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Chapter 1 Water System Description

1.1 Objective and Purpose

The objective of this chapter is to present background information for the City of Lynnwood (City) Water System Plan Update (Plan), including information on ownership and management of the system, system background, inventory of existing facilities, related planning documents, existing and future service areas and characteristics, service area agreements and policies, conditions of service, and complaints.

The Washington State Department of Health (DOH) regulations require water system plans to be updated every 6 years, or more frequently if necessary to reflect the current conditions of the water system. The purpose of this Plan is to update the City's Water System Comprehensive Plan dated November 2005. This Plan is prepared in accordance with DOH regulations WAC 246-290-100. In addition, this Plan meets the provisions of the DOH Water System Design Manual dated December 2009 and the DOH Water System Planning Handbook dated April 1997.

1.2 Water System Ownership and Management

The City owns and operates the Group A municipal water system that serves the majority of the area within the City limits. The Alderwood Water & Wastewater District (AWWD) is the primary supplier for the City's water system. The DOH water system identification number is 49270R and a copy of the Water Facilities Inventory Form (WFI) as included in Appendix A. The City is governed by an elected Mayor and City Council. The Public Works department manages the water system, while the Engineering division of the Public Works department oversees the Capital Improvements Projects (CIP). Decisions are made within the Engineering/Public Works department and are presented to the City Council for approval.

1.3 System Background

1.3.1 History of System Development and Growth

The City began as a small community of farms, forestlands, and businesses and was incorporated in 1959. The original water distribution system serving the City was built by AWWD.

The City purchased the portion of the water distribution system within its City limits from AWWD in 1966. In 1971, the first water system analysis and comprehensive plan was completed. By 1981, the water service area had expanded as a result of facility acquisitions outlined in the 1978 Lynnwood/AWWD Supply Agreement. The City acquired the two steel reservoirs that currently provide storage for the City's 573 zone in 1981. The current City limits encompass just over 5,000 acres (7.8 square miles), 4,543 of which are served by the City's water system. A few small areas within the current City limits are still served by AWWD.

1.3.2 Geography

The location of the City within southwestern Snohomish County is shown in Figure 1-1. Figures 1-2 and 1-3 show the topography and sensitive areas within in the vicinity of the City, respectively. Elevation differences within the City require the water system to operate with four pressure zones in order to provide adequate service pressures throughout the distribution system.

Figure 1-1 Location Map

Figure 1-2 Topographic Map

Figure 1-3 Sensitive Areas

1.3.3 Adjacent Purveyors

The City's adjacent water purveyors are shown in Figure 1-4. All water used by the City and its adjacent purveyors is treated at the City of Everett's Drinking Water Filtration Plant. AWWD purchases water from the City of Everett and wholesales it to the Cities of Lynnwood, Mountlake Terrace, and Edmonds. The City of Everett intends to continue its role as primary water supplier for most of southwest Snohomish County.

1.3.4 City Ordinances, Codes, and Requirements

City water ordinances are included as Appendix B.

The land use plans, codes, design criteria, construction standards, and franchise and permitting requirements of the City are found on the City's website (www.ci.lynnwood.wa.us).

1.4 Inventory of Existing Facilities

The existing facilities in the City's water system include the 680 Zone Booster Pump Station, two welded steel storage reservoirs, two pressure reducing stations, approximately 168 miles of transmission and distribution piping, one master meter, and 8,502 metered service connections. The City's service connections are discussed in Chapter 2.

The existing water system facilities are summarized in Tables 1-1 through 1-4, and are graphically depicted on Figure 1-5.

Table 1-1 Water System Reservoir Inventory

Name	Base/Overflow Elevation (ft)	Constructed	Total Volume (MG)
573 Zone 3.00 MG	535.7 / 573.0	1962	3.00
573 Zone 2.77 MG	532.7 / 573.0	1959	2.77

Table 1-2 Water System Pressure Reducing Station Inventory

Station No.	Location	Make/Model	Size (inches)	Inlet/Outlet Pressure (psi)
1	173rd Street SW and Spruce Way	Cla-Val/92-01	16	45.3/17.5
2	195th Street SW and 40th Avenue W	Cla-Val/92-01	6	

Table 1-3 Water System Pump Station Inventory

Name	Constructed	No. of Pumps	Pump Make/Model	Rated Capacity (gpm)	Rated TDH (ft)(1)	Motor HP
680 Zone	1999	3	Tiger/1070-7	85	125	5

Notes:
(1) Rated TDH is the total design head at the rated capacity.

Table 1-4 Water System Piping Inventory	
Diameter (inches)[(1)]	**Length (ft)[(1)]**
Unknown	1,704
2	1,491
4	48,233
6	168,723
8	435,510
10	35,435
12	136,414
16	26,135
18	20,998
24	14,588
Total	889,230 (169 miles)
Notes: (1) Information from City GIS.	

The primary water transmission main for the City is a 24-inch concrete cylinder pipe that runs along 35th Avenue W and Spruce Way from AWWD's storage facilities. Pressure reducing station number 1 is located in a vault at 173rd Street SW and Spruce Way on the 24-inch main, to reduce the pressure of the incoming supply from AWWD.

The City has two metered interties with AWWD that serve as the primary and emergency sources of supply. They are located at 164th Street SW and Spruce Way and 179th Street SW and 36th Avenue W. Additional unmetered valved interties, which are available for emergencies, are normally closed. Locations of the City's interties are listed in Table 1-5.

Table 1-5 Interties

Purveyor	Designation	Location	Size (inch)	City Pressure Zone	Metered?
City of Edmonds	E-1	76th Avenue W and 208th Street SW	8	573	No
	E-2	44th Avenue W and 164th Street SW	8	635	No
	E-3	76th Avenue W and 188th Street SW	8	573	No
	E-4	72nd Avenue W and 186th Street SW	8	573	No
City of Mountlake Terrace	E-5	52nd Avenue W and 212th Street SW	12	573	No
AWWD	E-6	37th Avenue W and 196th Street SW	12	573	No
	E-7	44th Avenue W and 212th Street SW	6	573	No
	E-8	44th Avenue W and 172nd Street SW	6	635	No
	E-9	52nd Avenue W and 168th Street SW	8	573	No
	E-10	62nd Avenue W and 168th Street SW	8	573	No
	E-11	40th Avenue W and 200th Street SW	8	573	No
	E-12	48th Avenue W and 168th Street SW	8	573	No
	E-13	179th Street SW and 36th Avenue W	8	635	Yes
	E-14	164th Street SW and Spruce Way	10	573	Yes

Figure 1-4 Adjacent Water Purveyors

Figure 1-5 Water System Map

1.5 Related Planning Documents

The following documents were utilized in the preparation of this Plan.

1.5.1 Water System Plans

- City of Lynnwood 2005 Water System Plan, Gray & Osborne, Inc., November, 2005
- City of Everett 2007 Comprehensive Water Plan, HDR, Adopted November 21, 2007
- Alderwood Water & Wastewater District 2009 Water Comprehensive Plan, HDR, August 2009
- Mukilteo Water District 2010 Comprehensive Water System Plan, Gray & Osborne, February 2010
- Silver Lake Water & Sewer District 2010 Comprehensive Water System Plan, Gray & Osborne, December 2010

1.5.2 Additional Plans, Policies and Development Regulations

- Washington State Office of Financial Management, April 1, 2010 City Density Reports.
- Census Block, P1 Total Population, 2010 Census Summary File 1, 100% Data. U.S. Census Bureau, 2010 Census
- Covered Employment Estimates by jurisdiction and by custom estimate. Provided by Puget Sound Regional Council September 2011 and February 2012
- City of Lynnwood, 2008-2010 American Community Survey 3-Year Estimates. Form B19053
- Snohomish County Tomorrow, Vision 2040 Preliminary Growth Distribution Working Paper, SCT Planning Advisory Committee, May 12, 2011
- City of Lynnwood City Center Sub-Area Plan, September 2007
- City of Lynnwood Addendum to Final Supplemental Environmental Impact Statement Lynnwood City Center Sub-Area Plan, May 24, 2011
- City of Lynnwood City Center Plan Final Supplemental Environmental Impact Statement, September 9, 2004
- City of Lynnwood Ordinance 2910 – Adoption of Highway 99 Subarea Plan, September 27, 2011
- City of Lynnwood Highway 99 Ordinance 2912 – Zoning Maps, September 12, 2011
- City of Lynnwood Highway 99 Subarea Plan, September 12, 2011
- City of Lynnwood Highway 99 Final Environmental Impact Statement, February 17, 2011
- Gray & Osborne Memorandum, Lynnwood High School Relocation Water & Sewer Demand Estimates, April 21, 2011
- Washington State Department of Health Water System Planning Handbook, April 1997
- Washington State Department of Health Conservation Planning Requirements, March 1994
- Washington State Department of Health Water Use Efficiency Guidebook, January 2011
- Washington State Department of Heath Conservation Planning Requirements for Water System Plans Fact Sheet, March 2005

1.6 Existing Service Area Characteristics

1.6.1 Customers

The different types of customers served by the City's water system are summarized in Table 1-6. The various service areas are presented in Figure 1-6.

Table 1-6 Service Area Customers

Customer Type	Number of Connections	Description
Lynnwood Direct Customers	7,987(1)	City customers served through the master meter. Does not include 525 UMR (724 zone) customers.
UMR Accounts	525(2)	"Unmetered Read" accounts: 724 zone customers who are served by AWWD's 724 zone storage and transmission, but are billed by the City. The City reads the meters for these accounts and bills the customer. Water use at these accounts is added to the City's bi-monthly wholesale water bill. These accounts are included in the City's Utility Billing Summaries.
AWWD Subtract Accounts	24(3)	AWWD customers who are in the 573 zone and are served by the City's transmission and distribution facilities most of which are adjacent to 36th Ave W in the northern portion of the City limits near 177th Place SW and 172nd St. SW. AWWD reads the meters for these accounts, and water use from these accounts is subtracted from City's bi-monthly wholesale water bill.
AWWD Direct Customers	479(2)	Customers who are located within City limits, but are served directly by AWWD (East of 36th Ave W & North of 180th Place SW; East of Hazel Road & South of I-5) and do not fall within a City pressure zone. These areas are not part of the City's water service area.

Notes:
(1) 8,512 2010 total customers per City Utility Billing Summaries: 8,512 – 525 = 7,987 Direct City Customers.
(2) Per customer list spreadsheet from City, received April 30, 2012
(3) Per subtract account spreadsheet from City, received May 29, 2012. 88 total accounts, 24 within City limits.

1.6.2 Pressure Zones

There are four pressure zones that distribute water within the City: 573, 635, 680, and 724 zones. The City serves the 573, 635, and 680 zones; the 724 zone is served by AWWD. The 573 zone serves the majority of the City. 573 zone water is stored in the two City reservoirs at 40th Avenue W and 185th Street SW. The static water pressure for this zone ranges from 60 to 100 psi. 573 zone customers are metered by the City.

The 635 zone is supplied through the master meter at 168th Street SW and Spruce Way. Static pressure in this zone ranges from 35 to 90 psi. Due to low pressures in the 635 zone, the City requires booster pumps for new construction in the affected areas. 635 zone customers are metered by the City.

The 680 zone was created in 2000 with the installation of the 680 Zone Booster Pump Station that is supplied by the City's reservoirs. The pump station provides pressures at approximately 65 psi. 680 zone customers are metered by the City.

The 724 zone is supplied and metered by AWWD. Static water pressure for this zone ranges from 50 to 80 psi. 724 zone customers are metered by AWWD.

The pressure zones are shown in Figure 1-5. A hydraulic profile of the existing system is shown in Figure 1-7.

Figure 1-6 Service Area Map

Figure 1-7 Water System Hydraulic Profile

1.6.3 Zoning and Land Use

Residential land use accounts for approximately 40 percent of the City's total land area; approximately 80 percent of this land is occupied by single-family residential units. In general, the single-family homes are concentrated north of 196th on either side of Highway 99, and in the south central part of the City between 52nd Avenue W and 60th Avenue W. Multi-family development is concentrated east of the commercial development on Highway 99 and along the 200th Street corridor. In addition, there are multiple mobile home parks and senior citizen housing developments located throughout the City.

The existing commercial land use in the City consists of heavy development along Highway 99, 196th Street SW, 44th Avenue W, and the Alderwood Mall area. Industrial land makes up less than 3 percent of the City and is concentrated south of 196th between Highway 99 and I-5. The City has 258 acres of parks, recreation, and open space land, ranging from small parks to a 75-acre golf course. Other public uses include schools and churches. The Civic Center in central Lynnwood consists of City Hall, a library, a recreation center, fire station, and the Criminal Justice Center. Figure 1-8 shows the zoning within the City.

1.7 Future Water Service Area Characteristics

The City is bounded by the City of Mountlake Terrace to the southwest, and the City of Edmonds to the west. Therefore, no expansion of the City's water service area will occur in these regions. The remainder of the City is bounded by AWWD service areas.

All areas within the proposed UGA currently receive water service from AWWD. The Agreement defines the process for future facility acquisitions should the City annex areas served by the AWWD. The City had pursued annexation to the east and north in 2008, but these plans have been put on hold due to the recession and resistance from the City of Mill Creek.

1.8 Service Area Agreements

The 2010 Lynnwood/AWWD Water Supply Agreement (Agreement) provides for the delivery of water needed by the City for the next fifty years. Under the Agreement, the City purchases its water supply from AWWD and owns all of the distribution and storage facilities within the city limits, except in areas served by AWWD. Should the City decide to annex areas currently served by AWWD, the Agreement outlines the process for the City to purchase AWWD's transmission and distribution facilities located in the annexed area if it chooses to do so. A copy of the Agreement is included as Appendix C. The City has no other agreements related to water service.

1.9 Service Area Policies and Conditions of Service

Table 1-7 summarizes service area policies that the DOH requires to be referenced in water system plans.

Table 1-7 Service Area Policies

Policy Name	City Policy	Reference
Water Service Policy	The utility will use all reasonable means to provide adequate and continuous water service for all customers, but in case the water service is interrupted or reduced, for any cause, the City shall not be liable for any injuries or damages resulting therefrom, and the interruption or reduction in service shall not give rise to any cause of action as to a breach of agreement for service.	City of Lynnwood Municipal Code Section 13.16.010
Direct Connection Policy	Satellite systems are not allowed. Developers must connect to existing water mains.	City of Lynnwood Municipal Code Section 13.12.20
Extension Policy within City Limits	Water main extensions will be required when the property does not front on a water main or when the existing water main is not adequate for the increased use proposed. The minimum extension shall be to a point at least 5 feet inside the prolongation of the property line. The minimum size shall be 8-inches in diameter unless otherwise approved by the Public Works Director.	City of Lynnwood Design and Construction Standards and Specifications Section 5
Extensions Policy outside City Limits	Areas outside the City limits are currently served by other water utilities.	Not Applicable
Annexation Policy	As the City annexes areas currently served by the AWWD, the distribution facilities used to serve the area may become the property of the City and the City shall pay the AWWD as outlined in the 1978 Agreement. For areas that are annexed by the City that cannot be served by the master meter, the AWWD shall bill the City a wholesale rate as determined by the Agreement.	1978 Agreement between the AWWD and the City of Lynnwood for Water Supply
Minimum Standards Policy	Except where provided otherwise, design, construction and materials shall conform to the appropriate standards of the latest edition of the Standard Specifications for Road, Bridge, and Municipal Construction produced by the WSDOT and the Washington State Chapter of the American Public Workers Association (APWA). These standards are supplemented by the City's Design and Construction Standards and Specifications.	City of Lynnwood Design and Construction Standards and Specifications Section 1
Late-Comer Agreement Policy	Developers using private funds to install street, water, or sewer may apply to the City to establish a latecomer agreement for recovery of a pro rata share of the cost of constructing said public improvement from other properties that will later derive a benefit of said improvements. Contractor must submit Plans, cost estimate, ownership reports on property, and other information City requires.	City of Lynnwood Municipal Code Section 3.30

Table 1-7 Service Area Policies

Policy Name	City Policy	Reference
Design and Performance Policy	All construction of water mains and related appurtenances shall conform to these Standards, applicable AWWA Specifications and Section 7-12 of the WSDOT/APWA Standard Specifications.	City of Lynnwood Design and Construction Standards and Specifications Section 5
Surcharge Policy	There is no surcharge policy for connections outside the City limits.	City of Lynnwood Municipal Code Section 13.20.010
Connection Responsibility Policy	Personnel from the water utility of the City of Lynnwood will make connections to the existing water mains in the Lynnwood water system and perform all labor and work incident thereto unless approval is received from the Director of Public Works.	City of Lynnwood Municipal Code Section 13.12.020
Connection Fee Policy	The charges for domestic water service shall be based upon the size of meter installed, number of connections or units being serviced therefrom, and the water delivered through the service meter.	City of Lynnwood Municipal Code Sections 3.104 and 13.20
Meters Policy	Before work is commenced for installation of a water meter, the customer shall pay the water utility as set forth in Chapter 3.104	City of Lynnwood Municipal Code Sections 3.104, 13.12.020 and 13.12.030
Materials Policy	All water mains shall be cement-mortar lined ductile iron pipe, standard thickness class 52, conforming to WSDOT Standard Specifications and AWWA Specifications unless otherwise specified. Gate valves shall be iron body, bronze mounted resilient seal.	City of Lynnwood Design and Construction Standards and Specifications Section 5
Growth Policy	All growth in the City of Lynnwood will be within the existing grid. Developer projects will be evaluated on an individual basis.	City of Lynnwood Municipal Code Section 13.12.010
Cross Connection Control	The installation or maintenance of a cross connection, which will endanger the water quality of the fresh water supply of the City, is prohibited. Any such cross connection now existing or hereafter installed is declared a nuisance and shall be abated immediately.	City of Lynnwood Municipal Code Section 13.12.080

Table 1-7 Service Area Policies

Policy Name	City Policy	Reference
UGA Purveyor Responsibilities	The unincorporated area of Snohomish County north, south and east of the City is currently served by the AWWD. The AWWD's elected Board of Commissioners (Board) establishes service area policies at its regularly-scheduled public meetings. The general public is free to address the Board on any issue relating to the AWWD's responsibilities for providing domestic water service within its service area. Service area polices are established by the Board through the adoption of official written resolutions. A summary of the adopted resolutions relating to developer extensions, connection charges, and new water meter purchases and hookups are available from the AWWD upon request.	The legal authority for the District and its service area policies are established under RCW Title 57, Water-Sewer Districts.

1.10 Customer Complaints

Customer complaints are typically received through the City's Front Desk Receptionist, and are transferred to the Water Operations Supervisor. Customer complaints of an emergency nature or threat to public health are addressed immediately. Concerns or complaints involving work that needs to be accomplished are entered as a Work Order into Cartegraph, the City's asset management software. Complaints are broken down into three categories: Water Leaks, Water Quality, and Water Meter. Cartegraph tracks all maintenance and repairs within the entire City Water System. In the years 2008 through 2011, there were 35 Water Leak complaints, 8 Water Quality complaints, and 30 Water Meter complaints.

Complaint emails are sent to the City's Webmaster, who forwards complaints onto the Operations Manager. Questions are answered via email, and should the email necessitate work, the Water Operations Supervisor is contacted, and Cartegraph is used to track and manage work as stated above.

The City activated the Cartegraph Customer Service Web Portal in early 2011. This allows customers to use their computer or smart phone to notify the City of any public works issues. All water issues submitted in this manner are sent to the Water Operations Supervisor who turns them into Work Orders as needed.

Figure 1-8 Zoning Map

Chapter 2 Basic Planning Data and Water Demand Forecasting

Chapter 2 provides a description of historical, 2010, and future projected population and employment. This chapter also summarizes historical and 2010 water demands within the City, and identifies target year (2012, 2018, and 2032) demand projections based on population and employment projections, water use data, and conservation effects. This data meets DOH reporting requirements and also provides the basis for the water system analysis performed to determine improvements necessary to serve current and future City customers.

