existing debt and debt principle payments have been around $87,000 and $154,000, respectively. Hence the utility's annual debt service payments have been around $241,000.

Over the last six years, the City transferred approximately $3.7 million from the water utility's operating fund to the capital construction fund to pay for the utility's capital needs. On average, this amount corresponds to approximately $624,000 a year.

In the years 2005 and 2008, the utility operated at a cash deficiency after paying for its operating expenditures, servicing its debt, and transferring monies for capital needs (2004 is not considered because of the cash flow impact of bond refinancing). During these four years, the utility used its available cash balances. In 2009, this trend reversed due to high water sales and corresponding increase in revenues, and savings due to furloughs and other cost

cutting measures. However, 2009 might be an anomaly and might not represent a breaking point in the utility's financial performance trends. It remains to be seen. On the other hand, the utility needs substantial capital investments to rehabilitate its aging infrastructure and meet regulatory requirements, as identified in this comprehensive plan. To be able to finance these capital projects and maintain a financially prudent and solid utility, the City would need a series of rate increases. The analysis of the utility's capital funding needs and other financial requirements, and hence projected rate adjustments are provided later in this chapter.

CAPITAL FUNDING RESOURCES

The City may fund the water CIP from variety of sources. In general, these sources can be summarized as: 1) governmental grant and loan programs; 2) publicly issued debt (tax exempt or taxable); and 3) cash resources and revenues. These sources are described below.

Government Programs

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However due to budgetary constraints, 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 Commerce and the Department of Health. They are primarily targeted at low-income and/or rural communities.

The Department of Commerce administers three grant and loan programs (one administered jointly by the Public Works Board and the Department of Health) that the City might be eligible for:

- Community Economic Revitalization Board (CERB) Grant and Loan Program
- Public Works Trust Fund Loan Program (PWTF)
- Drinking Water State Revolving Loan (DWSRF) Program

While the CERB and DWSRF programs are currently funded and accepting applications, the PWTF is providing no funding in the 2009-2011 biennium and may or may not be restored in the near future. Regardless, each of these programs is described in greater detail below.

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.choosewashington.com/SiteCollectionDocuments/CERB/CERB%20Fact%20Sheet.pdf

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.commerce.wa.gov/site/361/default.aspx.

Drinking Water State Revolving Loan Program – Funding historically targets protection of public health, compliance with drinking water regulations and assistance for small and disadvantaged communities. Recent legislation requires $7 million be provided for "green" or environmentally beneficial infrastructure. $58 million was available in the 2010 loan cycle. Loans range from $50,000 to $8 million.

Further detail is available at http://www.doh.wa.gov/ehp/dw/Publications/331-233.pdf

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 councilmanic 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 without a public vote 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 councilmanic 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 rate 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.

Build America Bonds – (from munibondadvisor.com) The Economic Recovery and Reinvestment Act (the "Act") created a new form of bonds known as Build America Bonds ("BABs"). Build America Bonds are taxable and, through Federal subsidies or tax credits, are intended to reduce municipal borrowing costs.

The Act created two types of BABs. The first type of BAB provides a Federal subsidy to investors equal to 35% of the interest payable by the issuer ("Tax Credit BAB"). The second type of BAB provides a direct Federal subsidy that will be paid to state and local governments in an amount equal to 35% of the interest ("Direct Payment BAB"). Both types of BABs must be issued before January 1, 2011.

Tax Credit BABs provide a 35% interest subsidy (net of the tax credit) to investors that results in a Federal subsidy to the issuer equal to approximately 25% of the total return to the investor (interest and the tax credit). Tax Credit BABs may be issued to finance any governmental purpose for which tax-exempt government bonds (excluding private activity bonds) could be issued including current refundings and one advance refunding. The bonds must comply with all requirements applicable to the issuance of tax-exempt governmental bonds.

Direct Payment BABs offer a larger Federal subsidy than Tax Credit BABs; however, they are subject to more restrictions. In general, Direct Payment BABs may be issued to finance capital expenditures for any governmental purpose for which tax-exempt government bonds may be issued, excluding private activity bonds and excluding refunding bonds. Costs of issuance paid from Direct Payment BAB proceeds are limited to 2%. In order to receive a Federal subsidy, issuers will be required to submit a payment request form no earlier than 90 days, and no later than 45 days, before each interest payment date. Issuers will receive the requested payment within 45 days of the date the form is filed with the Internal Revenue Service. In the future, the payment procedures may be changed to an electronic platform.

Financing for a project may be subdivided into two issues; one comprised of traditional tax-exempt municipal bonds and one comprised of BABs.

Further detail is available at http://www.munibondadvisor.com/BuildAmericaBonds.htm.

Cash Resources

Capital Facilities Charges – A capital facilities charge (CFC) 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 CFC 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. CFC 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 CFC, growth-related capital costs must 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 CFC 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 CFC.

The City currently imposes a charge of $908 per meter capacity equivalent water connection charge.

Utility Funds and Cash Reserves – User charges (rates) paid by the utility's customers are the main funding source for all water utility activities. The rates cover total annual costs associated with operation and maintenance of the water system, and other ongoing costs of providing water services. Rates can pay for capital improvement projects in two ways: either paying for debt service or directly paying for capital projects. Although funding the capital costs directly through rates does not result in the additional interest expense associated with issuing debt, this approach can cause large and/or volatile rate increases.

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 for planning purposes that bond financing will be utilized 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, this vehicle is most often reserved for other City (non-utility) purposes. Revenue bonds are a more secure financing mechanism for utility needs. This analysis conservatively assumes no tax credits or subsidies from BABs, though the City should consider BABs when it is ready to begin the process of debt issuance. The Capital Financing Strategy developed to fund the updated CIP assumes the following funding priority:

a) Available grant funds,
b) Accumulated capital cash reserves,
c) Annual revenue collections from capital facilities charges (CFCs),
d) Annual use of excess cash (above minimum balance targets) from operating reserves,
e) Interest earnings on capital reserves and other miscellaneous capital resources, including government program loans to the extent that they are accessible,
f) Revenue bond financing, and
g) Direct rate funding.

FINANCIAL PLAN

The City of Edmonds' water utility operates as an enterprise fund and as such it is responsible to fully 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 2010 – 2016. The plan defines a strategy for funding the CIP, including an analysis of available resources from rate revenues, existing reserves, capital facilities 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 Plan – 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.

Financial Policies

A brief summary of the key financial policies employed by the City, as well as those recommended 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 and meet long-term capital obligations. Common reserves among municipal utilities are operating reserves, capital contingency reserves, and bond 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 actual 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 45 to 60 days of operating and maintenance (O&M) expenses is targeted. Based upon the City's 2010 budget, this target range is equivalent to approximately between $470,000 and $625,000.

- *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 system fixed asset costs and, 2) determining the cost of replacing highly critical assets or facilities. For purposes of this analysis, no minimum target fund balance is set, per City staff's direction, to reduce the utility's rate adjustment needs.

- *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.

On the spectrum of policy options related to system reinvestment funding, basing a system reinvestment policy on the projected replacement cost of assets would result in the largest immediate rate impact and the lowest future debt obligation. A policy based on annual depreciation expense has the next greatest immediate rate impact. This policy does not target a replacement reserve level sufficient to cash fund 100% of future replacement costs and therefore assumes some replacement costs will be debt-financed.

One approach aimed at mitigating the accumulating asset replacement liability, as well as current rate impacts, is to fund an amount from rates equal to annual depreciation expense, net of annual debt principal repayment. Annual debt principal payments are one source of annual equity contribution to the system. Using annual depreciation expense as the measure of annual equity loss, and basis for a system reinvestment policy, it is appropriate then, to

reduce the annual depreciation expense by the annual equity contribution, as measured by debt principal repayment. This approach tends to balance reducing near-term rate impacts with mitigating accumulating asset replacement liability.

The analysis provided herein does not incorporate any system reinvestment funding, per City staff's direction, to reduce immediate rate impacts.

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 on a combined basis for the City's all three utilities (i.e. water, wastewater, and stormwater). This means that annual rate revenue must be set sufficient to support annual operating expenses, annual revenue bond debt repayment, and a cushion of 25% of the annual revenue bond debt repayment. For the purposes of this analysis, it is assumed that the water utility would meet 1.25 revenue bond coverage ratio independently, without relying on the other two utilities' financial performance.

As stated previously, The City maintains a restricted bond reserve in compliance with its bond covenants.

Capital Funding Plan

The CIP developed for this Plan totals $20.1 million ($21.6 million inflated) over the 2010 - 2016 planning horizon, and $51.8 million for the 20-year total ($71.7 million inflated). Costs are stated in 2009 dollars and escalated to the year of planned spending for financing projections at an annual inflation rate of 2% for 2012 and 4% thereafter. It is assumed that construction costs will stay the same in 2010 and 2011 due to current economic conditions.

Table 10-2 summarizes the annual CIP expenditures in 2009 and inflated costs.

Table 10-2
Water Utility Capital Improvement Program

Year	2009 Dollars	Inflated Dollars
2010	$ 3,161,000	$ 3,161,000
2011	2,707,000	2,707,000
2012	2,616,000	2,668,320
2013	2,716,000	2,881,133
2014	2,741,000	3,023,959
2015	3,196,000	3,666,967
2016	2,966,000	3,539,196
Total: 2010 - 2016	**$ 20,103,000**	**$ 21,647,575**
Total: 2017 - 2022 **[a]**	15,309,000	21,002,492
Total: 2023 - 2029 **[a]**	16,389,000	29,037,194
GRAND TOTAL	**$ 51,801,000**	**$ 71,687,261**

[a] Inflated project costs are calculated using average annual spending in related periods.