2.1 Historical Population and Employment Trends

The City of Lynnwood was incorporated in 1959. The City's population and employment growth from 1960 to 2010 is summarized in Table 2-1. Estimated total employment listed in Table 2-1 was calculated by combining a Covered Employment estimate (representing approximately 85 to 90 percent of total employment) with a percentage of households receiving self-employed income as reported by the American Community Survey (ACS). The City's most recent ACS reports that 13.3 percent of households received self-employment income.

Table 2-1 Historical Population and Employment 2000 to 2010

Year	Population[(1)]	Annual Population Growth Rate	Estimated Total Employment[(1)]	Annual Employment Growth Rate
1960	7,207	--	--	--
1970	16,919	--	--	--
1980	22,641	--	--	--
1990	28,637	--	--	--
2000	33,847	--	25,312	--
2001	34,010	0.5%	24,390	(3.6%)
2002	33,990	(0.1%)	23,497	(3.7%)
2003	34,500	1.5%	24,910	6.0%
2004	34,540	0.1%	25,485	2.3%
2005	34,830	0.8%	26,016	2.1%
2006	35,230	1.1%	27,556	5.9%
2007	35,490	0.7%	29,176	5.9%
2008	35,680	0.7%	29,298	0.4%
2009	35,740	0.2%	26,917	(8.1%)
2010	35,836	0.3%	25,933	(3.7%)

Notes:
(1) Data Sources: Population 1960-2009: Washington State Office of Financial Management (OFM) April 1 City Density Reports; Population 2010: 2010 Census; Estimated Total Employment: Covered Employment estimates provided by the Puget Sound Regional Council and Lynnwood 3-Year American Community Survey 2008 to 2010.

The City's population increased by approximately 5.9 percent between 2000 and 2010; the average annual population growth was approximately 0.6 percent.

Employment increased by approximately 2.5 percent between 2000 and 2010, with an average annual growth of approximately 0.4 percent. There were significant population fluctuations year to year due to economic factors.

2.2 Water Service Area Population

The population within the City's water service area boundary is estimated using the number of occupied single-family residential units (subtracting out the Alderwood Water and Wastewater District (AWWD) direct and subtract accounts within the City limits from the single-family residential units) and the multi-family residential units within the service area, multiplied by the number of people per unit. The unit density (persons per unit) from the US Census Bureau 2010 Demographic Profile Data (2.62 persons/unit, single-family residential and 2.36 persons/unit, multi-family) was used in the water demand forecasting. Table 2-2 is a summary of the estimated population within the water service area broken out by residential type.

Table 2-2 2010 Water Service Area Population

Customer Class	Occupied Residential Units[(1)(2)]	Unit Density (persons per unit)[(1)]	Estimated 2010 Population[(1)]
Single Family Residential	7,411	2.62	19,442
Less AWWD direct accounts[(3)]	625	2.62	1,640
Less AWWD subtract accounts, within City limits[(4)]	24	2.62	63
Total Single Family Residential	**6,762**	**2.62**	**17,739[(6)]**
Multi-Family Residential	**6,696**	**2.36**	**15,776[(7)]**
Total Housed Population[(5)]	13,458	----	33,515

Notes:
(1) Information from US Census Bureau, 2010 Demographic Profile Data.
(2) Assumption made that all AWWD direct and subtract accounts are single family residential units.
(3) AWWD direct accounts reflect an approximate population of 1562 which equates to approximately 625 residential units (assuming an average household site of 2.5 per the US Census Bureau, 2010 Demographic Profile Data).
(4) AWWD subtract accounts reflect 88 occupied units per City email 5/29/12; 24 of which are within City limits.
(5) City served residential population.
(6) 49.50% of 2010 City Census population is occupied single-family residential population.
(7) 44.02% of 2010 City Census population is occupied multi-family residential population.

2.3 Water Service Connections by Customer Class

Table 2-3 lists the number of City water service connections per customer type.

Table 2-3 City of Lynnwood Historical Service Connections

Customer Type	Total Water Service Connections			
	2008	**2009**	**2010**	**2011**
Single Family Residential(2)	6,669	6,764	6,770	6,770
Multi Family Residential	457	458	458	458
Commercial	899	900	894	891
School	40	41	41	37
Municipal	66	66	66	65
Government	17	17	17	17
Commercial - Various	264	264	264	263
Does Not Apply	2	1	2	1
Total	**8,414**	**8,511**	**8,512**	**8,502**

Notes:
(1) Water service connection data from City of Lynnwood Utility Billing Summaries, 2008 to 2011.
(2) Single Family Residential includes Single Family, Special Rate C, and Mobile Home P customer classes.
(3) Total water service connections includes UMR accounts.

As shown in Table 2-3, the City has experienced a small decline in water service connections over the last 3 years.

2.4 Water Use

2.4.1 Average and Peak Day Purchased Water History

The master meters connecting the City and the Alderwood Water & Wastewater District (AWWD) water systems are recorded daily to determine the amount of water use by the City. In addition, master meter data is telemetered to the AWWD operational headquarters. The AWWD telemetry system records and archives hourly and daily flows as recorded at the master meters. In addition, the AWWD keeps seven-day circular charts indicating continuous flow data as measured at the City master meters. The AWWD accounts are subtracted from the total amount billed to the City and the unmetered read (UMR) accounts are added to the City bill. Table 2-4 provides a summary of the historical amount of water purchased from the AWWD, along with the peak day water purchased.

Table 2-4 Historical Master Meter Data

Year	Total Master Meter Usage (mgd)[1]	Peak Day Meter Usage (mgd)[2]	Peaking Factor
2008	3.53	5.74	1.63
2009	3.63	6.47	1.78
2010	3.45	6.16	1.79
2011	3.45	5.53	1.60
		Average	**1.70**

Notes:
(1) Data from AWWD Water Consumption/Loss Reports. AWWD accounts in City service area subtracted out.
(2) Peak Day Meter Use from City SCADA Data, 2008-2011.

2.4.2 Consumption History

The City's water consumption for 2008 through 2011 for each customer class is listed in Table 2-5. As shown in Table 2-5, the City's total water consumption decreased from 2008-2011.

Table 2-5 Historical Metered Water Consumption by Customer Class

Customer Type	Average Day Annual Consumption (mgd)			
	2008	**2009**	**2010**	**2011**
Single Family Residential[1]	1.273	1.379	1.203	1.190
Multi Family Residential	0.763	0.809	0.730	0.762
Commercial	0.717	0.718	0.650	0.625
School	0.087	0.093	0.062	0.068
Municipal	0.044	0.050	0.027	0.036
Government	0.011	0.010	0.011	0.016
Commercial-Various	0.210	0.200	0.196	0.209
Does Not Apply	N/A	N/A	N/A	N/A
Total	**3.105**	**3.260**	**2.878**	**2.904**

Notes:
(1) Single Family Residential includes Single Family, Special Rate C, and Mobile Home P customer classes.
(2) Water consumption and service connection data from the City of Lynnwood Utility Billing Summaries.

2.4.3 Lost and Unaccounted for Water

Lost and unaccounted for (L/UF) water is defined as the difference between metered source production and metered consumption. Lost water includes any water loss due to leaks or unauthorized uses such as illegal service connections. Unaccounted for water results from accounting errors, inaccurate source and customer meters, and water leaving the system for unmetered and/or unestimated usage such as flushing of water mains, fire flows, and use by unmetered services.

Table 2-6 shows the City's meter usage, UMR consumption, purchased water, total sold to City customers, and lost and unaccounted for water for 2008 through 2011. As shown, the City's lost and unaccounted for water ranges from 13.3 percent in 2009 to 19.5 percent in 2010, assuming UMR is excluded from the total, as UMR consumption does not go through the master meter and cannot be properly tabulated. According to DOH, utilities must implement a leak detection program if their lost and unaccounted for water is greater than 10 percent. For comparison, the lost and unaccounted for water for other utilities in Snohomish County are listed in Table 2-7.

Table 2-6 Lost and Unaccounted for Water

Year	Total Master Meter Usage, MG	Consumption Not Through Master Meter (UMR Accts), MG	Total Usage per AWWD Billings, MG	Total Sold to City Customers	Lost and Unaccounted for Water		
					(MG)	% of Total, including UMR	% of Total, excluding UMR
2008	1,288	39	1,327	1,133	194	14.6%	15.1%
2009	1,325	40	1,366	1,190	176	12.9%	13.3%
2010	1,259	37	1,296	1,051	246	19.0%	19.5%
2011	1,259	37	1,296	1,060	235	18.2%	18.7%
					Average	**15.9%**	**16.4%**

Notes:
(1) Average Day Master Meter Usage from AWWD. AWWD accounts in Lynnwood are subtracted out. Data from Water Consumption/Loss Reports, given in CCF, calculated to MG.
(2) Total sold to City Customers data from 2008-2011 City of Lynnwood Utility Billing Summary, total Water/Irrigation Consumption (given in CCF, calculated to MG).
(3) Use % Lost excluding UMR, as UMR does not go thru master meter and UMR loss cannot be properly tabulated. Assume UMR loss is same as entire system loss, percentage-wise.

Table 2-7 Lost and Unaccounted for Water for Nearby Utilities

Utility	Years of Data	Average Lost and Unaccounted for Water[1]
Silver Lake Water District	2003 - 2008	5.3%[2]
Mukilteo Water District	1998 - 2008	6.0%[3]
City of Everett	2005	5.5%
AWWD	2004 - 2006	6.9%

Notes:
(1) The lost and unaccounted for water data was obtained from each utility's Water System Plan.
(2) The Silver Lake Water District had an unidentified problem with consumption data in 2004.
(3) The Mukilteo Water District had missing production data in 2004 and the need to calibrate source meters in 2008.

As shown in Table 2-6, the City's lost and unaccounted for water has averaged approximately 16.4 percent over the last two years, excluding UMR consumption, which is higher than the utilities listed in Table 2-7. As the City exceeds the DOH threshold of 10 percent, a leak detection program is in place that includes hiring a leak detection firm yearly to check problem areas within the system. A distribution system map identifying locations of leaks is maintained, and pipe segments with multiple leaks are identified and scheduled for replacement.

2.4.4 Equivalent Residential Units

The concept of Equivalent Residential Units (ERUs) is a way to express water use by non-residential customers as an equivalent number of residential customers. ERUs are calculated by dividing the total volume of water utilized in the single family residential customer class by the total number of active residential connections. This number defines the average single family residential water use. The volume of water used by other customer classes can then be divided by the average single family residential water use to determine the number of equivalent residential units utilized by other customer classes. Table 2-8 summarizes the City's ERU value for 2008 through 2011.

Population for 2008, 2009, and 2011 was based on the percent occupied units from the 2010 occupied population data from the US Census Bureau 2010 Demographic Profile Data versus the total 2010 City population (also from the US Census Bureau); 91 percent occupied for single-family residences and 99 percent occupied for multi-family residences. AWWD direct and subtract accounts were subtracted from the total single-family residential units.

Table 2-8 Equivalent Residential Units 2008-2011

	2008	2009	2010	2011	Average (2010-2011)
Single Family Residential Flow, mgd[1]	1.273	1.379	1.203	1.190	
Total Housing Units[2]	6,688	6,710	6,762	6,804	
Flow per ERU	190	206	178	175	176
GPCD	73	78	68	67	67
Multi Family Residential Flow, mgd[1]	0.763	0.809	0.730	0.762	
Total Housing Units[3]	6,591	6,600	6,696	6,673	
Flow per ERU	116	123	109	114	112
GPCD	49	52	46	48	47

Notes:
(1) Single Family Residential and Multi Family Residential Average Day Consumption from Utility Billing Summaries from City
(2) Based on 91% occupied units from 2010 calculation (2010 census occupied units divided by 2010 total units counted by OFM). AWWD direct accounts (assumed 625 units), and AWWD Subtract accounts (88 units) subtracted out.
(3) Based on 99% occupied units from 2010 calculation (2010 census occupied units divided by 2010 total units counted by OFM).

As shown in Table 2-8, the average daily Single Family Residential water use for the City from 2010 to 2011 (which is equivalent to one ERU) was 176 gpd/ERU, or 67 gpcd. These values will be used in projecting future flows. The 2010 to 2011 average for multi-family residential water use was 112 gpd/ERU or 47 gpcd. The averages above only considered years 2010 and 2011 as year 2008 and 2009 appear to be inflated due to system leakage.

Table 2-9 breaks down all customer-type connections into ERUs using 2010 data.

Table 2-9 2010 Equivalent Residential Units

Customer Type	Number of Connections[2]	Average Daily Consumption (gpd)[2]	Average gpd per Connection	ERUs per Connection	Total ERUs
Single Family Residential[1]	6,770	1,202,839	178	1	6,770
Multi Family Residential	458	729,849	1,594	9	4,108
Commercial	894	649,707	727	4	3,657
School	41	61,693	1,505	8	347
Municipal	66	26,879	407	2	151
Government	17	11,406	671	4	64
Commercial-Various	264	195,880	742	4	1,102
Total	**8,510**	**2,878,253**	**N/A**	**N/A**	**16,200**

Notes:
(1) Single Family Residential includes Single Family, Special Rate C, and Mobile Home P customer classes.
(2) Water consumption and service connection data from the City of Lynnwood Utility Billing Summaries.

Table 2-10 further distills equivalent residential units into an equivalent employee unit, which is useful for future employment water use projection. Employment consumption considers all customer classes except for residential customers, and assumes all employees use the same amount of water.

Table 2-10 Equivalent Employee Units 2009 through 2011

	2009	2010	2011
Employment Consumption (gpd)[1][2]	1,071,241	945,564	953,065
Employee Population	25,544	24,560	25,419
gpd/employee	41.9	38.5	37.5
Average gpd/employee	**39**		

Notes:
(1) Employment Consumption includes Commercial, Government, School, Municipal, and Commercial-Various customer class information
(2) Water consumption from City of Lynnwood Utility Billing Summary 2009-2011. Converted to gpd from CCF.
(3) 2009-2010 population from Table 2-1: 2011 interpolated based on population numbers in Table 2-14. 1,373 employees were subtracted from the employment population to account for the employment population in the area served directly by AWWD. This deduct value was assumed to stay at 1,373 for the three years as these areas are built out and not expected to see much employment change.
(4) Average gpd/employee assumes that all employees are equal.

2.4.5 Large Water Users

The ten largest water users in the City of Lynnwood are summarized in Table 2-11 along with their 2010 water consumption and their number of equivalent residential units (ERUs).

Table 2-11 Large Water Users

Customer[1]	2010 Annual Consumption (gpd)	Number of ERUs[2]
Lynnwood Embassy Suites Hotel	31,039	175
Whispering Cedars Apts.	23,243	131
Pinewood Square Apts.	20,341	114
HCR Manor Care	19,337	109
Somerset Village Apts.	16,832	95
Twin Cedars RV Park	14,629	82
Edmonds Community College	14,428	81
24 Hour Fitness #00418	13,391	75
Archadia Properties LLC	12,698	71
Darden Restaurant	12,479	70
AT&T	12,041	68
Whispering Pines	12,024	68
H-Mart	11,721	66
Lynnwood PFD	11,674	66
Lynnwood Garden Village	10,417	59

Notes:
(1) Large Water Users from 2010 Consumption Report – Top Ten spreadsheet, provided by the City.
(2) Based on an ERU value of 178 gpd/ERU.

2.5 Total City Population and Employment Forecasts

In 2006, the City and Snohomish County cooperated in an extensive allocation process which tied together Countywide Planning Policies, the Snohomish County Buildable Lands Report, Puget Sound Regional Council (PSRC) allocations, public input, and current City zoning and planning efforts. This resulted in agreed-upon City population and employment allocations for the year 2025 of 43,782 and 38,550, respectively.

Additional studies were reviewed to assist in identifying the 20-year (2032) projections required by the Department of Health for the Water System Plan Update. In 2008, PSRC released *VISION 2040* which outlined a new regional growth strategy and provided broad population and employment allocations on a regional basis. In May 2011, the Snohomish County Tomorrow Planning Advisory Committee released the *Vision 2040 Preliminary Growth Distribution Working Paper*, providing "early indication of what post-2025 [population and employment] growth based on Vision 2040 ***might*** look like [emphasis added]." The draft allocations for 2035 are qualified as preliminary because Snohomish County Tomorrow has yet to engage in an official growth targeting exercise and adopt an official growth scenario (scheduled for 2012-2013). Moreover, based on conversations with County and City staff, the City's current zoning has not yet been adjusted to support these draft allocation densities.

Population and employment forecasts developed from the planning efforts cited above are summarized in Table 2-12 and 2-13. Populations for target years 2012 and 2018 were calculated using straight-line interpolation between 2010 and 2025. Populations for target year 2032 were calculated using straight-line interpolation between 2025 and 2035. Historical and projected populations are shown in Figure 2-1.

Table 2-12 Population Forecast

Year	Population	Source
2010	35,836	See Table 2-1
2012	36,895	Interpolation
2018	40,074	Interpolation
2025	43,782	Allocation Process completed in 2006
2032	50,127	Interpolation
2035	52,846	Draft Allocation, Snohomish County Tomorrow, May 2011

Table 2-13 Employment Forecast

Year	Employment	Source
2010	25,933	See Table 2-1
2012	27,615	Interpolation
2018	32,662	Interpolation
2025	38,550	Allocation Process completed in 2006
2032	43,031	Interpolation
2035	44,951	Draft Allocation, Snohomish County Tomorrow, May 2011

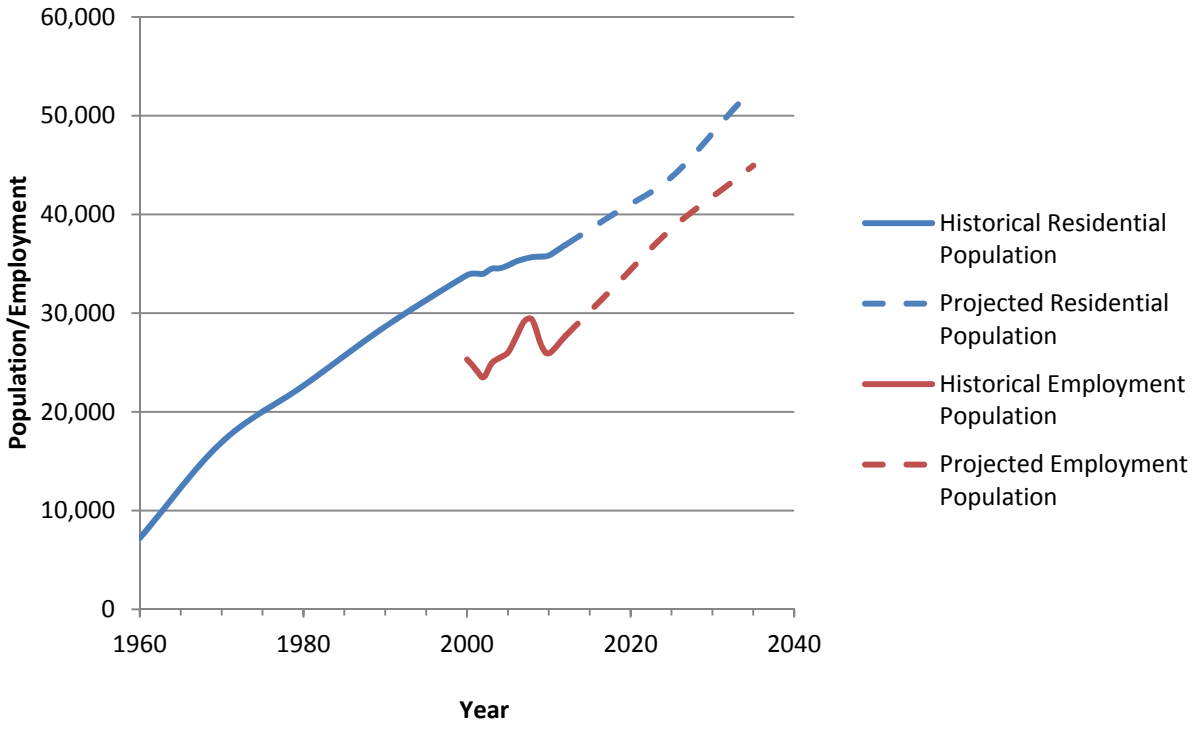

Figure 2-1 Historical and Projected Populations

2.6 Population and Employment Forecasts in Allocation Areas

Population and employment are not projected to grow uniformly throughout the City; five allocation areas have been identified as likely to capture a large percentage of growth. The City has adopted plans to concentrate future development in the City Center and within three nodes along Highway 99. In addition, permits are under review for significant new commercial and residential development at the site of the former Lynnwood High School.