A capital funding plan is developed to determine the total resources available to meet CIP costs and determine if new debt financing will be required. 2010 beginning operating and capital fund balances were $1,877,099 and ($133,802), respectively. After evaluating the utility's working capital needs, $1.4 million of the beginning operating fund balance was deemed excess fund balance and assumed to be available for capital. With the assumed transfer of $1.4 million from the operating fund, the total available capital fund balance at the beginning of the analysis period reached $1,266,197. The capital funding plan is summarized in **Table 10-3** below.

Table 10-3
2010 – 2016 Annual Capital Fund Cash Flow

Capital Fund	2010	2011	2012	2013	2014	2015	2016
Beginning Balance	$ 1,266,197	$ 43,993	$ 2,196,210	$ 79,905	$ 2,468,905	$ 106,133	$ 2,802,547
plus: Capital Facilities Charges	25,000	25,000	25,000	25,000	25,000	25,000	25,000
plus: Net Debt Proceeds Available for Projects	1,550,000	4,750,000	-	4,950,000	-	6,000,000	-
plus: Interest Earnings	18,993	880	54,905	1,998	61,723	2,653	70,064
plus: Transfer of Surplus from Operating Fund	-	83,337	-	293,135	19,411	335,727	-
plus: Direct Rate Funding	344,803	-	472,110	-	555,054	-	736,649
less: Capital Expenditures	(3,161,000)	(2,707,000)	(2,668,320)	(2,881,133)	(3,023,959)	(3,666,967)	(3,539,196)
Ending Balance	**$ 43,993**	**$ 2,196,210**	**$ 79,905**	**$ 2,468,905**	**$ 106,133**	**$ 2,802,547**	**$ 95,064**

The costs shown in the table are inflated to the year of spending. A majority (80%) of the 7-year CIP is projected to be financed with new debt issues. The remaining 20% of the 7-year CIP is financed from utility resources such as existing cash balances, rates, capital facility charge revenues, and capital fund interest earnings.

Industry best practice suggests maintaining a debt to equity ratio of no greater than 60% debt to 40% equity. By comparison, the City is currently leveraged at 15% debt to 85% equity in the system, leaving significant capacity to debt-finance future CIP costs. At the end of the analysis period, debt to equity ratio is projected to be 39% debt to 61% equity.

FINANCIAL FORECAST

The Financial Forecast, or revenue requirement analysis, projects 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 (as described above).

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. The analysis uses this rate revenue requirement to indicate annual rate adjustments.

Fire Protection Costs

Fire protection costs have historically been recovered through water rates, and assigned to customer classes in proportion to fire protection requirements. However, in the Lane v. Seattle decision of the Washington Supreme Court, fire protection costs of Seattle Public Utilities were found to be outside the valid basis for recovery through retail water rates. Instead, fire protection "customers" should be charged for the services provided. This would typically include general governments requiring fire protection through their land use regulation and thus receiving the benefit of public fire protection, along with customers receiving direct private fire protection service, such as through sprinklers or onsite fire distribution systems. Cities are now required to identify and separate these costs from water rate revenue requirements (and therefore rate structures) and recover fire protection costs from general purpose government funds.

The court upheld "a solution" that an increase to the utility tax on the water utility to recover identified fire protection costs is valid and within statutory authority.

In 2009, to comply with the Supreme Court's ruling, the City started charging its General Fund for fire protection costs, and increased the City utility tax rate for the water utility from 10% to 18.7% to generate the necessary revenues for its General Fund. The revenue generated from the incremental tax increase (8.7%) has been paid by the City's General Fund to the water utility for fire protection services.

The analysis results presented here reflect this change, and total rate revenues include the projected transfer amounts (8.7% of the rate revenues from retail rates) from the General Fund for fire protection costs. It is assumed that any projected rate increase would also automatically increase the related transfer amount from the General Fund.

Projected Financial Performance

The revenue requirement analysis is based on the following data, assumptions, and adjustments:

- The 2010 budget is used as the basis of analysis.

- Rate revenues under the existing rates are calculated to increase with customer growth, which is projected to be approximately 0.5% per year.

- Salary and benefits costs are escalated annually at 5% for assumed labor cost inflation.

- Other operating and maintenance expenses are escalated annually at 2% in 2011, and 3% thereafter.

- Per City staff's direction, Alderwood Water and Wastewater District water rates are assumed to increase by 6.8% in 2011, 5.9% in 2012, and 5% annually thereafter.

- Per City staff's direction, one-third of a full-time employee (FTE) for GIS is added in mid-year 2010. The annual cost of this position is assumed to be $30,000 per year.

- Inflated capital expenses reflect 2% construction cost inflation in 2012, and 4% annual inflation thereafter. It is assumed that the construction costs would not increase in 2010 and 2011 given the current economic conditions.

- In addition to maintenance and operating costs, revenue requirements include capital costs for new debt service incurred to fund the CIP.

- CFC revenues are assumed to stay the same throughout the projection period at the 2010 budget level of $25,000.

- The City's annual fund interest earnings rate is assumed to be 1.5% in 2010, 2% in 2011, and 2.5% thereafter.

- The 2010 beginning operating fund (Fund 411) balance was $1,877,099. Of this amount, $1.4 million is assumed to be transferred to the capital fund (Fund 412).

- The forecast assumes a revenue bond interest rate of 5%, and a repayment term of 20 years.

Table 10-4 summarizes the projected financial performance and rate revenue requirements of the water utility for 2010 through 2016 based upon the above assumptions.

Table 10-4
Summary of Projected Financial Performance & Revenue Requirements

Revenue Requirements	2010	2011	2012	2013	2014	2015	2016
Revenues							
Rate Revenues Under Existing Rates	$ 4,258,446	$ 4,279,738	$ 4,301,137	$ 4,322,642	$ 4,344,256	$ 4,365,977	$ 4,387,807
Non-Rate Revenues	109,003	115,254	134,278	134,677	145,089	145,846	159,723
Total Revenues	**$ 4,367,448**	**$ 4,394,992**	**$ 4,435,415**	**$ 4,457,319**	**$ 4,489,345**	**$ 4,511,823**	**$ 4,547,530**
Expenses							
Cash O&M Expenses **[a]**	$ 3,813,110	$ 4,030,547	$ 4,231,448	$ 4,427,934	$ 4,634,231	$ 4,850,860	$ 5,078,377
Existing Debt Service	205,923	219,022	208,412	161,999	161,394	160,685	139,833
New Debt Service	135,227	549,632	549,632	981,486	981,486	1,504,945	1,504,945
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Rate Funded CIP	344,803	-	472,110	-	555,054	-	736,649
Total Expenses	**$ 4,499,063**	**$ 4,799,201**	**$ 5,461,603**	**$ 5,571,419**	**$ 6,332,165**	**$ 6,516,491**	**$ 7,459,805**
Annual Rate Adjustment	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**
Rate Increases Dictated by:	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*
Rate Revenues After Rate Increase	$ 4,391,522	$ 4,945,772	$ 5,343,289	$ 5,772,755	$ 6,236,741	$ 6,738,019	$ 7,279,587
Net Cash Flow After Rate Increase	1,462	261,826	15,964	336,013	49,665	367,373	(20,494)
Coverage After Rate Increases	2.30	1.43	1.84	1.29	1.65	1.26	1.50

[a] Includes additional State Excise and B&O Taxes due to the proposed rate increases.

As shown in the table, planned and forecasted water utility service charges under the existing rates are not sufficient to fund projected rate needs. The projected revenue deficiency is primarily due to new debt repayment obligations and funding of the proposed capital improvement program.

It is projected that the City will need to increase its water rates by approximately 7.5% annually in 2010 through 2016. The analysis assumes that the rate adjustment in 2010 would be implemented in July, and the new rates will be in effect in the last 5-months of the year (i.e. August through December). The subsequent rate increases are assumed to be effective as of January 1st of each year.

Table 10-5 below demonstrates the projected cash balances (operating, capital, and debt reserve funds) for the water utility, assuming that the rate increases proposed in **Table 10-3** above are implemented.

Table 10-5
Projected Cash Balances

Fund Balances	2010	2011	2012	2013	2014	2015	2016
Operating Fund	$ 478,561	$ 657,050	$ 673,013	$ 715,892	$ 746,146	$ 777,792	$ 757,298
Capital Fund	43,993	2,196,210	79,905	2,468,905	106,133	2,802,547	95,064
Debt Reserve Fund	361,710	776,115	776,115	1,149,729	1,149,729	1,673,188	1,673,188
Total	**$ 884,264**	**$ 3,629,374**	**$ 1,529,034**	**$ 4,334,525**	**$ 2,002,008**	**$ 5,253,528**	**$ 2,525,549**
Combined Minimum Target Balance	*$ 775,805*	*$ 1,213,515*	*$ 1,235,952*	*$ 1,631,124*	*$ 1,653,815*	*$ 2,201,008*	*$ 2,225,836*

If the City is able to obtain available low cost loan and/or grant alternatives to fund its capital needs, required rate increases would be significantly less than the projected rate increases presented above.

It is important to note that these projections are based upon current assumptions and the capital program identified herein. Circumstances might change over time, causing actual rate adjustments to be higher or lower once actual costs are known. It is imperative that the City track its costs as they become available and compare them to assumptions used in the study. If significant changes occur, the City should revisit the analysis and make appropriate changes.

CURRENT AND PROJECTED RATES

Existing Rates

The City's existing water rate structure has two components; a bimonthly base charge and a uniform volume charge. Residential customers pay the base charge on a per unit basis, whereas other customers' base charges vary by meter size. All customers pay the same volume rate per hundred cubic feet (ccf) of water consumption. The City's current rate structure is presented in **Table 10-5** below.