A methodology was developed to take the following planning efforts into consideration:

- Population and employment forecasts for each of the allocation areas have been estimated based on data from adopted planning documents and environmental impact statements.
- Straight line interpolation methods were used to account for an allocation area's capture of overall total city growth.
- The City Center and the nodes along Highway 99 are not currently zoned to support the forecasted population and employment densities; the City plans to adjust zoning in these areas in accordance with adopted sub area plans.

The geographic extent of these allocation areas is shown in Figure 2-2. Table 2-14 illustrates their 2010 distribution of population and employment.

Table 2-14 2010 Population and Employment for Allocation Areas

Allocation Area	Population[(1)]	Percent of Total City Population[(2)]	Estimated Total Employment[(1)]	Percent of Total City Employment[(2)]
City Center	236	<1%	3,748	14%
Former Lynnwood High School Site	0	0%	0	0%
176th Street & Highway 99 Node	1,160	3%	608	2%
188th Street & Highway 99 Node	932	3%	734	3%
196th Street & Highway 99 Node	237	1%	1,357	5%

Notes:
(1) Data Sources: Population for allocation areas: 2010 Census block data, City parcel maps, and aerial photographs. Total employment for allocation areas: Lynnwood 2008-2010 ACS Estimate added to custom Covered Employment estimates as provided by PSRC.
(2) Total City population and employment from Table 2-1.

[INSERT FIGURE 2-1]

Figure 2-2 Population & Employment Allocation Areas

2.6.1 Population and Employment Forecasts in City Center

The Environmental Impact Statement for the City Center Plan forecasts a total of 5,400 residents and 15,000 employees within the City Center by the year 2020. However, based on conversations with City staff, that forecast date has been adjusted to 2025 to account for the slowdown in development due to the recent economic recession. Additional adjustments were made to the 2025 forecast to remove population and employment growth attributed to the "transition area" that was removed from the City Center in 2007 without a subsequent adjustment to the forecasted growth.

Data for target years 2012 and 2018 were calculated using straight-line interpolation between 2010 and 2025. From 2010 to 2025, the City Center is projected to capture 60 percent and 68 percent of the Total City's population and employment growth, respectively. Forecasts for 2032 assume that the City Center will continue to capture growth at these rates.

Population and employment forecasts for the City Center are summarized in Tables 2-15 and 2-16.

Table 2-15 Population Forecast within the City Center

Year	Population	Source
2010	236	2010 Federal Census, American Fact Finder 2, Census Block level data
2012	874	Interpolation
2018	2,789	Interpolation
2025	5,022	City Center Subarea EIS, adjusted to remove "transition area"
2032	8,810	60% of Total City growth from 2010-2025, added to base 2010 population

Table 2-16 Employment Forecast within the City Center

Year	Employment	Source
2010	3,748	2010 Covered Employment Estimate plus 2008-2010 ACS Self-Employment Estimate
2012	4,893	Interpolation
2018	8,327	Interpolation
2025	12,333	City Center Subarea EIS, adjusted to remove "transition area"
2032	15,374	68% of Total City growth from 2010-2025, added to base 2010 employment

2.6.2 Population and Employment Forecasts for Highway 99 Nodes

The Highway 99 Subarea Plan (Subarea Plan) designates three nodes along the Highway 99 corridor where the City would like to concentrate growth. These areas are located at the following intersections:

- 176th Street and Highway 99
- 188th Street and Highway 99
- 196th Street and Highway 99

The Subarea Plan discusses a transit-supportive target residential density of 1,000 dwelling units within a quarter mile of these nodes. The Environmental Impact Statement projects that this target density will be realized by 2025 at the 176th Street Node, while current economic climate and site specific conditions make 2032 a more feasible planning horizon for the 188th Street and 196th Street Nodes. Population for target years 2012 and 2018 were calculated by using straight-line interpolation between the 2010 census estimate and the 2025 population target for the 176th Street Node and between the 2010 census estimates and the 2032 population target for the remaining Nodes. From 2010 to 2025, the 176th Street Node is projected to capture 8 percent of the Total City's population and employment growth; the forecast for 2032 assumes that it will continue to capture growth at this rate.

The current land use composition of each of the Highway 99 nodes is primarily commercial. The Subarea Plan assumes intensification of mixed-use development, which means primarily adding residential capacity. The employment forecasts for the nodes were calculated by assuming that in 2012, 2018, and 2032, each node will continue to capture the same percentage of total City employment that they captured in 2010.

Population and employment forecasts for the Highway 99 nodes are summarized in Tables 2-17 through 2-22.

Table 2-17 Population Forecast at 176th Street and Highway 99

Year	Population	Source
2010	1,160	2010 Federal Census, American Fact Finder 2, Census Block level data
2012	1,245	Interpolation
2018	1,501	Interpolation
2025	1,800	Target density: Adopted Hwy 99 Subarea Plan. Planning horizon: Hwy 99 Final SEIS. Average household size of 1.8: City Center Sub Area Plan.
2032	2,303	8% of Total City growth from 2010-2025, added to base 2010 population

Table 2-18 Employment Forecast at 176th Street and Highway 99

Year	Employment	Source
2010	608	2010 Covered Employment Estimate plus 2008 – 2010 ACS Self-Employment Estimate
2012	648	2% of Total City Employment in 2012
2018	766	2% of Total City Employment in 2018
2025	904	2% of Total City Employment in 2025
2032	1,055	2% of Total City Employment in 2032

Table 2-19 Population Forecast at 188th Street and Highway 99

Year	Population	Source
2010	932	2010 Federal Census, American Fact Finder 2, Census Block level data
2012	1,011	Interpolation
2018	1,248	Interpolation
2025	1,524	Interpolation
2032	1,800	Target density: Adopted Hwy 99 Subarea Plan. Planning horizon: Hwy 99 Final SEIS.(1) Average household size of 1.8: City Center Sub Area Plan

Notes:
(1) Adjusted to 2032 to account for site specific feasibility and current economic conditions.

Table 2-20 Employment Forecast at 188th Street and Highway 99

Year	Employment	Source
2010	734	2010 Covered Employment Estimate + 2008-2010 ACS Self-Employment Estimate
2012	782	3% of Total City Employment in 2012
2018	925	3% of Total City Employment in 2018
2025	1,091	3% of Total City Employment in 2025
2032	1,218	3% of Total City Employment in 2032

Table 2-21 Population Forecast at 196th Street and Highway 99		
Year	**Population**	**Source**
2010	237	2010 Federal Census, American Fact Finder 2, Census Block level data
2012	379	Interpolation
2018	805	Interpolation
2025	1,303	Interpolation
2032	1,800	Target density: Adopted Hwy 99 Subarea Plan. Planning horizon: Hwy 99 Final SEIS.(1) Average household size of 1.8: City Center Sub Area Plan
Notes: (1) Adjusted to 2032 to account for site specific feasibility and current economic conditions.		

Table 2-22 Employment Forecast at 196th Street and Highway 99		
Year	**Employment**	**Source**
2010	1,357	2010 Covered Employment Estimate + 2008-2010 ACS Self-Employment Estimate
2012	1,445	5% of Total City Employment in 2012
2018	1,710	5% of Total City Employment in 2018
2025	2,018	5% of Total City Employment in 2025
2032	2,252	5% of Total City Employment in 2032

2.6.3 Population and Employment Forecasts for Former Lynnwood High School Site

The City is currently in the process of evaluating a proposal to develop the former Lynnwood High School site. Five development alternatives were presented in a pre-draft Environmental Impact Statement memorandum in April 2011.[1] According to the general timeline for the project sponsor's preferred alternative (Alternative 2), a Costco would be developed by the end of 2013 with additional retail, and residential development completed by 2018. The population and employment projections for Alternative 2 are presented in Tables 2-23 and 2-24.

[1] A Final Environmental Impact Statement is anticipated for release in Spring 2012.

Table 2-23 Population Forecast for the Former Lynnwood High School Site		
Year	**Population**	**Source**
2010	0	Site vacant
2012	0	Site currently under development
2018	900	Anticipated project completion: 500 multifamily dwelling units / 500,000sf
2025	900	Additional development capacity not anticipated by current permitting documents
2032	900	Additional development capacity not anticipated by current permitting documents
Notes: (1) Project sponsor's preferred alternative without office.		

Table 2-24 Employment Forecast for the Former Lynnwood High School Site		
Year	**Employment**	**Source**
2010	0	Site vacant
2012	0	Site currently under development
2018	980	Anticipated project completion[2]
2025	980	Additional development capacity not anticipated by current permitting documents
2032	980	Additional development capacity not anticipated by current permitting documents
Notes: (1) Project sponsor's preferred alternative without office.		

2.7 Summary of Population and Employment Forecasts

Figures 2-3 and 2-4 provide a graphical summary of the population and employment forecasts for the City as a whole and for the five allocation areas.

Given the forecast data available from the current planning efforts, and given the interpolation methods used to best approximate growth to target years (2012, 2018, and 2032), the total of population growth within the allocation areas captures the majority of City growth in all target years, and exceeds the total City growth in 2018. The allocation area population growth exceeding the total City growth in 2018 is likely due to inherent discrepancies in population forecasting and that the population forecasting presented in this Plan is the first effort at compiling the subarea plans into a single forecast.

[2] 160,000sf of Costco by 2013, additional 330,000sf retail by 2018, based on 2 employees per 1,000 square feet of retail space.

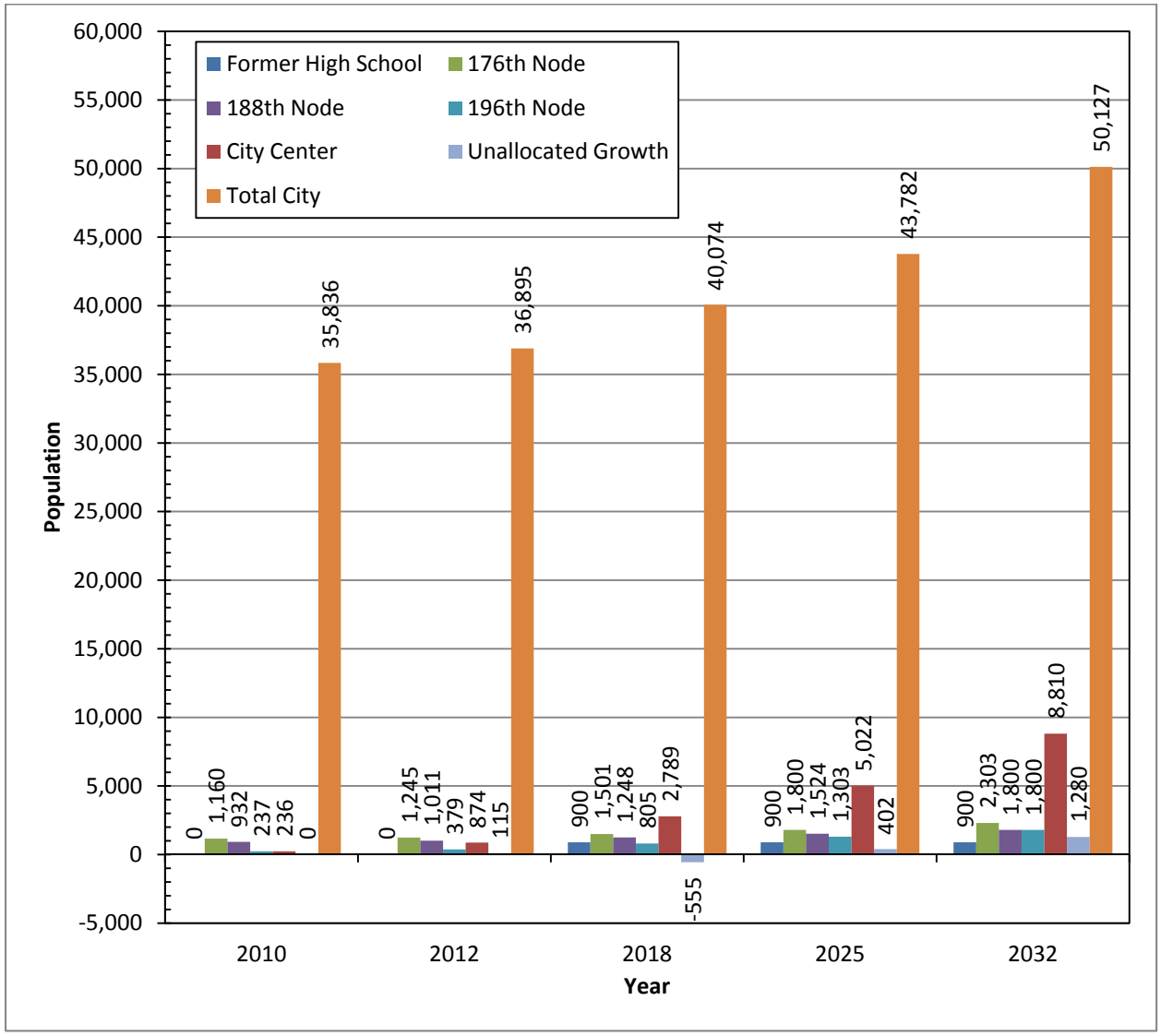

Figure 2-3 Summary of Population Forecasts

The total of employment growth within the allocation areas captures the majority of growth in 2018, and approximately 20 percent and 35 percent of employment growth in 2025 and 2032, respectively.

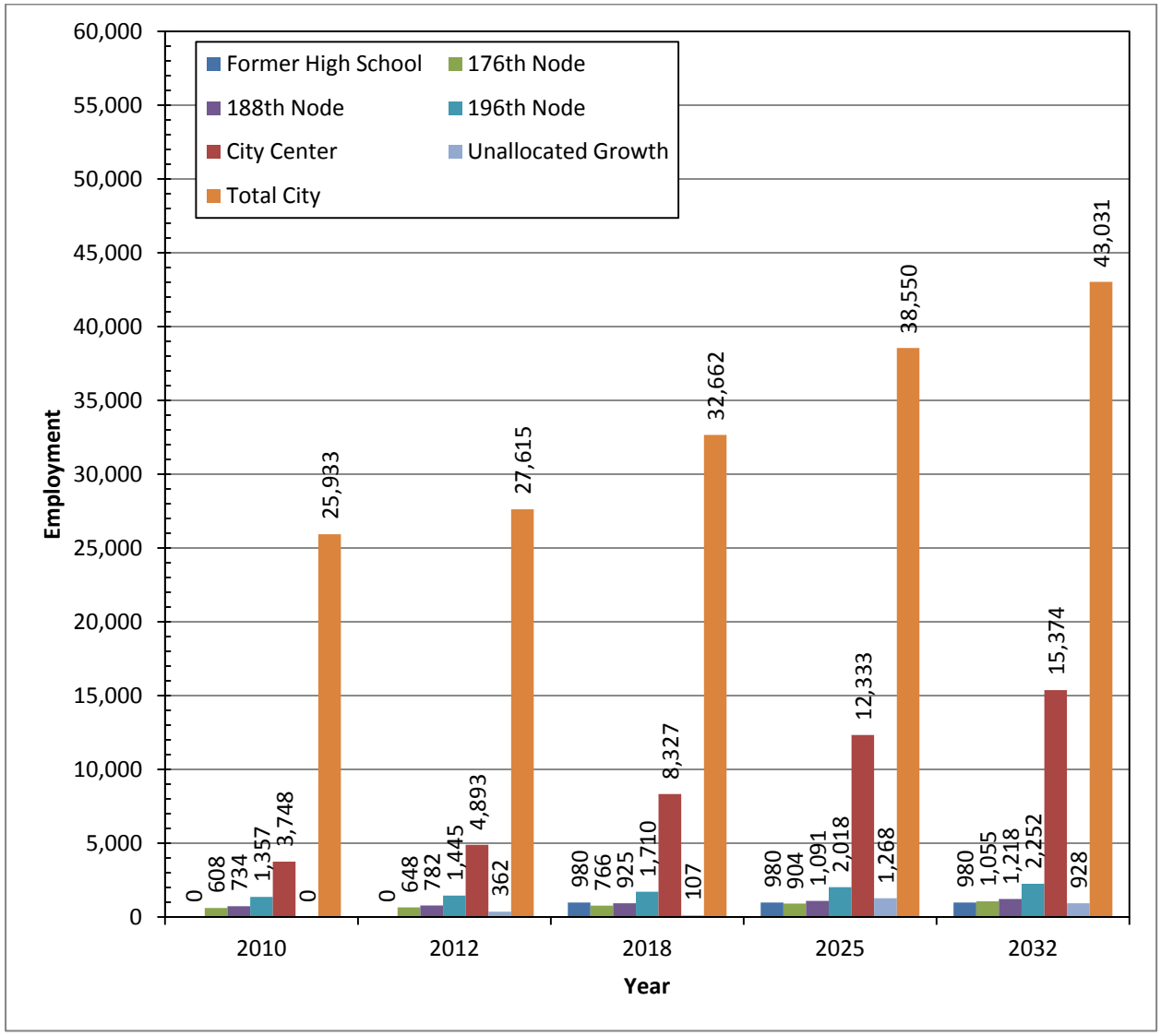

Figure 2-4 Summary of Employment Forecasts

2.8 Water Use Projections

Using the projected City residential populations as shown in Table 2-12, subtracting out the AWWD direct and subtract accounts within the City limits, and assuming the 2010 percentage of residential population for single-family and multi-family occupied residences (see Table 2-2), water use was projected for the City water service area as summarized in Table 2-25. The single and multi family occupied population percentage rates were assumed to remain the same in future forecasting as they were in 2010.

The projected employment population as shown in Table 2-13 was used in Table 2-25, less the AWWD direct accounts.

Table 2-25 Projected Service Area ADD Water Demands (Without Conservation)

Year	Projected Single Family Population	Projected Single Family ERUs[1]	Single Family Residential Water Demand (gpd)[2]	Projected Multi Family Population	Projected Multi Family ERUs[1]	Projected Multi Family Residential Water Demand (gpd)[2]	Projected Employment (from Table 2-13)[3]	Projected Employment Water Demand (gpd)[4]	Water Demand (gpd)	Total Water Demand (gpd)[5]	Non-Revenue Water (gpd)[6]
2012	18,264	6,962	1,227,758	16,242	6,894	769,127	26,242	1,031,586	3,028,470	**3,622,013**	593,543
2018	19,837	7,562	1,333,545	17,642	7,488	835,398	31,289	1,229,985	3,398,929	**4,065,077**	666,149
2025	21,673	8,261	1,456,937	19,274	8,181	912,696	37,177	1,461,446	3,831,078	**4,581,923**	750,845
2032	24,814	9,459	1,668,080	22,067	9,366	1,044,966	41,658	1,637,596	4,350,642	**5,203,315**	852,673

Notes:
(1) Projected ERUs based on 2.62 persons/unit for Single Family and 2.36 persons/unit for Multi Family residences.
(2) Uses 176gpd/ERU for Single Family residences and 112 gpd/ERU for Multi Family residences.
(3) Projected employment subtracts out 1,373 employees from total to account for AWWD direct customers employment population.
(4) Calculated based on average gpd/Employee.
(5) Total of projected water use and lost and unaccounted for water.
(6) Non-revenue water based on 16.4% average loss.
(7) AWWD direct and subtract account populations have been removed/accounted for in the Single Family Occupied Population numbers, as the 2010 % of total population calculation did not include those accounts.