In order to enhance conservation signals to water customers, the City might consider transitioning to increasing block rate structure for single family residential customers, and differentiate volume rates among the customer classes. Other potential options for enhancing conservation signals would be designating irrigation customers (if there are any) as a separate customer class, and considering implementing seasonal rates for customer classes with seasonal usage patterns. It should be noted that such changes in the rate structure require a more comprehensive and detailed rate and cost of service analyses, which the City is considering in the future.

Projected Rates

Table 10-6 presents the City's existing and projected water rate schedule incorporating the rate adjustments shown in the financial forecast. The projected rates are calculated on an across-the-board basis; the percentage increase is applied to all classes and to each rate component (fixed rates and volume rates) on an equal basis.

Table 10-6
Existing and Projected Rates

	Current Rates	2010 7.5%	2011 7.5%	2012 7.5%	2013 7.5%	2014 7.5%	2015 7.5%	2016 7.5%
Bimonthly Base Rate								
Single Family Residential (per unit)	$ 16.58	$ 17.82	$ 19.16	$ 20.60	$ 22.14	$ 23.80	$ 25.59	$ 27.51
Multi Family Residential (per unit)	14.60	15.70	16.87	18.14	19.50	20.96	22.53	24.22
All Other Customers:								
3/4" meter	$ 20.05	$ 21.55	$ 23.17	$ 24.91	$ 26.78	$ 28.78	$ 30.94	$ 33.26
1" meter	40.82	43.88	47.17	50.71	54.51	58.60	63.00	67.72
1.5" meter	75.49	81.15	87.24	93.78	100.81	108.38	116.50	125.24
2" meter	115.09	123.72	133.00	142.98	153.70	165.23	177.62	190.94
3" meter	248.27	266.89	286.91	308.43	331.56	356.42	383.16	411.89
4" meter	351.68	378.06	406.41	436.89	469.66	504.88	542.75	583.45
6" meter	697.15	749.44	805.64	866.07	931.02	1,000.85	1,075.91	1,156.61
Volume Rate								
All Customers (per ccf)	$ 1.72	$ 1.85	$ 1.99	$ 2.14	$ 2.30	$ 2.47	$ 2.65	$ 2.85

AFFORDABILITY

Affordability or hardship can be defined as the charge for service that a consumer can pay without jeopardizing their ability to pay for other necessities (food, shelter, etc.). In 2002, the American Water Works Association published a briefing paper that cited the Environmental Protection Agency's (EPA) affordability study. The EPA study concluded that households could afford to pay water bills ranging from 1.5% to 3.0% of the household's income. Although the study referred to water, it also referenced other public services such as wastewater, storm, and solid waste. EPA settled on 2.5% of median household income after comparing water service to the cost of other household services such as telephone and cable service. In the state of Washington, the Department of Ecology has defined financial hardship as 2% or greater of the median household income. The Department of Ecology uses financial hardship and affordability criteria to evaluate applications for the Centennial Clean Water Fund and State Revolving Fund grants and loans for water pollution control facilities construction projects.

The median household income for the City of Edmonds in the 2000 census was $53,522. The 2000 census figure was escalated to 2010 using the U.S. Department of Labor, Bureau of Labor Statistics Consumer Price Index (CPI) calculator. Future years are escalated 3% per year. **Table 10-7** presents the City's rates with the projected rate increases annually for the forecast period (using single family residential rates and 8 ccf/month water consumption assumption), tested against the 2% threshold.

Applying the 2% test, the City's rates are forecasted to remain well within the indicated affordability threshold throughout the projection period.

Table 10-7
Affordability Test

Year	Annual Inflation	Median Household Income	2% Monthly Threshold	SFR Monthly Bill (8 ccf)
2000		$ 53,522	$ 89.20	
2001	2.85%	55,047	91.75	
2002	1.58%	55,917	93.20	
2003	2.28%	57,192	95.32	
2004	2.66%	58,713	97.86	
2005	3.39%	60,704	101.17	
2006	3.23%	62,664	104.44	
2007	2.85%	64,450	107.42	
2008	3.84%	66,925	111.54	
2009	-0.40%	66,658	111.10	$ 22.05
2010	3.00%	68,657	114.43	23.70
2011	3.00%	70,717	117.86	25.48
2012	3.00%	72,839	121.40	27.39
2013	3.00%	75,024	125.04	29.45
2014	3.00%	77,274	128.79	31.66
2015	3.00%	79,593	132.65	34.03
2016	3.00%	81,980	136.63	36.58

CONCLUSION

Starting in 2010, the City's current rates are projected to be insufficient to fully fund the forecasted financial obligations of the utility. New financial obligations for which the utility will require additional rate revenues are mostly driven by the capital financing impacts (i.e. debt service payments for the new bond issues, and rate funding) of the proposed $20.1 million CIP (2009 dollars; $21.6 inflated dollars).

To generate adequate working capital to fund utility obligations and meet annual cash flow and debt service coverage requirements, a series of rate increases will be needed in years 2010 through 2016.

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FIGURE 2-1

Comprehensive Water System Plan

EXISTING WATER SYSTEM

MSA

August 2010

LEGEND

- 596 ZONE / 596 ZONE WATER MAIN
- 505 ZONE / 505 ZONE WATER MAIN
- 500 ZONE / 500 ZONE WATER MAIN
- 486 ZONE / 486 ZONE WATER MAIN
- 425 ZONE / 425 ZONE WATER MAIN
- 420 ZONE / 420 ZONE WATER MAIN
- 325 ZONE / 325 ZONE WATER MAIN
- PRESSURE RELIEF FACILITY
- PRESSURE REDUCING STATION
- ZONE VALVE
- RESERVOIR
- SUPPLY STATION
- PUMP STATION
- EMERGENCY INTERTIE
- CITY OF EDMONDS CITY LIMITS
- SNOHOMISH/KING COUNTY LINE
- CITY OF EDMONDS RETAIL WATER SERVICE AREA

N

1000 0 1000 2000

SCALE IN FEET

PUGET SOUND

ALDERWOOD WATER & WASTEWATER DISTRICT

PRESSURE RELIEF #4

PRV #3

PRV #2

Supply From Alderwood Water District 635 Zone

PRV #6

PRV #5

PRV #7

PRV #8

PRV #12 (OFFLINE/OPEN)

PRV #13

PRV #10

Seaview Reservoir 1.5 MG

PRV #14

Emergency Interties with City of Lynnwood 573 Zone

PRV #9

PRV #11 (OFFLINE/OPEN)

PRV #15

PRESSURE RELIEF #19

PRV #16

CITY OF LYNNWOOD

PRV #18

PRV #17

Yost Reservoir 1.5 MG

Five Corners Reservoirs and Pump Station 1.5 MG 3.0 MG

Emergency Interties with City of Lynnwood 573 Zone

PRV #21 (OFFLINE/CLOSED)

Emergency Intertie with Olympic View Water District Woodway 353 Zone

PRV #20

Emergency Interties with Olympic View Water District 540 Low Zone

Emergency Intertie with Olympic View Water District 540 Low Zone

UNINCORPORATED SNOHOMISH COUNTY

CITY OF MOUNTLAKE TERRACE

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

Supply From Seattle Public Utilities 592 Zone

SNOHOMISH COUNTY KING COUNTY

CITY OF SEATTLE

SHORELINE WATER DISTRICT

NORTH ⟷ SOUTH

650 ALDERWOOD WATER & SEWER DISTRICT SUPPLY (635 ZONE)

600 596 ZONE

PRV #2

PRV #5

PRV #8

PRV #9

PRV #10 & 13

PRV #14

PRV #15

PRV #16

PRV #17

CITY OF LYNNWOOD 573 ZONE

596 ZONE

SEATTLE PUBLIC UTILITIES STANDBY SUPPLY (592 ZONE)

550

500 ZONE

505 ZONE

486 ZONE

OE=492.5'

3.0 MG RESERVOIR
DIAMETER: 104'
BOTTOM EL: 445'
63,540 GAL/FT

OE=486'

1.5 MG RESERVOIR
DIAMETER: 80'
BOTTOM EL: 449'
37,600 GAL/FT

FIVE CORNERS RESERVOIRS & PUMP STATION

OLYMPIC VIEW WATER DISTRICT LOW ZONE (540 FT)

500

450

PRV #18

420 ZONE

425 ZONE

PRV #3

PRV #6

PRV #7

PRV #20

400

350

OLYMPIC VIEW WATER DISTRICT WOODWAY ZONE (353 FT)

325 ZONE

325 ZONE

PRESSURE RELIEF STATION #4

OE=325'

1.5 MG SEAVIEW RESERVOIR
DIM: 119'x119'
BOTTOM EL: 310'
105,924 GAL/FT

PRESSURE RELIEF STATION #19

OE=325'

1.5 MG YOST RESERVOIR
DIM: 119'x119'
BOTTOM EL: 310'
105,924 GAL/FT

300

LEGEND

- 596 ZONE
- 505 ZONE
- 500 ZONE
- 486 ZONE
- 425 ZONE
- 420 ZONE
- 325 ZONE
- ADJACENT SYSTEM
- PRESSURE REDUCING STATION/VALVE
- ISOLATION VALVE
- CONTROL VALVE
- PRESSURE RELIEF STATION
- INTERTIE
- PUMP STATION
- FACILITIES AT SAME SITE

ABBREVIATIONS

EL	ELEVATION
FT	FEET
MG	MILLION GALLONS
OE	OVERFLOW ELEVATION

FIGURE 2-2

CITY OF EDMONDS Inc. 1890

Comprehensive Water System Plan

EXISTING WATER SYSTEM HYDRAULIC PROFILE

MSA

August 2010

G:\PDX_Projects\09\1030\103\CAD\09-1030-103-WA-FIG 2-2 v4.dwg FIGURE 2-2 8/25/2010 11:17 AM HCM 18.0s (LMS Tech)