Table 2-26 Projected City Center Water Demand

Year	Population Forecast[1]	Projected Population Water Demand (gpd)[2]	Employment Forecast[3]	Projected Employment Water Demand (gpd)[2]	Total Projected Water Demand (gpd)[4]
2012	874	97,509	4,893	192,346	289,855
2018	2,789	311,160	8,327	327,338	638,498
2025	5,022	560,288	12,333	484,816	1,045,104
2032	8,810	982,903	15,374	604,359	1,587,262

Notes:
(1) Population Forecast based on Table 2-15. Projected population is assumed to be all multi-family units.
(2) Projected Water Use based on 112 gpd/ERU (multi family residential population) and 39 gpd/employee (employment).
(3) Employment Forecast based on Table 2-16.
(4) Without conservation.
(5) No AWWD subtract or direct accounts are in this area; therefore, no deducts have occurred in the forecasts.

Table 2-27 Projected 176th Street and Highway 99 Node Water Demand

Year	Population Forecast[1]	Projected Population Water Demand (gpd)[2]	Employment Forecast[3]	Projected Employment Water Demand (gpd)[2]	Total Projected Water Demand (gpd)[4]
2012	1,245	138,901	648	25,473	164,374
2018	1,501	167,462	766	30,112	197,573
2025	1,800	200,820	904	35,537	236,357
2032	2,303	256,938	1,055	41,473	298,411

Notes:
(1) Population Forecast based on Table 2-17. Projected population is assumed to be all multi-family units.
(2) Projected Water Use based on 112 gpd/ERU (multi family residential population) and 39 gpd/employee (employment).
(3) Employment Forecast based on Table 2-18.
(4) Without conservation.
(5) No AWWD subtract or direct accounts are in this area; therefore, no deducts have occurred in the forecasts.

Table 2-28 Projected 188th Street and Highway 99 Node Water Demand

Year	Population Forecast(1)	Projected Population Water Demand (gpd)(2)	Employment Forecast(3)	Projected Employment Water Demand (gpd)(2)	Total Projected Water Demand (gpd)(4)
2012	1,011	112,794	782	30,741	143,535
2018	1,248	139,235	925	36,362	175,597
2025	1,524	170,028	1,091	42,888	212,915
2032	1,800	200,820	1,218	47,880	248,700

Notes:
(1) Population Forecast based on Table 2-19. Projected population is assumed to be all multi-family units.
(2) Projected Water Use based on 112 gpd/ERU (multi family residential population) and 39 gpd/employee (employment).
(3) Employment Forecast based on Table 2-20.
(4) Without conservation.
(5) No AWWD subtract or direct accounts are in this area; therefore, no deducts have occurred in the forecasts.

Table 2-29 Projected 196th Street and Highway 99 Node Water Demand

Year	Population Forecast(1)	Projected Population Water Demand (gpd)(2)	Employment Forecast(3)	Projected Employment Water Demand (gpd)(2)	Total Projected Water Demand (gpd)(4)
2012	379	42,284	1,445	56,804	99,087
2018	805	89,811	1,710	67,221	157,032
2025	1,303	145,371	2,018	79,329	224,700
2032	1,800	200,820	2,252	88,527	289,347

Notes:
(1) Population Forecast based on Table 2-21. Projected population is assumed to be all multi-family units.
(2) Projected Water Use based on 112 gpd/ERU (multi family residential population) and 39 gpd/employee (employment).
(3) Employment Forecast based on Table 2-22.
(4) Without conservation.
(5) No AWWD subtract or direct accounts are in this area; therefore, no deducts have occurred in the forecasts.

Table 2-30 Projected Former Lynnwood High School Site Water Demand

Year	Population Forecast[1]	Projected Population Water Demand (gpd)[2]	Employment Forecast[3]	Projected Employment Water Demand (gpd)[2]	Total Projected Water Demand (gpd)[4]
2012	0	0	0	0	0
2018	900	100,410	980	38,524	138,934
2025	900	100,410	980	38,524	138,934
2032	900	100,410	980	38,524	138,934

Notes:
(1) Population Forecast based on Table 2-23. Projected population is assumed to bal all multi-family units.
(2) Projected Water Use based on 112 gpd/ERU (multi family residential population) and 39 gpd/employee (employment).
(3) Employment Forecast based on Table 2-24.
(4) Without conservation.
(5) No AWWD subtract or direct accounts are in this area; therefore, no deducts have occurred in the forecasts.

2.8.1 Conservation

The City maintains an ongoing water conservation program in recognition of the significant water demands that population growth are placing on the Puget Sound regional water supply. Efficient use of the existing supply is a central component of sustaining the City's needs. The goal of the conservation program is to eliminate waste and encourage the City's customers to use water wisely, thereby reducing per capita use on a long-term basis.

Table 2-8 indicates water use per ERU has decreased between 2008 and 2011. The reduction from 2008 and 2011 was 8.3 percent. It is believed this reduction is in part due to conservation measures and serves as documentation that the City's conservation efforts are successful.

The City buys City of Everett water through the AWWD. Everett has established the Everett Water Utility Committee (EWUC) to communicate system information and to coordinate activities. The City is a member of EWUC, and thus shares in the system-wide conservation goal, which is to reduce demand by 1.97 MGD by 2012. The City of Everett shows the following forecast for programmatic demand reduction in their 2007 Plan:

Table 2-31 Annual Conservation Goal	
Year	**Annual Reduction Goal**
2007	1.5%
2008	1.4%
2009	1.3%
2010	1.3%
2011	1.3%
2012	1.2%

As conservation methods are implemented (including conservation water pricing, education, indoor and outdoor conservation kits, toilet and washer rebates), a decrease in conservation will be noticed. Estimating out to year 2032, and assuming a continual decline in water use demand, this water system plan assumes annual conservation beginning in 2012 at 1.2 percent and reducing to 0.5 percent in 2032, based on the trend the City of Everett shows in their 2007 Plan. It is possible that more or less savings will be realized within the City's service area; future water system plans will adjust these projections based on actual demand reductions. With this conservation goal, the water demand forecast has been adjusted on a City-Wide basis. The projected demands with conservation accounted for are summarized in Table 2-32.

Table 2-32 Projected Service Area ADD Water Demands (With Conservation)

Year	Projected Single Family Population	Projected Single Family ERUs[1]	Conservation	Projected Single Family Residential gpcd/ERU with Conservation[2]	Projected Single Family Residential Water Demand (gpd)	Projected Multi Family Population	Projected Multi Family ERUs[1]	Multi Family Residential gpcd/ERU with Conservation[2]	Projected Multi Family Residential Water Demand (gpd)[2]	Projected Employment (from Table 2-13)	Projected Employment gpcd/Employee with Conservation[3]	Projected Employment Water Demand (gpd)	Water Demand (gpd)	Total Water Demand (gpd)[5]	Non-Revenue Water (gpd)[4]
2012	18,264	6,962	1.20%	174	1,213,025	16,242	6,894	110	759,898	26,242	39	1,019,206	2,992,129	3,578,549	586,421
2018	19,837	7,562	1.00%	163	1,234,188	17,642	7,488	103	773,155	31,289	36	1,138,344	3,145,686	3,762,202	616,516
2025	21,673	8,261	0.75%	154	1,269,531	19,274	8,181	97	795,296	37,177	34	1,273,460	3,338,287	3,992,550	654,263
2032	24,814	9,459	0.50%	147	1,392,852	22,067	9,366	93	872,550	41,658	33	1,367,397	3,632,799	4,344,783	711,984

Notes:
(1) Projected ERUs based on 2.62 persons/unit for Single Family and 2.36 persons/unit for Multi Family residences.
(2) Conservation based on 176 gpd/ERU Single Family residence and 112 gpd/ERU Multi Family residence.
(3) Conservation based on 39 gpd/Employee.
(4) Non-revenue water based on 16.4% average loss.
(5) Total of projected water use and lost and unaccounted for water.
(6) AWWD direct and subtract account populations have been removed/accounted for in the Single Family Occupied Population numbers, as the 2010 % of total population calculation did not include those accounts.

2.8.2 Peak Water Demand

The City's maximum day demand through the master meter has averaged approximately 1.7 times the average day demand over the last three years. This factor is used to project maximum day demands.

The maximum quantity of water purchased over a one-hour period during a maximum day demand is the peak hour demand. If precise records of peak hour demand are not available, the peak hour demand is often expressed in terms of a peaking factor. A peaking factor is defined as the ratio of peak hour to the maximum day demand. It is generally accepted that peak hour factors range from 1.5 to 2.5. The DOH *Water System Design Manual*, provides a methodology for calculating peak hour demand (PHD). The generalized equation is as follows:

$$PHD = (MDD/1440)[(C)(N) + F] + 18$$

Where:

PHD = *Peak Hourly Demand, (gallons per minute, gpm)*
C= *Coefficient Associated with Ranges of ERUs*
N= *Number of ERUs*
F= *Factor Associated with Ranges of ERUs*
MDD= *Maximum Day Demand, (gpd/ERU)*

The values for C and F of the peak hour demand formula are taken from the DOH *Water System Design Manual*, Table 5-1. C is equal to 1.6 and F is equal to 225. Based on the 2010 maximum day demand and the above formula, the City's maximum day to peak hour factor is approximately 1.62.

The projected average day, maximum day, and peak hour demand for the City through 2032 are summarized in Table 2-34.

Table 2-33 Projected City-Wide Average Day, Maximum Day, and Peak Hour Demand

Year	Projected Average Day Demand (mgd)[(1)]	Projected Maximum Day Demand (mgd)[(2)]	Projected Peak Hour Demand (mgd)[(2)]	Projected Peak Hour Demand (gpm)
2012	3.58	6.08	9.84	6,837
2018	3.76	6.40	10.35	7,188
2025	3.99	6.79	10.98	7,628
2032	4.34	7.39	11.95	8,301

Notes:
(1) Includes conservation
(2) Projected maximum day demand is based on an average day to maximum day peaking factor of 1.70.
(3) Projected peak hour demand is based on a maximum day to peak hour peaking factor of 1.62.

Chapter 3 Water System Analysis

3.1 Objective

Water system planning includes an analysis of a water utility's ability to meet level of service standards for existing and future customers. Standards are presented that identify monitoring, serviceability, design, and construction criteria that are applicable to the City's water system. A water quality analysis examines existing water quality compared to the monitoring standards. Because the City purchases water from the City of Everett via the Alderwood Water and Wastewater District (AWWD), many of the water quality monitoring requirements do not apply. A facility analysis is executed which compares existing system facilities to the serviceability and design and construction standards. Based on these comparisons, water system deficiencies are identified and recommendations are made to alleviate the deficiencies.

3.2 Water System Standards

The City has adopted design, water quality, and construction standards. These standards are summarized in the following sections.

3.2.1 Design Standards

WAC 246-290 contains general criteria and standards that must be followed in the development and maintenance of public water systems. In addition, the Washington State Department of Health (DOH) 2009 Water System Design Manual provides more specific guidance for water system design, including sizing and reliability requirements for source, storage, distribution, and fire flow conditions.

Table 3-1 presents suggested DOH Water System Design Manual standards and the City's policies with regard to each standard.

Table 3-1 General Facility Design Requirements

Standard	DOH Water System Design Manual Criteria (December 2009)	City Standard
Average Day and Maximum Day Demand	Average Day Demand (ADD) should be determined from metered water use data. Maximum Day Demand (MDD) is estimated at approximately 2.0 times the average day demand if metered data is not available. *Chapter 5*	ADD = metered purchased water MDD = metered maximum day purchased water
Peak Hour Demand	Peak hour demand is determined using the following equation: PHD = (MDD/1440)[(C)(N) + F] + 18 C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor of range from DOH Table 5-1 *Chapter 5*	Same as DOH Water System Design Manual.
Reliability Recommen-dations	• Sources capable of supplying MDD within an 18-hour period • Sources meet ADD with largest source out of service • Back-up power equipment for pump stations unless there are two independent public power sources • Provision of multiple storage tanks • Standby storage equivalent to ADD x 2, with a minimum of 200 gpd/ERU • Low and high level storage alarms • Looping of distribution mains when feasible • Pipeline velocities not > 8fps at PHD • Flushing velocities of 2.5 fps for all pipelines *Chapter 5*	Same as DOH Water System Design Manual.
Source	Capacity must be sufficient to meet MDD and replenish fire suppression storage in 72 hours. *Chapter 7*	Same as DOH Water System Design Manual.
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under peak hour demand and 20 psi under fire flow conditions during MDD. *Chapter 8*	Same as DOH Water System Design Manual.
Fire Flow Standard	The minimum fire flow shall be determined by the local fire authority or WAC 246-293/246-290 for systems within a Critical Water Supply Service Area (CWSSA), whichever is greater. *Chapter 8*	The City's fire flow requirements are based on the Insurance Services Office (ISO) Guidelines.

Table 3-1 General Facility Design Requirements

Standard	DOH Water System Design Manual Criteria (December 2009)	City Standard
Minimum Pipe Sizes	The diameter of a transmission line shall be determined by hydraulic analysis. The minimum size distribution system line shall not be less than 6-inches in diameter. *Chapter 8*	Same as DOH Water System Design Manual.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. Fire hydrants should be provided with their own auxiliary gate valve. *Chapter 8*	Valve and hydrant standards are outlined in the City's Standard Plans.
Storage	The sum of: **Operational Storage** Volume sufficient to prevent pump recycling **Equalizing Storage** $V_{ES} = (Q_{PH} - Q_S) * 150$ ***Standby Storage*** $V_{SB} = 2 ((ADD * N) - t_m * (Q_S - Q_L))$ ***Fire Suppression Storage*** $V_{FSS} = NFF * T$ and ***Dead Storage*** Where: ADD = average day demand, gpd/ERU N = number of ERU's Q_{PH} = peak hour demand, gpm Q_S = capacity of all sources, excluding emergency sources, gpm Q_L = capacity of largest source, gpm t_m = daily pump source run time, min (1440) NFF = needed fire flow, gpm T = fire flow duration, min (Chapter 9)	Same as DOH Water System Design Manual.

3.2.2 Standard Construction Plans

Standard construction plans set forth the actual materials and construction standards that contractors, developers, and the City must follow when constructing water system facility improvements. Standard construction plans for the City are included in Appendix D.

3.2.3 Water Quality Parameters

The City is classified as a Group A public water system and is required to comply with applicable DOH requirements. The DOH defines maximum contaminant levels (MCL's) for water systems. Constituents that require monitoring and the MCL's are listed in WAC 246-290-300 and 246-290-310.

The City of Everett is responsible for testing and treating the water that is purchased by the City via AWWD. The City is responsible for the distribution system monitoring that is outlined in WAC 246-290-300, that includes coliform sampling, disinfection byproduct sampling, residual disinfectant sampling, and lead and copper monitoring. Those tests are described below.

3.3 Water Quality Analysis

This section summarizes an evaluation of the City's efforts to comply with the required water quality regulations and testing requirements. The City provides a Water Quality Report to its customers annually. A copy of the City's 2011 Water Quality Report (year 2010 data) is located in Appendix G.

3.3.1 Bacteriological

The City takes coliform samples in accordance with the Coliform Monitoring Plan, which is included in Appendix E. The City currently takes 40 coliform samples each month, 21 of which are taken on the first Tuesday of the month and 19 of which are taken on the second Tuesday of the month. The City has had 4 positive coliform samples since 2007. All repeat samples were negative for coliform.

3.3.2 Residual Disinfectant

The City monitors for residual disinfectant daily at the Spruce Way PRV station. In the past 6 years, the City has never had a sample where chlorine residual was not detected. The City has recorded residual disinfectant concentrations since February 2002. Residual disinfectant sampling data is included in Appendix F and summarized in Table 3-2.

3.3.3 Disinfectants/Disinfection By-Products Rule (DBPR)

Disinfection byproducts (DBP) result from the reaction of disinfectants such as chlorine and chloramines with traces of organic compounds in the drinking water. Some common DBP are chloroform, dichloromethane, halogenated acetic acids, and other halogenated organic compounds. The risks that are posed by DBP range from increased risk of cancer to neurological damage and damage to major organ systems.

The City tests for DBP four times each quarter. The results are summarized in Table 3-2.

3.3.4 Fluoride Monitoring

Fluoride levels are monitored by the City of Everett and reported on in the City's Water Quality report. The results are summarized in Table 3-2 and included as Appendix G.

3.3.5 Water Quality Sampling Results

Table 3-2 summarizes the City's water quality results from 2010.

Table 3-2 Water Quality Results

Parameter	Units	Ideal Level/Goal (MCLG)	Maximum Allowable (MCL)	Range	Average Value	Comply?
Nitrate	ppm	10	10	<0.100–0.114	<0.080	Yes
Total Coliform Bacteria	% positive	0	5% positive per month	0-1.6%	n/a	Yes
Fluoride	ppm	2	4	0.7–1.1	0.9	Yes
Residual Disinfectant Level (free chlorine)	ppm	4.0 (MRDLG)	4.0 (MRDL)	0.1-1.0	0.6	Yes
Haloacetic Acids (5)	ppb	N/A	60	22.6-45.6	33.3	Yes
Total Trihalomethanes	ppb	N/A	80	27.3-44.0	35.6	Yes

3.3.6 Lead and Copper

The City participates in the Everett Regional Lead and Copper Rule Monitoring Program. The purpose of the Program is to help fulfill the monitoring, notification, and treatment optimization in accordance with the EPA Lead and Copper Rule. This Program allows data to be collected using similar protocols for the entire City of Everett water service area.

The City tests for lead and copper every three years. In 2009, the City took samples at six locations. The results for the City's lead and copper sampling are summarized in Table 3-3.

Table 3-3 City of Lynnwood 2009 Lead and Copper Sampling Results

Action Level	State Reporting Level	90th Percentile Concentration, mg/L	Sample Location	Action Level Exceeded?
Lead				
0.015 mg/L	0.002 mg/L	<0.0005	17629 54th Ave W	No
		0.0005	3912 172nd St SW	No
		0.0007	18632 70th Ave W	No
		0.0009	4520 180th Pl SW	No
		<0.0005	17414 44th Ave W	No
		0.0011	7028 168th St SW	No
Copper				
1.3 mg/L	0.2 mg/L	0.0216	17629 54th Ave W	No
		0.0488	3912 172nd St SW	No
		0.0447	18632 70th Ave W	No
		0.0569	4520 180th Pl SW	No
		0.0306	17414 44th Ave W	No
		0.0272	7028 168th St SW	No

As shown in Table 3-4, the City's 90th percentile concentration has not exceeded the action level for lead or copper in 2009.

3.3.7 City of Everett Water Quality Monitoring Results

A detailed review of the water quality of the City of Everett public drinking water system is provided in the City of Everett 2007 Comprehensive Water Plan.

3.4 System Component Analysis

3.4.1 Source of Supply Analysis

A description of the City's source of supply was presented in Chapter 1. In compliance with DOH Design Standards, source production capacity must be sufficient to supply maximum day demands. Maximum day and average day demands must also comply with the maximum instantaneous and maximum annual withdrawal limitations of associated water rights. The City does not own their water source and consequently does not hold any water rights. The City's entire water supply is obtained from AWWD that in turn purchases water supply from the City of Everett.

The source of supply analysis is based on source availability and reliability. The path of water from the City of Everett, to AWWD, and then to the City is as follows:

- City of Everett water supply originates in the Sultan River Basin and is stored in the Lake Chaplain Reservoir.
- From the Lake Chaplain Reservoir, water is treated at Everett's Water Filtration Plant and then pumped through the southern pipeline corridor to the City of Everett 20 MG Reservoir No. 3.

- From Reservoir No. 3, water is pumped by an AWWD pump station through two 30-inch transmission lines to the three AWWD reservoirs (total capacity 76 MG) located just north of the Lynnwood city limits.
- From the reservoirs, the water either flows by gravity through 30 and 24-inch mains to the City's master meters or is pumped into the AWWD's standpipes which serve the City's 724 Zone.

The Lynnwood/AWWD agreement states that up to 10 mgd is available to the City through the master meter. This does not include serving the City's 724 Zone, as that zone is fed directly by AWWD. To determine total projected maximum day demand purchase from AWWD, in accordance with the Department of Health (DOH) 2009 Water System Design Manual, the maximum day demand (MDD) from the 573 Zone was considered, along with the peak hour demand (PHD) from the closed 635 and 680 Zones. A closed zone is defined as a zone with no storage.

Table 3-4 provides a comparison between the available supply through the master meter and the projected peak day purchase.

Table 3-4 Source Capacity Analysis

Year	Projected Maximum Day Demand Purchase[(1)] (mgd)	Available Source Capacity through the Master Meter (mgd)	Source Capacity Surplus/(Deficit) (mgd)
2012	6.55	10.0	3.45
2018	6.88	10.0	3.12
2025	7.30	10.0	2.70
2032	7.95	10.0	2.05

Notes:
(1) Projected demand includes 573 Zone MDD, 680 Zone PHD and 635 Zone PHD

As shown in Table 3-6, based on the projected peak day purchase requirements, the existing Lynnwood/AWWD supply agreement is adequate to meet future purchase requirements through 2032.

Source Reliability

Source reliability is an important component of the source of supply analysis. Since the City receives its water supply from the City of Everett, a wellhead protection program or watershed control program is not required as a part of the Water System Plan.

3.4.2 Storage Analysis

The City owns and operates two storage reservoirs that provide storage for the City's 573 Zone. The usable storage capacity of the two reservoirs totals 5.77 MG. Each has an overflow elevation of 573 feet. Storage capacity from the 573 Zone reservoirs is available to the City's 680 Zone via the 680 Zone booster station. The City does not own storage facilities that serve the City's 635 Zone. This Zone is fed directly through the master meter, which draws water from the AWWD 635 Zone reservoirs. The City's 724 Zone is served directly from AWWD's 724 Zone reservoirs.

Storage requirements for the City are determined by applying the design standards outlined in the Department of Health Group A Water System Design Manual, December 2009. The storage volume recommended according to this guidance document is based on the sum of the following:

- Operational Storage
- Equalizing Storage
- Standby Storage
- Fire Suppression Storage
- Dead Storage (if any)

Operational Storage

Operational storage is the volume of the reservoir devoted to supplying the water system while, under normal operation conditions, the source(s) of supply are in "off" status. This volume is dependent upon the sensitivity of the reservoir water level sensors and the tank configuration necessary to prevent excessive cycling of source pump motors. Operational storage is in addition to other storage components, thus providing a factor of safety for equalizing, standby, and fire suppression components.

The City has indicated that the water level in their 573 Zone reservoirs varies by approximately 10 feet during normal operation. Based on a 10-foot draw down in each reservoir, plus one foot of freeboard, the current operational storage component of the City's reservoirs is approximately 1,470,000 gallons.

Equalizing Storage

Equalizing storage is typically used to meet diurnal demands that exceed the average day and maximum day demands. The volume of equalizing storage required depends on peak system demands, the magnitude of diurnal water system demand variations, the source production rate, and the mode of system operation. Sufficient equalizing storage must be provided in combination with available water sources and pumping facilities such that peak system demands can be satisfied.

Equalizing storage is calculated using the following equation:

$$ES = (PHD - Q_S)(150 \text{ minutes})$$

Where:

ES = Equalizing storage (gallons)
PHD = Peak hourly demand (gpm)
Q_S = Total source of supply capacity, excluding emergency sources (gpm)

The total source of supply capacity for the City's 680 and 573 Zones is 10.0 mgd, or 6,944 gpm. For this storage analysis, it is assumed that approximately 82 percent of the 10.0 mgd is available to the 680 and 573 Zones. This is based on a meter count within the City's Service Area, and the number of meters within these two zones. Peak hour demand is discussed in Chapter 2. The equalizing storage requirement for the City is shown in Table 3-5.

Standby Storage

Standby storage is provided to meet demands in the event of a system failure such as a power outage, an interruption of supply, or break in a major transmission line. The amount of standby storage should be based on the reliability of supply and pumping equipment, standby power sources, and the anticipated length of time the system could be out of service.

Standby storage is calculated using the following equation:

SB_{TSS} = (2 days)(ADD)(N)

Where:

- SB_{TSS} = Total standby storage for a single water source (gallons)
- ADD = Average day demand for the design year (gpd/ERU)
- N = Number of ERUs

Standby storage is not shown in Table 3-5, as the City's standby storage component is met by AWWD. Per the AWWD 2009 Water Comprehensive Plan Summary, page 42 (included as Appendix I), "At the system-wide level, the evaluation shows the District's existing storage facilities are adequate to meet projected needs beyond 2028, including provision of standby storage for the City of Lynnwood." The City considers AWWD storage as part of their system. In conversations with AWWD, it was reiterated that AWWD allows the City to use as much water as necessary, for storage as well as fire flow and daily demands. No storage agreement exists between AWWD and the City, as verified by AWWD as well as DOH.

Fire Suppression Storage

Fire suppression storage is provided to ensure that the volume of water required for fighting fires is available when necessary. Fire suppression storage also reduces the impact of fire fighting on distribution system water pressure. The amount of water required for firefighting purposes is specified in terms of rate of flow in gallons per minute (gpm) and an associated duration. Fire flow must be provided at a residual water system pressure of at least 20 pounds per square inch (psi).

Fire suppression storage is calculated using the following equation:

FSS = (FF)(t_m)

Where:

- FSS = Required fire suppression storage (gallons)
- FF = Required fire flow rate, as specified by fire protection authority or under WAC 246-293-640, whichever is greater (gpm)
- t_m = Duration of FF rate, as specified by fire protection authority or under WAC 246-293-640, whichever is greater (minutes)

Fire suppression storage for the City's 573 Zone is based on a maximum fire flow requirement of 6,000 gpm for 6 hours, or 2.16 MG, which is the fire flow requirement for the Alderwood Mall. The 680 Zone consists of single-family residences for which the City needs to provide 1,000 gpm for 1 hour.

Nesting: The standby storage component or the fire suppression storage component, whichever volume is smaller, can be excluded from a water system's total storage requirement provided that such practice is not prohibited by: (1) a locally developed and adopted Coordinated Water System Plan, (2) local ordinance, or (3) the local fire protection authority or

County Fire Marshal (reference WAC 246-290-235(4)). This practice is referred to as "nesting" and has been implemented in the storage analysis for this Plan. Therefore, fire suppression storage is not shown in Table 3-5**.**

Dead Storage

Dead storage is the volume of stored water not available to all customers at the minimum design pressure in accordance with WAC 246-290-230(5) and (6). Dead storage is excluded from the volumes provided to meet the other storage requirements.

The highest water service connection served by the 573 Zone reservoirs is at approximately 490 feet. The base of the 3.0 MG 573 Zone reservoir is at 535.7 feet; the base of the 2.77 MG 573 Zone reservoir is at 532.7 feet. Therefore, approximately 0.3 feet in the 3.0 MG reservoir and approximately 3.3 feet in the 2.77 MG reservoir are considered unusable to meet the minimum 20 psi requirement. This equates to a total dead storage volume of approximately 262,580 gallons. This volume is added to the total required storage in the 573 Zone.

Storage Analysis

Table 3-5 680 and 573 Zone Storage Analysis

Year	Operational Storage (MG)	Equalizing Storage (MG)	Dead Storage (MG)	Total Required (MG)[(1)(2)]	Storage Surplus or Deficit (MG)
2012	1.47	0.20	0.26	1.93	3.58
2018	1.42	0.25	0.26	1.93	3.58
2025	1.35	0.32	0.26	1.93	3.58
2032	1.25	0.42	0.26	1.93	3.58

Notes:
(1) Fire Suppression Storage not included in Total Required Storage, as FSS is nested with standby storage and SS volume exceeds the FSS volume.
(2) Standby Storage is not shown in the Total Required volume, as it is completely supplied by AWWD.
(3) Total available City storage is 5.51 MG, which is the total volume of the tanks (5.77 MG less the Dead Storage (0.26 MG).

As shown in Table 3-5, the City has adequate storage for the 573 and 680 Zones, assuming AWWD provides standby storage.

The City could add storage to meet the standby storage requirements for the 680 and 573 Zones on their own; however, this would be a costly solution, and also could promote water quality issues due to chlorine residual and water age. Therefore, the City should maintain the use of AWWD standby storage as is currently practiced, but it is recommended that the City obtain a written standby storage agreement with AWWD.

The 635 and 724 Zones were not analyzed for storage, as they are both part of larger AWWD zones. Both the 635 and 724 Zones were included in the AWWD 2009 Water System Plan storage analyses, and that Plan indicates that AWWD has adequate storage capacity through 2032, including those City customers in the 635 and 724 Zones.

3.4.3 Booster Pump Station Analysis

The City owns and operates one booster station that supplies water to the City's 680 Zone, which is a closed zone. This booster station pumps water from the 573 Zone reservoirs to a residential area surrounding the reservoirs. Check valves, which isolate the 680 Zone piping from the 635 Zone piping, allow flow from the 635 Zone to the 680 Zone in the event of a fire in the 680 Zone when the booster pumps cannot meet demand. The 680 Zone booster station consists of three 85-gpm pumps.

According to the 2009 DOH Water System Design Manual, a closed system booster pump station must be capable of providing peak hour demand for the specific pressure zone. For reliability purposes, DOH recommends that this capability be provided with the largest pump out of service. A closed system booster pump station must also be capable of meeting maximum day demand plus fire flow requirements.

The 680 Zone serves 181 meters, based on a GIS meter count. Assuming that each meter serves one ERU, there are 181 ERUs in the 680 Zone. These customers, based on Zoning, are primarily single family residences. The projected peak hour demand for the 680 Zone is based on a 2010 value of 176 gpd/ERU, considers conservation for future projections, and a peaking factor of 1.70, which were established in Chapter 2. It is assumed that the 680 Zone is "built-out" and minimal change to the customer base will occur in the future. A 2.89 PHD factor was calculated, assuming only 680 Zone ERUs.

The projected peak hour demand in the 680 Zone is compared to the capacity of the 680 Zone booster station in Table 3-6.

Table 3-6 680 Zone Booster Pump Station Analysis

Year	Projected Peak Hour Demand in 680 Zone (gpm)[(1)]	680 Zone Booster Pump Station Capacity with Largest Pump Out of Service (gpm)	680 Zone Booster Pump Station Capacity Surplus/(Deficit) (gpm)
2012	108	170	62
2018	101	170	69
2025	95	170	75
2032	91	170	79

Notes:
(1) Projected Peak hour demand decreases due to conservation estimates on water usage per ERU.

As shown in Table 3-6, the 680 Zone booster station has adequate capacity to meet projected peak hour demand in the 680 Zone through 2032 with the largest pump out of service.

The booster pump does not have an emergency generator. However, the 680 zone is connected to the 635 zone in such a way that if pressure in the 680 zone falls below the 635 zone, water can flow from the 635 zone to the 680 zone through piping equipped with check valves that only allow flow from the 635 to 680 zone. Therefore, a standby power system is not needed to maintain a minimum system pressure of 30 psi.

3.4.4 Distribution System Hydraulic Analysis

The development of a computer hydraulic model, which can accurately and realistically simulate the performance of a water distribution system under a variety of conditions and scenarios, has become an increasingly important element in the planning, design, and analysis of municipal water systems. The Washington State Department of Health's WAC 246-290 requires hydraulic modeling as a component of water system plans.

Hydraulic Modeling Software

The City's water system was analyzed using Innovyze's Infowater hydraulic modeling software, which operates in a Geographical Information System (GIS) platform. The distribution system hydraulic model (model) was created by importing the City's previous H2ONet model into InfoWater software and updating the model's representation of the City's distribution system and system demands.

The Infowater model is configured with a graphical user interface. Each distribution system element, including pipes, valves, pumps, and reservoirs, is assigned a unique graphical representation within the model. Each element is assigned a number of attributes specific to its function in the actual water system. These model elements include spatial coordinates, elevation, water demand, pipe lengths and diameters, pressure settings for pressure reducing valves, and critical water levels for reservoirs. With attributes of each system element as the model input, the Infowater software calculates model output in the form of flow and pressure throughout the simulated distribution system.

Model Assumptions

Prior to calibration of the hydraulic model, the layout of the water system was reviewed and updated within the model. Lengths, diameters, and connection points of system piping were checked using an updated GIS database representing the water system. The locations of normally closed valves, check valves, and pressure reducing valves (PRVs) were identified in the GIS database, while the critical elevations of the City's reservoirs were taken from the City's SCADA system settings. Assumptions regarding the modeling of the City's water sources, system demands, and the settings of PRVs are included in the following sections.

Source

The City is supplied fully by AWWD. During typical daily operation, water enters the City through master meters located at 164th Street SW and Spruce Way. In addition to the water supplied through the master meters, the City's 724 pressure zone is supplied directly from AWWD's 724 zone storage reservoirs.

Booster Stations

The City's only booster pump station has been included in the hydraulic model. Pump curves have been assigned to each pump based on data obtained from the City. The booster station provides daily demands to the 680 Zone, but does not provide fire flow. Fire flows in the 680 Zone are supplied by the 635 Zone via check valves located at the 680/635 zone boundary. As the 680 Zone gradient falls during a fire flow demand, the check valves open and 635 zone water is supplied to the 680 zone.

Pressure Reducing Valves

The City has three PRV stations within their water system. One PRV station is located in a vault at 173rd Street SW and Spruce Way on the 24-inch CCP main. This station consists of two parallel 16-inch pressure reducing, pressure sustaining valves. One valve is set to maintain a

downstream hydraulic gradeline of approximately 573 feet; the second valve is set to maintain a downstream hydraulic gradeline of approximately 560 feet. The second PRV station is located at 195th Street SW and 40th Avenue W. This station contains a 6-inch and a parallel 2-inch PRV, installed on an 8-inch cast iron main. Both of these PRV stations provide flow from the 635 Zone to the 573 Zone. The third PRV is located at 166th Pl SW and 44th Ave W. This PRV is normally closed. The pressure setting at this PRV Station is purposefully set lower to supply only fire flows to this portion of the 635 zone from the 724 Zone. The pressure setting on this PRV station does not allow supply for daily domestic demands.

System Demands

A key element in the hydraulic modeling process is the distribution of demands throughout the water system. Total average and peak domestic demands experienced by the distribution system are based on the existing and projected demands developed in Chapter 2. Existing demands were distributed throughout the water system according to billing records provided by the City. The City's GIS database includes water meters with associated account numbers. The City's water consumption data was applied to model nodes according to water meter locations/account numbers.

Ten demand scenarios were used in the hydraulic analysis:

- 2010 Average Daily Demands: These demands were used while calibrating the model.
- 2012 Average Day Demands: These demands were used to evaluate maximum pressures in the distribution system for the base year.
- 2012 Peak Hour Demands: These demands were used to verify the system is able to meet the DOH standard to supply domestic water at a minimum system wide pressure of 30 psi for the base year.
- 2012 Maximum Day Demands: These demands were used to evaluate the system's ability to meet the maximum day demand plus required fire flows at DOH's minimum residual pressure criteria of 20 psi for the base year.
- 2018 Average Day Demands: These demands were used to evaluate maximum system pressures within the 6-year planning period.
- 2018 Peak Hour Demands: These demands were used to verify the system is able to meet the DOH standard to supply domestic water at a minimum system wide pressure of 30 psi within the 6-year planning period.
- 2018 Maximum Day Demands: These demands were used to evaluate the system's ability to meet the maximum day demand plus required fire flows at DOH's minimum residual pressure criteria of 20 psi within the 6-year planning period.
- 2032 Average Day Demands: These demands were used to evaluate maximum system pressures within the 20-year planning period.
- 2032 Peak Hour Demands: These demands were used to verify the system is able to meet the DOH standard to supply domestic water at a minimum system wide pressure of 30 psi within the 20-year planning period.
- 2032 Maximum Day Demands: These demands were used to evaluate the system's ability to meet the maximum day demand plus required fire flows at DOH's minimum residual pressure criteria of 20 psi within the 20-year planning period.

Model Calibration

The calibration of a hydraulic model provides a measure of assurance that the model is an accurate and realistic representation of the actual system. The hydraulic model of the City's water system was calibrated using flow and pressure data obtained by the City, from hydrant

tests performed at various locations throughout the system. The purpose of conducting hydrant tests is to identify the water system's response in terms of pressure drop, to a high (fire flow) demand located at a specific point, then adjust model parameters to replicate the flow-pressure relationship recorded in the field. Six hydrant tests were conducted in November 2011. During these tests, static and residual pressures were recorded as City staff opened hydrants and recorded the flow. Field results were used to calibrate the hydraulic model through verification and adjustment of pipe type, sizes, roughness coefficients, and elevations.

The testing locations include five points within the 573 pressure zone and a single location within the 635 pressure zone. A description of each testing location is presented in Table 3-7.

Table 3-7 Hydrant Testing Locations

Test Number	Pressure Zone	Testing Location
1	573	163rd Pl SW and 66th Avenue W
2	573	165th Pl SW and 64th Avenue W
3	573	Hurst Road North of 186th Pl SW
4	573	210th St SW and 54th Avenue W
5	635	182nd Pl SW and 32nd Avenue W
6	573	Dale Way and 61st Pl W

The hydraulic model was used to generate static pressure and residual pressure at the measured hydrant flow rate. The total system demand at the time of the hydrant tests was assumed to be the average day demand for 2010. Model output was generated at points in the model equivalent to the locations of the hydrant tests.

Model output for static pressure was generated by running the model at 2010 average day demands. Model output for residual pressure was generated at each hydrant test location by placing an added demand equal to the measured hydrant flow rate and recording the resulting pressure.

System pressures and pipe flow rates determined in the hydraulic analysis are closely related to the friction loss characteristics (Hazen Williams 'C' values) established for each pipe. The friction losses occurring in lengths of pipe and various fittings are accounted for in the hydraulic model, using 'C' values. Friction losses through valves are typically accounted for separately by assigning minor loss coefficients to each valve. The 'C' values assigned to the pipes in the modeled system are adjusted throughout the calibration process until model output best approximates the measured values. 'C'- values between 110 and 140 are used throughout the system. These friction factors are typical values for most pipe and are representative of 'C' values for similar pipe types and ages throughout the country.

Upon completion of the calibration analysis a model calibration technical memorandum was produced, which provides details of the calibration process and interpretation of the results. This calibration memorandum is included in Appendix I.

Model Input

Model operational settings have significant impacts on the ability of the distribution system to meet peak hour demand and fire flow performance criteria. Table 3-8 shows the reservoir levels modeled for each scenario. During peak hour demand scenarios, the 573 Zone reservoir levels have been depleted of all operational storage, and the AWWD 635 Zone reservoirs are depleted of operational, demand management, and equalizing storage. During fire flow scenarios, operational and fire suppression storage has been removed from the 573 Zone reservoirs, and operational, demand management, and equalizing storage has been depleted from the AWWD 635 Zone reservoirs.

Table 3-8 Reservoir Levels

Scenario	573 Zone Reservoirs Levels (feet)	AWWD 635 Zone Reservoirs (feet)
Peak Hour Demand	562.0	629.0
1,000 gpm Fire Flow	560.5	629.0
3,000 gpm Fire Flow	558.3	629.0
5,000 gpm Fire Flow	551.6	629.0
6,000 gpm Fire Flow	547.1	629.0

The pressure reducing valve station at 173rd Street SW and Spruce Way is set at 563 feet, with the pressure sustaining feature set at 40 psi. The pressure reducing valve at 195th Street SW and 40th Avenue W. is set at 560 feet.

Peak Hour Demand Modeling Results

According to WAC 246-290, a water system must maintain a minimum pressure of 30 psi in the distribution system under peak hour demand conditions. The City's existing distribution system has been modeled under 2018 and 2032 peak hour demand conditions. Table 3-9 lists the minimum pressures seen in the distribution system under 2018 and 2032 peak hour demand. Results for the entire system are included in Appendix I.