G:\PDX_Projects\09\1030\103\CAD\09-1030-103-WA-FIG 2-3.dwg FIGURE 2-3 8/25/2010 11:21 AM HCM 18.0s (LMS Tech)

FIGURE 2-3

Comprehensive Water System Plan

SERVICE AREA AND ADJACENT WATER SYSTEMS

MSA

August 2010

N

1000 0 1000 2000

SCALE IN FEET

LEGEND

- CITY OF EDMONDS RETAIL WATER SERVICE AREA
- ALDERWOOD WATER DISTRICT
- CITY OF LYNNWOOD
- CITY OF MOUNTLAKE TERRACE
- OLYMPIC VIEW WATER & SEWER DISTRICT
- CITY OF SEATTLE
- SHORELINE WATER DISTRICT
- CITY OF EDMONDS CITY LIMITS
- SNOHOMISH/KING COUNTY LINE

ALDERWOOD WATER & WASTEWATER DISTRICT

PUGET SOUND

CITY OF EDMONDS

CITY OF LYNNWOOD

UNINCORPORATED SNOHOMISH COUNTY

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

CITY OF MOUNTLAKE TERRACE

SNOHOMISH COUNTY
KING COUNTY

CITY OF SEATTLE

SHORELINE WATER DISTRICT

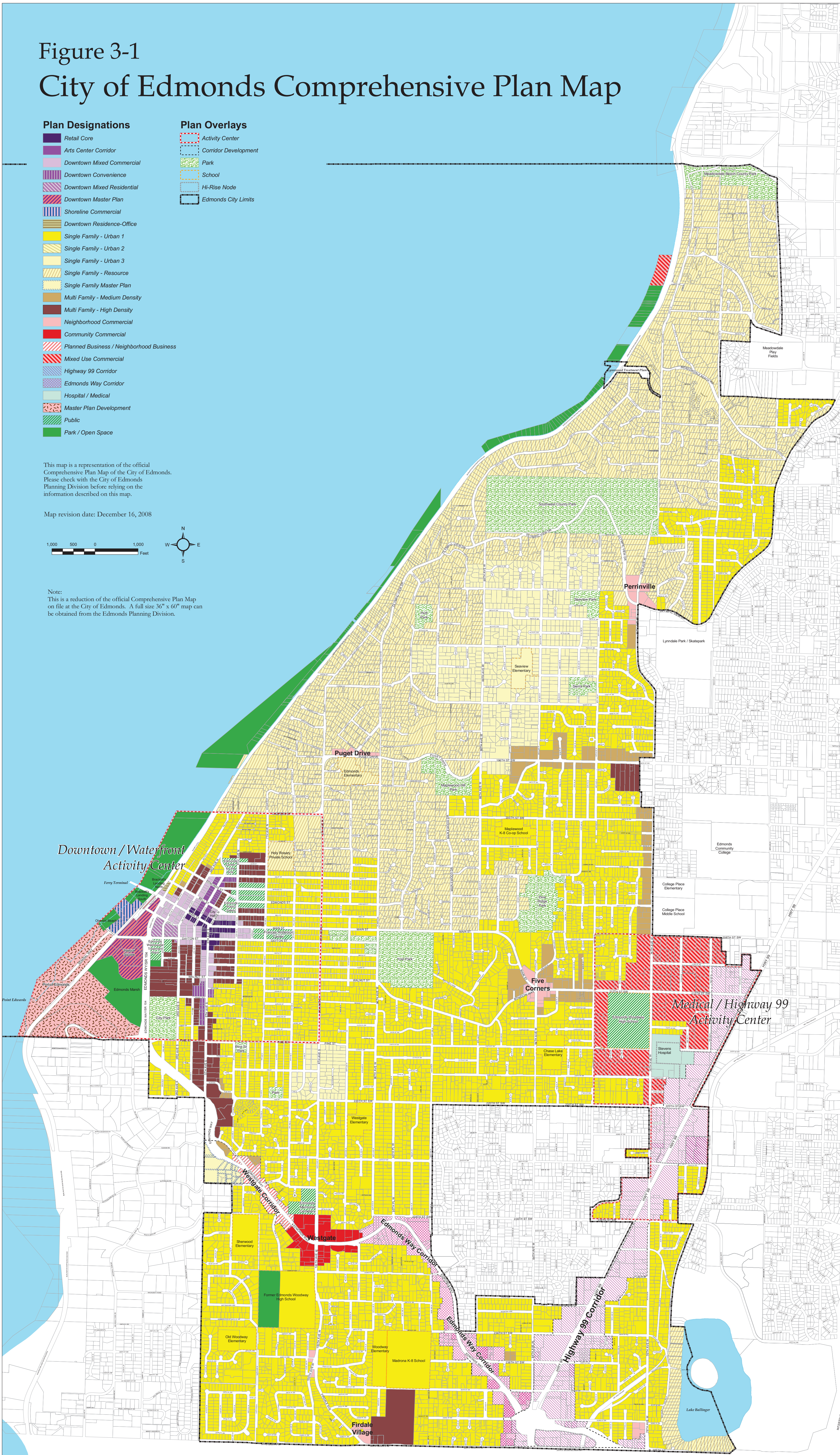
Figure 3-1
City of Edmonds Comprehensive Plan Map
Plan Designations
Retail Core
Arts Center Corridor
Downtown Mixed Commercial
Downtown Convenience
Downtown Mixed Residential
Downtown Master Plan
Shoreline Commercial
Downtown Residence-Office
Single Family - Urban 1
Single Family - Urban 2
Single Family - Urban 3
Single Family - Resource
Single Family Master Plan
Multi Family - Medium Density
Multi Family - High Density
Neighborhood Commercial
Community Commercial
Planned Business / Neighborhood Business
Mixed Use Commercial
Highway 99 Corridor
Edmonds Way Corridor
Hospital / Medical
Master Plan Development
Public
Park / Open Space
Plan Overlays
Activity Center
Corridor Development
Park
School
Hi-Rise Node
Edmonds City Limits
This map is a representation of the official Comprehensive Plan Map of the City of Edmonds. Please check with the City of Edmonds Planning Division before relying on the information described on this map.
Map revision date: December 16, 2008
1,000 500 0 1,000
Feet
N
W
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S
Note:
This is a reduction of the official Comprehensive Plan Map on file at the City of Edmonds. A full size 36" x 60" map can be obtained from the Edmonds Planning Division.
Perrinville
Lyndale Park / Skatepark
Meadowdale Play Fields
Puget Drive
Downtown / Waterfront Activity Center
Ferry Terminal
Point Edwards
Edmonds Marsh
City Park
Five Corners
Edmonds Community College
College Place Elementary
College Place Middle School
Medical / Highway 99 Activity Center
Stevens Hospital
Chase Lake Elementary
Westgate Corridor
Westgate
Edmonds Way Corridor
Highway 99 Corridor
Sherwood Elementary
Former Edmonds Woodway High School
Old Woodway Elementary
Woodway Elementary
Madrona K-8 School
Firdale Village
Lake Ballinger
Westgate Elementary
Maplewood K-8 Co-op School
Seaview Elementary
Seaview Park
Sierra Park
Yost Park
Holy Rosary Private School
Edmonds Elementary
Southwest County Park
Meadowdale Beach County Park
HWY 99