Table 3-9 Lowest System Pressures under Peak Hour Demand Conditions, Existing System

Node Number	Zone	Minimum Pressure Under 2018 Peak Hour Demand	Minimum Pressure Under 2032 Peak Hour Demand
J730	635	26.33	26.28
J436	635	27.18	26.44
J408	635	28.23	28.10
J404	635	28.66	28.53
4756	635	28.81	28.54
4758	635	29.09	28.96
J406	635	29.09	28.96
1582	635	29.64	28.72
1580	635	30.08	29.19
4744	635	30.10	29.51

Table 3-9 Lowest System Pressures under Peak Hour Demand Conditions, Existing System

Node Number	Zone	Minimum Pressure Under 2018 Peak Hour Demand	Minimum Pressure Under 2032 Peak Hour Demand
4784	635	30.29	30.24
1588	635	30.87	29.94
1586	635	31.46	30.53
4746	635	31.50	30.82
J594	635	31.92	31.92
J332	635	32.26	31.21
1626	635	32.55	31.31
1584	635	32.64	31.72
J336	635	33.05	31.98
1510	635	33.18	32.97
1578	635	33.24	32.36
1516	635	33.58	33.21
1590	635	33.64	32.69
1514	635	33.75	33.40
1622	635	33.84	32.59
1508	635	33.89	33.72
1512	635	33.93	33.66
J334	635	34.26	33.20
J340	635	34.33	33.25
J306	635	34.38	33.07

As shown in Table 3-9, the majority of pressures in the City's distribution system are at or above the minimum 30 psi requirement under PHD conditions. However, under the 2018 PHD condition there are eight nodes that exhibit deficient pressures. An additional three (eleven total) nodes have deficient pressures under 2032 PHD conditions. All of the nodes shown in Table 3-9, with the exception of three, are in the 635 Zone. The nodes with deficient pressures are located within two general areas within the 635 zone. The first area is the area bracketed by Spruce Way and 36th Ave W between 177th Pl SW and 173rd Pl SW and the second is located west of 36th Ave W between 180th Pl SW and 186th Pl SW. The pressures in these areas are dependent on the level in the AWWD 635 Zone reservoirs, head loss due to pipe velocity, as well as the setting of the pressure sustaining pilot in the PRV station on 173rd Street SW and Spruce Way. Model runs indicate that at high demands, flows through the pressure reducing valves and pressures in the 635 Zone are very sensitive to the setting of the pressure sustaining pilot.

Fire Flow Modeling Results

The DOH 2009 Water System Design Manual states that a water system should be designed to provide adequate fire flow under peak day demand conditions, while maintaining a minimum system pressure of 20 psi. The City has also indicated that a maximum pipe velocity of 10 feet per second (fps) should be used for design purposes. Fire flow analysis was completed using the existing water system piping. Fire flow demands were modeled at hydrant locations throughout the City's water system. At locations that require large fire flows (e.g. greater than

3,000 gpm) the fire flow conditions were modeled manually. This allows the larger fire flow demands to be distributed between multiple hydrants. Table 3-10 lists locations in the City with high fire flow demand requirements and the available fire flow at those locations under 2032 peak day demand.

Table 3-10 Available Fire Flow under 2032 Peak Day Demand Conditions Without System Improvements

Location	Required Fire Flow(1) (gpm)	Residual Pressure at Fire Flow Node (psi)	Minimum System Pressure (psi)	Velocities Exceeding 10 fps
Alderwood Mall - Alderwood Mall Blvd. & Poplar Way	6,000	23.39	11.85	Yes
Future Costco Site – 182nd Pl SW and 32nd Ave W	6,000	Negative	Negative	Yes
Fred Meyer – 196th St SW and 44th Ave W	6,000	39.83	27.26(2)	None
Cedar Valley Elementary - 196th St SW & 56th Ave W	5,000	47.72	27.64(2)	Yes
Scriber Lake High School - 206th St SW & 52nd Ave W	3,000	54.83	27.97(2)	Yes
South Snohomish Christian School - 180th St SW & 64th Ave. W	3,000	34.28	28.02(2)	None
196th & Highway 99	3,000	62.14	28.00(2)	None
208th St SW & Highway 99	3,000	58.18	28.33(2)	None
Group Health – 202nd Pl SW & 54th Ave W	3,000	60.69	28.31(2)	Yes
Lynndale Elementary School - 192nd St SW & 72nd Ave W	3,000	21.66	28.34(2)	Yes

Notes:
(1) Notes: Multiple hydrants were flowed simultaneously to meet the fire flow requirements.
(2) Minimum pressures located adjacent to 36th Ave W and east of Spruce way near 173rd St SW are a result of tank elevation and result in pressures less than 30 psi during non-fire flow MDD conditions.

Available fire flows were also evaluated system wide under 2018 and 2032 peak day demands. The results of these analyses are included in Appendix I.

As shown in Table 3-10 and on Figure N-1, there are locations within the City's water distribution system that cannot meet fire flow requirements. The deficiencies are generally found in locations that have large fire flow demand requirements. In general the system deficiencies can be resolved with fairly simple improvements to the water system. These improvements include upsizing mains and providing new mains to provide looping for existing dead-end mains. In some locations more significant improvements are required.

Appendix I and on Figure N-1 show that there are locations throughout the distribution system, primarily dead-end residential 4-inch and 6-inch water mains with hydrants, that are not able to meet the minimum residential fire flow requirement of 1,000 gpm. Various pipe improvement projects are identified in Chapter 6, Capital Improvement Program, which replace undersized water mains with 8-inch pipe, thereby resolving the identified deficiencies.

3.5 Summary of System Deficiencies

Existing and future system deficiencies of the City's water system are summarized below.

3.5.1 Water Quality

The City does not have any deficiencies relating to water quality.

3.5.2 Source of Supply

The existing 2010 Agreement between the City and AWWD states that AWWD will supply the necessary peak day water supply to the City, up to 10 mgd in 2050.

According to the source capacity analysis shown in Table 3-6, the projected peak day demand for the City is not anticipated to exceed 10 mgd by 2032. The existing 2010 Lynnwood/AWWD agreement is valid through January 1, 2055. It is anticipated that AWWD will be able to supply the City's peak day demand through the 20-year planning period, assuming current zone deliniation.

The Agreement may be impacted should the City rezone the water service area as discussed in Chapter 6. Consideration must be given to the Agreement should any rezoning occur.

3.5.3 Storage

The 2010 Water Service Agreement between the City and AWWD does not mention storage requirements of AWWD, although the City considers AWWD storage as part of their system, and AWWD allows the City to use as much water as necessary for storage. No storage agreement exists between AWWD and the City, which has been verified in conversations with AWWD as well as DOH.

It is recommended that the City obtain a written storage agreement with AWWD.

3.5.4 Booster Station

The City's existing 680 Zone booster pump station has adequate capacity to provide the required peak hour demand through 2032, with the largest pump out of service. Fire flow is provided from the 635 Zone through check valves, which allow flow from the 635 Zone to the 680 Zone when residual pressures drop in the 680 Zone due to fire flow demands.

3.5.5 Distribution System

During the distribution system analysis four replacement project categories were determined to be necessary to differentiate the priority of improvements to the system. These categories in order of priority are as follows:

- Capital improvement projects (CIPs) that are required to meet DOH requirements,
- City priority projects that address leaking,
- Fire flow system improvements (FF-A)
- Undersized dead end hydrant main replacements (FF-B).

These four categories of improvements are shown on Figure N-1 and described in Chapter 6.

The City's water distribution system meets the minimum pressure requirement of 30 psi system wide during 2012 peak hour demand conditions. However, under 2018 and 2032 peak hour demand scenarios the existing distribution system is not capable of meeting the minimum pressure requirement. The deficient nodes are located within the 635 pressure zone in two centralized locations. The first area is located between Spruce Way and 36th Ave W and 173rd St SW and Maple Way. The second are is located west of 36th Ave W between 180th Pl SW and 186th Pl SW. Three alternative (CIPs) have been developed to resolve the pressure deficiencies found in these two areas. Alternative A identifies two CIP projects that resolve the identified deficiencies while relatively maintaining the existing distribution system pressure zone configuration. Alternatives B and C require creating new pressure zones and removing the 680 zone booster pump station. The details of these CIP alternatives are provided in Chapter 6.

Overall the City's distribution piping is in good condition. However, the City has identified a list of priority mains selected for replacement. These mains are primarily older 4-inch and 6-inch steel mains and include some galvanized mains as well. The City provided prioritization for replacement of these mains as shown on Figure N-1.

As shown in Table 3-10 and on Figure N-1, there are locations within the City's water distribution system where fire flow requirements cannot be met. The deficiencies are generally found in locations that have large fire flow demand requirements. In general the system deficiencies can be resolved with fairly simple improvements to the water system. These improvements include upsizing mains and providing new mains to loop the existing system. Several locations will require more significant distribution system improvements to provide the required fire flow demand. In some cases, such as the future Costco site, developers will be responsible for improving the water distribution system to provide the required fire flow for the development.

Figure N-1 shows that at isolated areas throughout the distribution system, primarily dead-end 4-inch and 6-inch water mains with fire hydrants, there are mains than cannot meet the minimum residential fire flow requirement of 1,000 gpm. These pipe replacement projects are identified as Fire Flow B projects and are detailed in Chapter 6. There is no specific prioritization for these projects and the City intends to replace a portion of these lines on an annual basis and as roadway improvements are made in the vicinity of the mains.

Chapter 4 Conservation Program, System Reliability, and Interties

4.1 Objective

The objectives of this chapter are to assess the development and implementation of the City's Conservation Program to promote efficient water use, assess system reliability, and to describe existing interties. Also evaluated in this chapter are water reuse opportunities in accordance with Chapter 90.46 RCW. The City purchases its entire water supply from the Alderwood Water & Wastewater District (AWWD) and, therefore, does not maintain water rights. Accordingly, this chapter does not include an analysis of water rights.

4.2 Conservation Planning Requirements

The Washington Legislature passed the Water Use Efficiency Act of 1989 (43.20.230 RCW) that directs Washington State Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In response to this mandate, the Department of Ecology (Ecology), the Washington Water Utilities Council, and DOH jointly published a document entitled *Conservation Planning Requirements* (1994). This document provided guidelines and requirements regarding the development and implementation of conservation programs for public water systems. In 2003, the State of Washington revised the water conservation planning requirements by passing the Municipal Water Law. Consequently, Group A Public Water Supplies are required to consider water use efficiency by reporting performance and goals (246-290 WAC). The Water Use Efficiency Rule (RCW 70.119A.180) prompted DOH to publish the Water Use Efficiency (WUE) Guidebook. The WUE Guidebook is currently in its third edition (January 2011).

The City's conservation program documents actions and planning efforts that the City has taken relating to the implementation of water conservation measures. The Conservation Planning Requirements and the WUE Guidebook list specific requirements and compliance dates that public water systems must adhere to.

Prior to the Municipal Water Law, public water systems had varying implementation requirements based upon the number of connections in the distribution system. Under the previous law, the City was classified as a "medium" public water system since the number of connections to the City's system is between 1,000 and 25,000. Under the current law all water systems are required to meet the same conservation requirements. These water conservation measures are discussed further in this Chapter. Consistent with the State guidelines, the City's conservation program contains water use data collection, water demand forecasts, development of a water use efficiency program, and setting goals for water conservation. Water use data and water demand forecasts were previously presented in Chapter 2 of this Plan.

4.3 Installation of Water Meters

The first requirement of the WUE is that all municipal water systems must install water meters at all service connections. The City currently has a water meter installed at each service connection.

4.4 Water Use Data Reporting

A summary of the City's water use data is presented in Table 4-1.

Table 4-1 Summary of Water Use Data Collection

Required Data Type[(1)]	Unit of Measure	Collection Frequency	Comments
Water Service Connections	Number of Connections	Annually	As of November 2011
Source of Supply Meter Readings	100 cubic feet (CF)	Daily	The City of Lynnwood master meters are located at 164th St SW and Spruce Way. Production data is collected daily and reported on a monthly basis.
Import/Export from Emergency Intertie	100 CF	Daily	Two emergency interties exist: one with the City of Edmonds and one with the City of Mountlake Terrace.
Wholesale Water Purchased	100 CF	Daily	Purchased from AWWD
Peak Day	100 CF	Daily	Daily meter readings are taken at the master meters.
Peak Month	100 CF	Annually	Peak month is tabulated monthly based on master meter readings.
Unaccounted for Water	Percent	Annually	Based on annual purchased water and consumption
Accounted for Water (Service Meter Readings): - Single-family - Multi-family - Industrial/Commercial	Cubic Feet	Bi-monthly	Customer meter readings are read bi-monthly.
Population Served	Number of People	Annually	Estimated 2010 population
Economic Data	Existing Water Rates	Annually	See existing water rates in Table 4-3.
Conservation Data	Type of measure, level of implementation, duration of measure, and start date	Annually	See Regional Conservation Savings in Table 4-4 and City of Everett 2007 Water System Plan, Ch. 5.

Notes:
(1) Water use data collection requirements are based on 1994 Conservation Planning Requirements and DOH 2011 Water Use Efficiency Guidelines

4.5 Conservation Program

4.5.1 Projected Water Demand with Conservation

The City of Everett and AWWD have water conservation programs that the City follows. The City of Everett has developed a conservation goal of approximately 1.20 percent water reduction by 2012. This goal is appropriate for the City, because it is ambitious enough to result in noticeable water savings and is realistic to obtain.

Table 4-2 shows the City's water use projections as derived in Chapter 2, and conservation savings based on the goals described in the previous paragraph.

Table 4-2 Water System Demand Including Conservation

Year	Projected Water Demand (gpd)[1]	Conservation Goal (per year)[2]	Cumulative Reduction	Projected Water Demand with Conservation (gpd)[2]	Daily Savings (gpd)	Annual Savings (MG)
2012	3,621,970	1.20%	1.20%	3,578,506	43,464	15.7
2018	4,065,030	1.00%	7.45%	3,762,159	302,871	109.0
2025	4,581,872	0.75%	12.86%	3,992,505	589,366	212.2
2032	5,203,256	0.50%	16.50%	4,344,734	858,522	309.1

Notes:
(1) Per Table 2-26
(2) Per Table 2-33

4.5.2 Historical Water Conservation Program

The City has followed the City of Everett's conservation program since its inception in the early 1980's.

4.5.3 Required Measures for All Systems

The following conservation measures listed are required for all public water system regardless of size. Level of implementation is identified after each measure.

Source Meter Installation: The installation of flow meters on each source of supply is required for all water systems to measure the amount of water entering the distribution system. All water supplied from AWWD to the City's 635 and 573 Zones is transmitted through the 24-inch transmission main on Spruce Way that is metered through the master meter vault located on Spruce Way south of 164th Street SW.

The City's 724 zone is not on the master meter. The "Unmetered Read" (UMR) customers within this pressure zone are served by AWWD's 724 zone storage and transmission, but billed by the City. Water use for these accounts is added to the City's bi-monthly wholesale water bill.

Additionally, there are customers in the City that are served by the City's distribution system but billed by AWWD. Water use for these accounts is subtracted from the City's bi-monthly wholesale water bill.

Finally, there are customers within the City that are served and billed by AWWD. These customers are not part of the City's water service area and the water use for these accounts are not included in the City's bi-monthly wholesale water bill.

Service Connection Meter Installation: The installation of flow meters at each service connection is required for all water systems to measure water consumption within the system. All water service connections within the City's distribution system are metered.

Program Promotion: Program promotion includes publicizing the need for water conservation through distribution of DOH brochures, bill inserts, and requiring efficient plumbing fixtures in new development. The City is a member of the Everett Water Utility Committee (EWUC) Conservation Committee and participates in the Snohomish County Conservation Program. Each year a Summer Lawn Watering Calendar is mailed to water customers with their water bill. In addition, the City supports educational programs at schools, has implemented a "Water Use it Wisely" campaign sponsored by the City of Everett, and uses outside advertising to promote water conservation.

Non-Revenue Water/Leak Detection and Repair Program: Prior to adoption of the Municipal Water Law suppliers were encouraged to limit distribution system leakage to less than 20 percent. Now all municipal water suppliers are required to meet the State standard for distribution system leakage of 10 percent or less. The leakage is based on a rolling three-year average and must be presented both as a percentage and volume. The City's lost and unaccounted for water has averaged approximately 16.4 percent from 2008 to 2011. As this is higher than the state requirement, the City has a leak detection and repair program which uses a technology that operates on the same radio frequency that the leak produces, placing repair crews within a few feet of the leak. The City employs other strategies to minimize unaccounted for water, such as tracking all water used for maintenance and fire activities, and regularly testing intertie valves.

4.5.4 WUE Program Goals and Implementation

The Municipal Water Law requires all municipal water suppliers to develop a WUE program. The WUE program is required to include implementation measures and goals that result in water conservation. Specific implementation measures are identified after each measure.

Customer Assistance: Customer assistance entails providing information to water customers that facilitates conservation. Indoor and outdoor conservation kits are also distributed by the City to customers free of charge. Also available to customers are toilet and washer rebates. The City also participates in Everett's school programs and water audits for business customers.

Bills Reflecting Consumption History: Bills showing consumption history provide information to the customer and to the purveyor regarding water use trends. The customer can observe the difference in water consumption during the same period for both the current and previous year. The City's water bills include a history of water consumption over a 12-month period.

Service Meters: All water conservation programs shall consider the benefits and cost of installing individual service meters. The metering program shall include periodic tests and repairs. All customers within the City's water service area have service meters. The City services the meters when erroneous readings appear or a customer submits a complaint.

Water Conservation Kits: Water conservation kits containing easily installed water saving devices are distributed to customers. These kits can include such items as shower flow restrictors, toilet-tank-water displacement devices, leak detection tablets, informational brochures, and other materials. The City has outdoor and indoor water conservation kits at City Hall, which are free of charge to customers. The indoor kit includes a low-flow showerhead and kitchen and bath faucet aerators. The outdoor kits contain an automatic hose bib shut-off, a hose repair kit, a multi-function nozzle, and reduced flow hose washers.

Landscape Management: Water use management of large irrigation operations for agriculture, nurseries, and landscaping can increase the irrigation efficiency of these operations. Moisture sensors, flow timers, low volume sprinklers, drip irrigation, weather monitoring, low water demand landscaping, and other practices can be encouraged by the water utility. The Cities of Lynnwood and Everett work cooperatively to provide irrigation audits for institutional, government, and commercial customers. Irrigation audits are available to schools, parks, and commercial buildings with irrigated landscapes, nurseries, and small agricultural concerns. A summer watering calendar is also instituted by the City and is found on the City's website.

Conservation Pricing: Another means of promoting customer water conservation is through water rates that can provide an economic incentive to conserve water. The City currently has a variable base rate dependent on customer class or meter size that includes up to 500 cubic feet (or 5 hundred cubic feet (ccf)) of water. The City's current water rates that became effective January 1, 2012 are summarized in Table 4-3.

Table 4-3 Water System Base Rate and Volume Charge

Customer Classification or Meter Size	Monthly Base Rate (Incl. 5 ccf)	Monthly Volume Charge (> 5 ccf, per ccf)	Monthly Volume Charge (>5 ccf to 20 ccf, per ccf)	Monthly Volume Charge (>20 ccf, per ccf)
Residential				
Single Unit	$14.29	N/A	$1.64	$2.47
Multiple/Mobile-Unit	$5.80	$1.27	N/A	N/A
Special Water Rate, Income Level Status A	$5.72	N/A	$0.66	$0.99
Special Water Rate, Income Level Status B	$6.43	N/A	$0.74	$1.11
Special Water Rate, Income Level Status C	$7.15	N/A	$0.82	$1.24
Commercial/Industrial				
5/8 to 3/4 inch	$15.76	$1.92	N/A	N/A
1-inch	$34.13	$1.92	N/A	N/A
1-1/2-inch	$64.33	$1.92	N/A	N/A
2-inch	$99.78	$1.92	N/A	N/A
3-inch	$186.43	$1.92	N/A	N/A
4-inch	$305.89	$1.92	N/A	N/A
6-inch	$607.85	$1.92	N/A	N/A

Notes:
(1) Per the City's billing information on the City's website.

4.5.5 Regional Conservation Programs

EWUC, representing the City of Everett and its wholesale water customers (including the City), developed regional conservation goals for the six year period of 2007-2012. Future conservation goals are forthcoming, but unavailable at the time of this Update.

The EWUC recommended the eight primary conservation measures summarized in Table 4-4 along with estimates of the average day savings and peak day savings for each conservation measure.

Table 4-4 Regional Conservation Savings, 2007-2012

Conservation Measure	Average Annual Savings (mgd)	Peak Season Savings (mgd)	Budget
Education	0.67	0.67	$1,050,000
Indoor Retrofit Kits	0.40	0.40	$243,000
Outdoor Irrigation Kits	0.20	0.59	$393,000
Toilet Leak Detection	0.45	0.45	$201,360
Toilet Rebates	0.08	0.08	$810,000
Washer Rebates	0.11	0.11	$810,000
Commercial Indoor Audits	0.04	0.04	$45,000
School Irrigation System Audits	0.02	0.06	$56,410
Total Savings	**1.97**	**2.41**	**$3,608,770**

Notes:
(1) Source: City of Everett 2007 Comprehensive Water Plan, Chapter 5.

4.6 Water System Reliability

It is the responsibility of the City to ensure an adequate water supply at all times. Public health may be threatened when water shortages or interruptions in service occur. The City has undertaken planning to reduce the risk of water shortages and to respond appropriately when shortages do occur.

4.6.1 Source Reliability

The City's water is supplied by AWWD via the City of Everett. Everett has an abundance of water from its source to distribute to all of its customers and is reliable to distribute this water for the foreseeable future.

4.6.2 Facility Reliability

The analyses summarized in Chapter 3 indicate that the supply, distribution, pumping and storage facilities are adequate to reliably provide a sufficient quantity of water at sufficient pressure to meet domestic, commercial, industrial, and fire suppression water demands. Facility improvements including additional pipelines are identified in Chapter 3. The 680 Zone Booster Pump Station includes redundant components so that maximum day demands can be provided with the largest component out of service. Additional reliability criteria are included in the System Design Standards identified in Chapter 3 and the City Water Ordinances in Appendix B.

4.6.3 Water Shortage Response Planning

The City follows the Water Shortage Response Plan provided by the EWUC.

4.7 Interties

Please see Chapter 1 for a discussion on the City's interties.

4.8 Water Reuse

The City is committed to water reuse. Water reuse can serve as an environmentally beneficial source of water by reducing the need for potable water. The water reuse component of the 2005 Water System Plan was reconsidered and it was determined that the conclusions presented are still applicable. The 2005 preliminary cost estimate for a water reuse distribution system has been modified as follows:

- Cost is escalated from 2005 dollars to 2012 dollars
- Contingency is revised to 30 percent

The opinion of probable project cost for a water reuse distribution system is $9.3 million. This estimated cost does not include costs for upgrading the City's Wastewater Treatment Facility to produce reclaimed water. The upgrade cost would be very high due to the lack of available land and a current treatment process that is not conducive to producing reclaimed water.

For the foreseeable future, the City can meet its water conservation goals without investing in significant reuse projects (i.e. upgrading the City's Wastewater Treatment Facility to produce reclaimed water and a water reuse distribution system). There appear to be no environmental pressures for the City to discontinue discharging their treated wastewater effluent into the Puget Sound. Therefore, the costs of implementing reuse measures outweigh potential benefits for developing a water reuse program and infrastructure. Because the City is committed to water reuse, water reuse will be evaluated as opportunities arise.

Chapter 5 Operation and Maintenance Program

5.1 Introduction

The purpose of this chapter is to summarize the operation and maintenance programs maintained by the City that ensure performance and reliability of the potable water supply system. The City maintains and services two reservoirs, one booster pump station, two master meters, two pressure reducing stations, and approximately 168 miles of water main.

5.2 Water System Management and Personnel

The City's Water Utility is managed, supervised, and operated within the City's Public Works Department. An abbreviated Public Works organization chart is shown on Figure 5-1. This chart illustrates the specific personnel positions and corresponding responsibility for the City's municipal water system.

The Operation and Maintenance (O&M) staff is a collectively pooled work group consisting of staff charged with water and sewer maintenance duties. Routine water utility work and assignments include, at a minimum, the following tasks:

- Water service repair and replacement
- Water main inspections and repair
- Control valve service and repair
- System valve maintenance and repair
- Booster station maintenance and repair
- Reservoir inspection and maintenance
- Fire hydrant maintenance, testing and repair
- Meter reading
- Water meter testing, repair and replacement
- Water main flushing
- Water quality sampling and testing

5.3 Operator Certification

Waterworks Operator Certification, required under WAC 246-292, mandates that Washington State public water systems retain in their employment individuals who are certified, by examination, as competent in water supply operation and management. The Washington State Department of Health (DOH) determines the required level and number of certified positions based on the population and complexity of the water system. Minimum education and experience requirements for the various certification levels are detailed in the Water Works Operators Certification Regulations, published by the DOH.

Under the current certification requirements, the City must provide one mandatory certification position, a Water Distribution Manager (WDM) Level 3. In addition to the mandatory certification position, the City maintains additional certified employees. Many of these employees hold multiple levels of certification. A summary of the water system operator certifications is provided in Table 5-1. The City must notify the Water Works Certification Board in the event of any changes in the mandatory personnel.

Figure 5-1 City of Lynnwood Public Works Organization

Table 5-1 Water System Operator Certifications

Certification Level	Operator Name	Job Title
WDM 4	Les Rubstello	Operations Manager
WDM 3, Cross Connection Specialist (CCS), Water Distribution Specialist (WDS)	Paul McIntyre	Water Operations Supervisor
WDM 3, CCS	Ron Hammons	Engineering Technician
WDM 2	Chris Danson	Engineering Technician
WDM 1	Scott Weston	Lead Maintenance Worker
WDM 1	Andrew Lorenzen	Lead Maintenance Worker
WDS	Kevon Peters	Lead Maintenance Worker
WDS	Carl Shaw	Water Quality Specialist

5.4 Routine System Operation and Control

The general operation of the overall water system is described herein.

The City water system operates on four pressure zones. The 573 zone, which is the largest of the City's four zones, includes the two City reservoirs, with a total capacity of 5.77 million gallons (MG). The reservoirs are described later in the chapter. The 573 zone is supplied from the 635 zone via two parallel 16-inch Cla-Val Pressure Reducing Valves (PRVs). The PRVs, which are located in an underground vault near Spruce Way and 173rd Street SW, are opened and closed based on the levels in the City's 573 zone reservoirs. These PRVs have a pressure sustaining feature which is set at approximately 35 psi. The City is able to adjust the pressure sustaining feature and settings of the PRVs to control the amount of flow through the master meters. The City also operates a second 6-inch pressure reducing station, located at 195th Street SW and 40th Avenue W, which also supplies the 573 zone.

The 635 zone relies on Alderwood Water & Wastewater District's (AWWD) 76 MG 635 zone storage facilities located approximately one mile north of the City near 35th Avenue West. Two 10-inch master meters located in a vault near the intersection of 164th Street Southwest and Spruce Way meter water from AWWD coming into the City's 635 zone. A second master meter connection to AWWD, located near 179th Street Southwest and 36th Avenue West, is available during periods of very high demands or for emergency uses as necessary.

The 680 zone is a small pressure zone that serves the residential area surrounding the 573 zone reservoirs. Water is supplied to this pressure zone via the 680 Zone Booster Pump Station, which pumps water from the 573 zone reservoirs to the 680 zone. The booster pump station is described below.

The City's 724 zone is metered at the individual service connections. A pump station operated by AWWD transmits water directly from the AWWD 635 reservoirs to this zone.

Storage

The City owns and operates two covered steel reservoirs, the 3.00 MG reservoir and the 2.77 MG reservoir. They are located adjacent to each other at 185th Street SW and 40th Avenue W. Figure 5-1.

Both reservoirs have overflow elevations of 573 feet. The 3.00 MG reservoir has a base elevation of 535.7 feet; the 2.77 MG reservoir has a base elevation of 532.7 feet. The low level and high level alarms for both reservoirs are set at elevations of 561.3 feet and 571.5 feet, respectively. The 2.77 MG reservoir nameplate indicates that the tank was constructed in 1959 by Morton Tank Inc. The 3.00 MG reservoir was constructed after 1960. Cleaning and inspection of the reservoirs occurs every other year. In 1992 and 1993, the interior of both reservoirs were repaired and recoated. A seismic evaluation of the 573 zone reservoirs, including installation of seismic sensors and controllers, was completed in 1999.

Booster Pump Station

The City has one booster pump station that was constructed in 1999 to mitigate low pressure problems in the area surrounding the City's reservoirs. This booster station pumps water from the City's 573 zone reservoirs to the 680 zone, where the highest service elevation is 540. Check valves, which isolate the 680 zone piping from the 635 zone piping, allow flow from the 635 zone to the 680 zone in the event of a fire in the 680 zone. The 680 zone booster pump station consists of three 85 gpm, 5 horsepower (hp) pumps, and one 132 gallon hydro-pneumatic tank. One of the 5 hp pumps runs continuously during low to moderate demands, and a second pump is called on by a flow sensor on the discharge line in higher demand periods. The third pump is provided for redundancy. To maintain a constant discharge pressure, pressure regulating valves are located on the discharge side of each pump.

The 680 zone booster pump station does not have an emergency generator. Check valves from the 635 zone supply the 680 zone during power outages and fire flow conditions.

The booster pump station is inspected daily. Pump data is recorded and monitored to identify any irregularities in system operation. Pump station pumps and other equipment receive regular service on an "hours-in-operation" basis, and check valves are flushed twice per year.

A schematic of the water system operation is provided in Chapter 3. Appendix J contains the City's O&M procedures.

5.4.1 Alternate Operation and Control

If the Spruce Avenue pressure reducing station is out of service, the City has alternate supply connections to the AWWD system. A meter station that can be used in emergencies is located at 179th Street SW (Maple Road) and 36th Avenue W. Normally isolated from the system, this meter serves as a backup for the Spruce Avenue station. Additional interties with the AWWD must be opened if this meter station is to operate alone. Additional supply to the 573 zone is available via 10 unmetered emergency interties with AWWD, and the Cities of Edmonds and Mountlake Terrace. The locations of the interties are shown on Figure 1-5 and further discussed in Chapter 4.

5.4.2 Telemetry System

The City's telemetry system monitors flow through the master meters, reservoir levels, and flow and pressures at the pressure reducing stations. The City is able to use the telemetry system to set the maximum flow rate through the master meters, and set the reservoir levels that operate the system pressure reducing stations. The maximum flow rate through the master meters is generally set at a maximum of 9 mgd.

In 2012, the City will complete a complete upgrade of its telemetry system. All remote facilities (PRVs, booster pumps, reservoirs, altitude valves) will be connected to the City's fiber optic network. All these facilities will have programmable logic controllers (PLCs) to monitor and control operations. The PLCs will communicate on a client server network to a central control software package at City Hall that will allow 24/7 control via the City's intranet, as well as over the internet.

5.5 Preventive Maintenance Program

The City plans for present and future maintenance of the water system facilities by means of a preventative maintenance (PM) program. This program allows for the optimum level of maintenance activities to be provided at the least total maintenance cost. The City has defined tasks to be performed, scheduled the frequency for each task, and then provided necessary staff to perform the task.

Table 5-2 highlights the City's PM program for the major water system components.

Table 5-2 Major Water System Component Preventive Maintenance Schedule

System Component	Year Maintained	Routine Maintenance Schedule	Special Maintenance
Storage			
2.77 MG Reservoir	2005	Inspection of Interior every 10 years Inspection of Exterior Annually	Interior/exterior recoated in 1992
3.00 MG Reservoir	2005	Inspection of Interior every 10 years Inspection of Exterior Annually	Interior/exterior recoated in 1993
Reservoir Altitude Valves	2011	Every 3 Years	Inspected and maintained in 2011 by Cla-Val.
PRVs			
173rd Street SW and Spruce Way	2011	Every 3 Years	Inspected and maintained in 2011 by Cla-Val.
195th Street SW and 40th Avenue W	2011	Every 3 Years	Inspected and maintained in 2011 by Cla-Val.
Master Meters			
164th Street SW and Spruce Way	N/A	Annually	Testing and calibration by AWWD
179th Street SW and 36th Avenue W	N/A	Periodic	Testing and calibration by AWWD

5.6 Comprehensive Monitoring Plan

The City samples and monitors the system's water quality in accordance with WAC 246-290-300. The City's water quality is discussed in detail in Chapter 3, Water System Analysis. The City of Everett is responsible for monitoring source water quality parameters. A summary of the water quality monitoring schedule for the City, including the sampling frequency and location for each required parameter, is presented in Table 5-3.

Table 5-3 Water Quality Monitoring Requirements

Parameter	Sample Location	Sampling Frequency	Consequence of Exceeding Standard
Bacteriological	Distribution System	40 samples per month	Follow-up and repeat sampling
Chlorine Residual	PRV Station, 17235 Spruce Way	Daily	Coordination with Everett and AWWD, possible treatment modifications
Lead and Copper	From customer taps	10 samples every 3 years(1)	Coordination with Everett and AWWD, possible treatment modifications
Trihalomethanes (TTHMs)	Distribution System	4 per quarter	Immediate repeat sampling; coordination with Everett and AWWD; letter to customers
Haloacetic Acids (HAA5)	Distribution System	4 per quarter	Immediate repeat sampling; coordination with Everett and AWWD; letter to customers

Notes:
(1) Including pH and alkalinity.

5.7 Coliform Monitoring Plan

The City's Coliform Monitoring Plan discusses sampling information, unsatisfactory sample procedures, and field sampling procedures. Forty samples are taken each month and are taken throughout the distribution system. A copy of the Plan is included as Appendix E.

5.8 Emergency Response Program

The operation of the water system under emergency conditions is an important responsibility of the City staff. Emergency response procedures should be rehearsed and reviewed by all personnel on a regular basis. Staff members should be aware of emergency procedures and the location of emergency contact information.

5.8.1 Emergency Response Procedures

Water utilities have the responsibility to provide an adequate quantity and quality of water in a reliable manner at all times. Therefore, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts. Though it is not possible to anticipate all potential disasters affecting the City's water system, formulating procedures to manage and remedy several common emergencies is appropriate. The City completed a Vulnerability Assessment and an Emergency Response Plan in 2004 to meet current requirements under the Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act), Public Law 107-122 of June 12, 2002. These documents are kept confidential.
The City's Emergency Response Plan addresses the following:

- State and Federal Requirements
- Emergency Planning and Operations Precepts
- Hazard Identification and Vulnerability Analysis Summary
- System Specific Information
- Community Water System Roles and Responsibilities
- Water System Communication Procedures
- Personal Safety
- Identification of Alternative Water Sources
- Replacement of Equipment and Chemicals
- Property Protection
- Water Sampling and Monitoring
- Incident Specific Plans

Incident specific response plans included in the Emergency Response Plan include:

- Drinking Water Unique: Bacteriological contamination
- Natural Disasters: drought, earthquake, flood, landslide/mudflow/debris flow, severe local storm, tsunami & seiche, volcano
  Technological Hazards: dam failure, hazardous materials, transportation accident, urban fire
- Criminal Acts: Chemical, Biological, Radiological, Nuclear and high-yield Explosives (CBRNE) terrorism, cyber attack, vandalism
- Natural Disease Outbreak

An emergency contact list for the water system has been completed and is included in the City's Emergency Response Plan.

5.8.2 Notification Procedures

A procedure for quickly notifying all City staff, customers, other utilities, and if necessary, the local and state health departments, of a water system related emergency is included in the City's Emergency Response Plan, and described below. In addition, should it be necessary to alert the public in the event of a water system emergency, the City maintains a listing of both television and radio resources that can be provided with news releases.

One of four Operations Supervisor/Foreman is designated each week as the Person-In-Charge (PIC). The PIC takes after hours calls from the Police Department and citizens regarding Public Works issues. Of the twelve water and sewer maintenance workers, a minimum of four rotate weekly being on-call after hours. If a water issue arises that the PIC feels cannot wait until the next work day, he dispatches the on-call water and sewer worker. If more personnel are

needed, the PIC calls the other water and sewer workers (and, possibly, street and storm workers) until enough staff is dispatched to respond to the issue.

5.8.3 Emergency Phone Numbers

The City maintains two emergency phone number lists for use by City personnel. One list is City staff home phone numbers, addresses, and cell phone numbers. The second list includes the numbers for emergency services, generator rentals, adjacent utilities, fuel suppliers, parts suppliers, safety equipment, pumper trucks, and contractors. The emergency phone numbers are updated frequently as phone numbers change.

5.9 Water Shortage Response Planning

Water shortage response planning is coordinated with AWWD, the City of Everett, and Everett's other wholesale customers.

5.10 Contingency Operational Plan

The following sections provide information regarding contingent modes of operation for system facilities.

5.10.1 Source of Supply

Should AWWD's or the City of Everett's water supply system fail, it is anticipated that all of the City's neighboring customers would be equally affected. Therefore, it is unlikely that the City could depend on adjacent purveyors for assistance. In the event of a total loss of the City's supply, the full capacity of the City's reservoirs could supply 1.5 days of supply under 2012 average daily demand conditions, and more under carefully controlled water rationing.

5.10.2 Transmission Facilities

In the event of a transmission main failure, it is possible to close off the main without a serious interruption of water service. However, some residents along that segment may be without water service until repairs could be completed. In the event that repairs should take more than 8 to 12 hours, temporary emergency service lines could be placed above ground and directly connected to each customer's service meter.

5.10.3 Booster Station

The City relies on the 680 Zone Booster Pump Station to provide system pressure to the closed 680 pressure zone. In the event that the booster station should fail, the 680 zone can also be supplied through several check valves between the 635 and 680 pressure zones. These check valves are located at the intersections of Maple Road and 41st Place W, 186th and 41st Place W, Maple Road and 40th Avenue W, 188th Street SW and 40th Avenue W, and 41st Place W and 188th Street SW.

5.10.4 Storage Facilities

Since the City's reservoirs primarily provide supply for peak demand periods, if one of the reservoirs was removed from service during average demand conditions, it should not cause significant problems within the water system. If a reservoir was removed from service during peak demand conditions, additional water from AWWD may be required.

5.11 Safety Procedures

Work place hazards for the City's water system are primarily limited to confined space entry and access for elevated structures. Staff is trained as to proper entry into confined spaces such as

below grade equipment vaults. Inspection of water storage reservoirs is made using the proper harness and restraining device to reduce the chances of accidental falls.

All water utility employees are provided with the following training:

- Emergency evacuation and sheltering procedures
- Equipment lock-out/tag-out procedures
- Hazard communication
- Emergency first aid
- Cardiopulmonary resuscitation (CPR)
- Protection from water borne pathogens

The water utility has a hoist, harness, gas detection and venting equipment for confined space entry. Water utility employees are issued protective equipment appropriate to their job responsibilities including hard hats, safety goggles, and gloves. Employees are required to provide their own safety boots.

Safety procedures are discussed further in the City's Emergency Response Plan, which is kept as a confidential document.

5.12 Materials and Equipment Inventory

To ensure the continued reliability of the water system, the City maintains a considerable inventory of spare parts and materials.

The City's materials inventory is divided between store stock and dead stock. Planned maintenance activities are supplied from store stock, while emergency repairs are accomplished through dead stock. If the required items or materials are not available in inventory, the City has informal agreements with adjacent purveyors to obtain needed materials.

Included in Appendix K is a summary of available emergency repair materials (dead stock) available to the City in the event of a water system emergency.

City equipment that is shared by the Sewer Utility includes:

- 1 Vaccon 780 eductor
- 1 Caterpillar 420e Backhoe
- 1 5-cy Dump Truck
- 2 1-ton Dump Trucks
- 1 Utility Service Truck
- 8 Pickups
- 6 Light Vehicles

5.13 Cross Connection Control

The City updated the City of Lynnwood Cross Connection Control Policy (Policy) in July 2011. The DOH approved the updated policy in 2008. A copy of the Policy is included as Appendix L. The City requires that all non-residential service connections meet the backflow prevention requirements set forth in the Policy.