FIGURE 9-1

Comprehensive Water System Plan

PROPOSED CAPITAL IMPROVEMENTS

MSA

August 2010

N

1000 0 1000 2000

SCALE IN FEET

LEGEND

- CITY OF EDMONDS CITY LIMITS
- SNOHOMISH/KING COUNTY LINE
- CITY OF EDMONDS RETAIL WATER SERVICE AREA
- 596 ZONE / 596 ZONE WATER MAIN
- 505 ZONE / 505 ZONE WATER MAIN
- 500 ZONE / 500 ZONE WATER MAIN
- 486 ZONE / 486 ZONE WATER MAIN
- 425 ZONE / 425 ZONE WATER MAIN
- 420 ZONE / 420 ZONE WATER MAIN
- 325 ZONE / 325 ZONE WATER MAIN
- PRESSURE RELIEF FACILITY
- PRESSURE REDUCING STATION
- ZONE VALVE
- R RESERVOIR
- SUPPLY STATION
- PUMP STATION
- I EMERGENCY INTERTIE
- 8" PROPOSED 8" WATER MAIN
- 12" PROPOSED 12" WATER MAIN
- PROPOSED PRESSURE REDUCING STATION
- 60 CAPITAL IMPROVEMENT PROJECT NUMBER

PUGET SOUND

ALDERWOOD WATER & WASTEWATER DISTRICT

PRESSURE RELIEF #4

PRV #3

PRV #2

Supply From Alderwood Water District 635 Zone

PRV #6

PRV #5

PRV #7

PRV #8

PRV #12 (OFFLINE/OPEN)

PRV #13

PRV #10

Emergency Interties with City of Lynnwood 573 Zone

1.5 MG Seaview Reservoir

PRV #14

PRV #9

PRV #11 (OFFLINE/OPEN)

PRV #15

PRESSURE RELIEF #19

PRV #16

CITY OF LYNNWOOD

PRV #18

PRV #17

Five Corners Reservoirs and Pump Station 1.5 MG 3.0 MG

Yost Reservoir 1.5 MG

PRV #21 (OFFLINE/CLOSED)

Emergency Intertie with Olympic View Water District Woodway 353 Zone

PRV #20

Emergency Interties with Olympic View Water District 540 Low Zone

Emergency Intertie with Olympic View Water District 540 Low Zone

UNINCORPORATED SNOHOMISH COUNTY

CITY OF MOUNTLAKE TERRACE

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

Supply From Seattle Public Utilities 592 Zone

SNOHOMISH COUNTY KING COUNTY

CITY OF SEATTLE

SHORELINE WATER DISTRICT