The City's Cross Connection Control Program is maintained through the City's Engineering Division. Ron Hammons, who is a Cross Connection Control Specialist, oversees the program. The City currently employs two certified Cross-Connection Control Specialists. The City's cross

connection control program and records are updated and kept on file in a database using TOKAY Cross Connection Control Software. The following records are included in these files:

- Location of each water service connection with a cross-connection control device
- Cross connection control devices installed at high and medium hazards (as defined in the Policy)
- Initial inspection information
- Installation information, including type of device and location
- Testing history
- Notification address

The City's Cross Connection Control Program requires inspection of backflow prevention assemblies at the time of installation. The installation of cross connection control devices is coordinated between the City's Public Works Department and Building Official at the time of installation to ensure the proper cross connection device is installed and the inventory is kept up to date at all times. The City provides customers with 30 days notice of when their annual test is due, however it is the responsibility of the customer to see that the device is tested. If there is a contamination risk or violation, service may be terminated immediately, depending on the level of health risk. The City may notify the DOH in the event of service termination, depending on the type of business involved.

5.14 O&M Deficiencies

Operation and maintenance of the new SCADA system needs to be documented in the City's Operations and Maintenance Manual.

5.15 Sanitary Survey Findings

A Sanitary Survey was done on the City's system in October 2010. There are no findings of that survey that need to be addressed in this Plan.

5.16 Record Keeping and Recording

All of the City's water tests and results (as seen in Table 5-3) are entered into Cartegraph (the City's asset management software) and are kept indefinitely.

5.17 Customer Complaint Response Program

The customer complaint response program is discussed in Chapter 1 and summarized below:

- Emergency-related complaints are addressed immediately.
- Calls are received by the Front Desk Receptionist and transferred to the Water Operations Supervisor.
- Emails are received by the City's Webmaster and forwarded onto the Operations Manager.
- Complaints are entered into Cartegraph, and are broken down by category: Water Leaks, Water Quality, and Water Meter.
- The Cartegraph Customer Service Web Portal allows customers to notify the City of public works issues via computer or smart phone.

Chapter 6 Capital Improvement Program

6.1 Introduction

Chapter 6 presents the Capital Improvement Program (CIP) in accordance with the requirements of WAC 246-290-100. Recommended water system improvements, associated costs, and scheduling are presented in the following sections. These improvements are based on deficiencies identified in Chapter 3. Financing of these improvements is discussed in Chapter 7.

In the future, additional projects may arise that are not identified herein. Such projects may be deemed necessary for ensuring water quality, preserving emergency water supply, or addressing unforeseen problems with the City's water system. Due to budgetary constraints, the completion of these projects may require that the proposed completion date for the projects in this CIP be rescheduled. The City retains the flexibility to reschedule the proposed projects and to expand or reduce the scope of the proposed projects when new information becomes available for evaluation.

6.2 Recommended Improvements

All of the recommended improvements listed below have associated opinions of probable project costs and figures that are located in the Appendices C and N, respectively. Figure N-1 provides system wide locations of all of the recommended improvements.

6.2.1 Distribution System

The majority of the distribution system improvements included in the 6-year CIP involve issues surrounding meeting peak hour demand minimum pressures in the northeastern portion of the City's service area. Three alternatives are presented to alleviate low peak hour demand pressures in this area, all of which require pressure rezoning. These alternatives are described below, and are outlined in Table 6-1.

Alternative A

- Expands the existing 680 and 724 Pressure Zones to address pressure deficiencies during peak hour demands (see Figure N-2).
- New zone valves will be installed where needed.

Alternative B

- Changes the existing 635, 680 and 724 Pressure Zone boundaries to address pressure deficiencies during peak hour demands, to improve water system performance, and to improve water quality (see Figure N-3).
- A new PRV station will be installed in the 680 Zone.
- The 680 Zone will be supplied by the AWWD 724 Zone through a new 16-inch diameter distribution main from the AWWD 724 Reservoirs.
- The existing 680 booster pump station will be decommissioned.
- The existing 635 pressure zone boundary east of the Costco site will be relocated to the west and include a PRV station at the zone boundary, supplying the site by the 573 Zone. This modification provides for more optimum service pressures to the Costco site and facilitates fire flow supply.
- Two additional PRV stations will be installed between the 680 and 635 zones to improve the hydraulics of the system.

- A new master meter and vault will be installed to enable metering of consumption in the updated pressure zones.

Alternative C

- Eliminates the existing 680 and 724 Pressure Zones and adds a 710 Pressure Zone to address pressure deficiencies during peak hour demands, to improve water system performance, and to improve water quality (see Figure N-4).
- Add PRV stations to the system to reduce the area served by the 635 Zone.
- The new 710 Zone will be supplied by the AWWD 724 Zone through a new 16-inch diameter distribution main from the AWWD 724 Reservoirs.
- The existing 680 booster pump station will be decommissioned.
- Additional PRV stations will be added to the system to improve the hydraulics of the system.
- A new master meter and vault will be installed to enable metering of consumption in the updated pressure zones.

6.2.2 Reservoirs

Reservoir projects including roof repairs to the east tank, top railings for both tanks, and climbing system replacements for both tanks are also included in the 6-year CIP. $500,000 has been estimated to account for engineering, construction, and sales tax; the City should verify the costs of these projects with an independent tank company for a more precise construction estimate.

6.2.3 Automated Meter Readers (AMR)

Installation of AMR on the City's water meters will help track sold water, decrease unaccounted for water, and provide better customer service to the City's customers. $1,536,000 has been estimated to account for material costs, a 10 percent contingency and sales tax. It has been assumed that the City will install the AMR.

6.2.4 Annual Upgrade and Replacement Projects

Additionally, the City wants to include annual water system upgrade and replacement dollars into the 6-year CIP as well. A $1,000,000 per year program is included as part of the financial evaluation presented in Chapter 7. These projects are described in Section 6.2.6.

All costs are in 2012 dollars, and include design, construction costs. A water system base map that shows the locations of the proposed improvements is included as Figure N-1 in Appendix N.

The design and construction of the chosen alternative should occur as soon as possible, as these improvements are critical to the system.

Reservoir improvements should occur as soon as possible to conform to DOH standards as well as maintain the useful life of the tanks.

Water system upgrade and replacement projects are projected to occur on an ongoing annual basis.

Table 6-1 Recommended 6-Year Capital Improvement Projects

Project Number	Project Description	Need for Project	Page/Figure Where Identified	Opinion of Probable Construction Costs	Opinion of Probable Project Costs
Alt A CIP 1A	1,100 lf of new 8-inch Ductile Iron (D.I.) waterline, 176th Pl SW north to 173rd Pl SW along Spruce Way	Expand 724 Zone to achieve minimum peak hour demand pressures	6-1/Figure N-5	$410,000	$557,000
Alt A CIP 2A	1,000 lf of new 8-inch D.I. waterline, looping existing pipe at 180th Pl SW and 184th Pl SW to existing piping near 36th Ave W.	Expand 680 Zone to achieve minimum peak hour demand pressures	6-1/Figure N-6	$450,000	$1,005,000
Alt B CIP 1B	4,600 lf of new 16-inch D.I. waterline from AWWD Reservoir; 1,100lf of new 8-inch D.I waterline to loop existing piping; 9 PRV stations to reduce pressure from new 16-inch main to City system; a new master meter and vault, and decommissioning of the existing booster pump station	Eliminates pressure deficiencies during peak hour demands, improves water system performance, and improves water quality	6-1/Figures N-7 through N-9	$2,777,000	$3,451,000
Alt C CIP 1C	4,600 lf of new 16-inch D.I. waterline from AWWD Reservoir, 9 PRV stations to reduce pressure from new 16-inch main to City system; a new master meter and vault, and decommissioning of the existing booster pump station	Eliminates pressure deficiencies during peak hour demands, improves water system performance, and improves water quality	6-2/Figures N-13 through N-19	$3,202,000	$3,979,000
Reservoir Projects	Railings and climbing system upgrades to both tanks; roof repair to east tank	Safety and O&M	6-2	$455,000	$500,000
AMR	Installation of AMRs at each existing water meter	Allows for better servicing and maintaining water meters, as well as keeping track of City water use	6-2	N/A	$1,536,000
Annual upgrades	Steel pipe replacement projects (City Priority Projects), fire flow improvement projects (Fire Flow A), upgrade dead-end piping (Fire Flow B)	Reduce system leakage, obtain adequate fire flows within the system, upgrade dead-ends	6-2	N/A	$1,000,000 per year

Notes:
(1) Construction costs include a 30% contingency and sales tax; project costs include design engineering, administrative costs, easements, permitting and surveying.

6.2.5 20-Year CIP Projects

Additional to the 6-Year CIP distribution projects listed above, the City has upgrade projects that include replacing existing steel pipes with ductile iron pipe, improving fire flow via upsizing pipes, and upgrading dead-end piping within the system. These projects are prioritized and summarized below. The City intends to perform 5 percent of the work for these three types of improvement projects. None of these specific projects are scheduled at this time. The City will coordinate the completion of these projects with roadway improvement projects and/or other utility projects and needs. As mentioned above, it is recommended that the City allocate approximately $1,000,000 per year for these improvement projects. Projects remaining after the yearly allocation will move beyond the 20-year planning horizon.

City Priority Projects

City Priority projects have been identified by the City as steel pipes with leakage associated with them. There are 28 steel pipe replacement projects equaling approximately $10 million dollars. Individual costs associated with these projects are found in the Appendices. Projects 1 through 10 are listed in priority of completion; projects 11 through 28 are used only for project identification and do not identify project priority.

Fire Flow A Improvement Projects

Fire Flow A improvement projects were identified during system hydraulic modeling as piping that needs to be upsized to adequately convey necessary fire flows. These projects are typically distribution system upgrades or completion of distribution system looping. 40 projects were identified totaling approximately $10 million dollars. Individual costs associated with these projects are found in the Appendices. Fire flow project numbering is used only for project identification and does not necessarily identify project priority.

Fire Flow B Projects

Fire Flow B projects were also identified during system hydraulic modeling. Fire Flow B projects are 8-inch line improvements to improve small diameter dead-ends in the City's system. 103 projects were identified totaling approximately $8.2 million dollars. Individual costs associated with these projects are found in the Appendices. Project numbering is used only for identification and does not identify project priority.

6.2.6 Storage

The storage analysis completed in Chapter 3 of this Plan indicates that the City has adequate storage capacity through the year 2023.

6.2.7 Department of Health Approval

The City requests approval from the Department of Health (DOH) to proceed with the improvement projects listed herein without submittal of a project report and construction documents to DOH in accordance with WAC 246-290-125. The City will maintain project summary files, engineering design review reports, construction reports, and Water Facilities Inventory forms as identified in WAC 246-290-125.

Chapter 7 Financial Plan

7.1 Introduction

This chapter was prepared by FCS GROUP to provide a financial program that allows the City's water utility to remain financially viable during the planning period, and provide stable revenue for execution of the Capital Improvement Program (CIP) identified in this Plan. This financial viability analysis considers the historical financial condition, current and identified future financial and policy obligations, operation and maintenance (O&M) needs and the ability to support the financial impact related to the completion of the identified projects in the CIP. Furthermore, this chapter provides a review of the utility's current rate structure with respect to rate adequacy, promotion of water conservation and customer affordability. Appendix O presents backup documentation related to this financial plan.

7.2 Past Financial Performance

This section includes an historical summary of financial performance as reported by the City on the fund resources and uses arising from cash transactions specific to the water utility.

7.2.1 Comparative Financial Statement

The City legally owns and operates a combined utility fund that includes water and sewer services. Therefore, standard financial statements are not readily available for the water utility alone. However, some of the specific line items within the financial statements can be attributed directly to a utility service when the utility is included in the name of the item. Table 7-1 uses these utility specific line items to construct an income statement for the water utility for the previous 6 years (2005 through 2010). Noteworthy findings and trends are discussed below to demonstrate the historical performance and condition of the utility.

Table 7-1 Summary of Historical Fund Resources and Uses Arising from Cash Transactions

	2005	2006	2007	2008	2009	2010
Revenues and Other Sources						
Water Sales	$ 2,570,018	$ 2,953,072	$ 2,701,260	$ 2,949,571	$ 3,067,770	$ 3,055,754
Grants	-	-	1,625	5,669	1,363	2,364
Hydrant Water Usage	635	1,524	4,298	6,357	4,435	3,992
Water After Hours	1,895	1,020	680	425	1,530	1,870
Water On/Off Charges	41,840	40,945	39,200	43,715	43,750	49,960
Final Bill Search Fee	-	525	10,455	5,235	5,530	6,290
Water Penalty Charges	(7,773)	50,325	50,970	61,581	64,634	77,960
Interest	139,074	225,221	226,593	156,538	86,303	26,098
Sale of Fixed Assets	177	-	-	-	-	-
Sale of Junk/Scrap	340	219	1,003	874	1,733	1,441
Public Repairs	360	-	2,838	-	-	-
Admin Fees	500	2,500	350	-	-	-
Capital Contributions	113,134	132,164	49,798	67,110	39,733	115,684
Donations/Gifts	651,350	355,300	246,450	57,250	42,032	115,000
Transfers	-	11,402	-	1,806,590	-	-
Total Resources	**$ 3,511,549**	**$ 3,774,217**	**$ 3,335,520**	**$ 5,160,917**	**$ 3,358,811**	**$ 3,456,414**
Operating Expenditures						
Administration	$ 1,233,760	$ 1,067,803	$ 1,709,991	$ 1,998,624	$ 2,258,687	$ 2,191,157
Source	1,452,529	1,728,739	1,343,542	1,409,788	1,711,148	1,515,093
Storage	138,930	79,622	73,484	97,364	71,038	93,642
Transmission & Distribution	396,829	478,977	454,061	537,117	537,897	558,557
Fire Services	19,205	23,162	13,925	20,963	27,892	1,031
Meters	19,011	12,273	14,164	19,636	4,738	(4,073)
Utility Construction	33,220	20,510	13,761	7,604	7,338	(95)
Main Replacements	29,492	1,349	53,198	5,481	-	(58,680)
Total Expenditures	**$ 3,322,976**	**$ 3,412,435**	**$ 3,676,126**	**$ 4,096,577**	**$ 4,618,738**	**$ 4,296,632**
Excess (Deficit) of Resources Over Uses	**$ 188,574**	**$ 361,782**	**$ (340,606)**	**$ 1,064,340**	**$(1,259,927)**	**$ (840,218)**

7.2.2 Findings and Trends

- Water sales have fluctuated over the years, but ended 2010 nearly $0.5 million higher than 2005. Expenditures increased steadily from 2005 to 2009. Costs were cut in 2010 and expenditures decreased by nearly 7 percent compared to 2009, but were still greater than revenues. The City increased rates 3 percent in 2010, but did not see increased revenue due to conditions out of their control with the cooler than normal weather and the depressed economy. The combined utility fund has been used to cover the difference.

- The O&M Coverage Ratio (water sales revenues divided by total operating expenses) began 2005 at 0.77, ranged from a high of 0.87 in 2006 to a low of 0.66 in 2009 and ended 2010 at 0.71. Over 1.00 would show that water sales can independently cover expenses.

- The Operating Ratio (total operating expenses divided by total operating revenues) began 2005 at 94.63 percent, increased to a high of 137.51 percent in 2009, and decreased to 124.31 percent in 2010. A ratio greater than 90 percent indicates there is little room for new debt service and capital replacement without additional rate increases. A ratio greater than 100 percent indicates that operating expenses exceed operating revenues and is indicative of an unsustainable financial condition.

- In 2008 the Operating Ratio was at a six-year low of 79.38 percent due to a transfer from the Revenue Bond Fund. Without this transfer, the Operating Ratio would have continued to increase to 122.13 percent.

7.3 Current Financial Structure

This section summarizes the current financial structure used as the baseline for the capital financing strategy and financial forecast developed for this Plan.

7.3.1 Financial Plan

The City's water utility is responsible for funding its related costs through user fees, but has also relied on the combined utility fund. It does not depend on general tax revenues or general fund resources. The primary source of funding for the water utility is derived from ongoing bi-monthly charges for service, with additional revenues coming from water on/off charges, and water penalty charges. The City controls the level of user 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 services, both operating and capital. To meet these objectives, the following elements have been completed:

1. **Capital Funding Plan**. Identifies the total CIP obligations of the planning period. The plan defines a strategy for funding the CIP including an analysis of available resources from rate revenues, existing reserves, connection 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 the use of debt financing (resulting in annual debt service) and the assumed rate revenue resources available for capital funding.

2. **Financial Forecast**. Identifies future annual non-capital costs associated with the operating, 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, capital outlays, and reserve contributions, as well as any coverage requirements associated with long-term debt. The plan also identifies the future adjustments required to fully fund all utility obligations in the projection period.

7.3.2 Capital Funding Plan

The CIP developed for this Plan identifies three alternatives. Consistent in all three alternatives is an annual water system upgrade and replacement program that is budgeted for $769,000 in 2012 and $1.00 million every year thereafter, as well as a $0.50 million reservoir rehabilitation project in 2014 and a $1.54 million plan to install automated meter readers over three years starting in 2014. The difference in each of the three alternatives is the additional project in 2017. The additional 2017 project costs range from $1.56 million in Alternative A to $3.98 million in Alternative C. All three alternatives reflect the peak hour demand improvements necessary for the City to meet Department of Health (DOH) requirements. Costs are stated in 2012 dollars and are escalated by 4.0 percent annual construction cost inflation to the year of planned spending for financing projections.

A summary of the 20-year CIP with Alternative A is shown in Table 7-2. The 2017 project costs increase by $1.89 million in Alternative B and an additional $0.53 million in Alternative C (in 2012 dollars). Table 7-3 provides more detail for the 6-year CIP for Alternative A.

Table 7-2 6 and 20-Year CIP – Alternative A

Year	2012$	Inflated
2012	$ 769,000	$ 769,000
2013	1,000,000	1,040,000
2014	2,012,000	2,176,179
2015	1,512,000	1,700,794
2016	1,512,000	1,768,826
2017	2,562,000	3,117,065
6-Year Total	**$ 9,367,000**	**$ 10,571,864**
2018-2031	14,000,000	23,145,103
20-Year Total	**$ 23,367,000**	**$ 33,716,967**

Table 7-3 6-Year CIP (2012$) – Alternative A

Project	2012	2013	2014	2015	2016	2017
Reservoir Rehabilitation Project			500,000			
Annual water system upgrade and replacement	769,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Automated Meter Readers (AMR) Installation			512,000	512,000	512,000	
Rezone Alternative 1 – CIP #1						557,000
Rezone Alternative 1 – CIP #2						1,005,000
Total	**$769,000**	**$1,000,000**	**$2,012,000**	**$1,512,000**	**$1,512,000**	**$2,562,000**

7.3.3 Capital Financing Strategy

An ideal capital funding strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume bond financing to meet needs for which the City's available cash resources are insufficient. Revenue bonds have been used as the debt funding instrument in this analysis. The capital financing strategy developed to fund the CIP identified in this Plan assumes the following funding resources:

- Accumulated cash reserves
- Annual transfers of excess cash (over minimum balance targets) from Operating Fund, if any
- Interest earning on Capital Fund balances and other miscellaneous capital resources
- Revenue bond financing

Based on information provided by the City, the water utility began 2012 with $2.65 million in the Operating Fund and $0.98 million in the Capital Fund. When possible, additional funds beyond the Operating target of 90 days are transferred to the Capital Fund. In 2012, after meeting the 90 day minimum fund balance target, an additional 90 days of expenses was kept in the Operating Fund to cover costs in the following year. After 2012, funds are made available for capital through rate funded system reinvestment starting at $0.2 million in 2013, $0.6 million in 2014 and $1.0 million beginning in 2015 and escalated by 4.0 percent annual construction cost inflation.

The cash resources described above are forecasted to fund 100 percent of the 20-year CIP. Table 7-4 presents the corresponding 20-year capital financing strategy for CIP Alternative A. Funding for Alternative A would include revenue bond financing of $1.5 million in 2014 and $1.6 million in 2017, while funding for Alternative B would include revenue bond financing of $1.5 million in 2014 and $4.0 million in 2017, and funding for Alternative C would include revenue bond financing of $1.5 million in 2014 and $4.65 million in 2017. For each alternative, all other funding would be from cash.

Table 7-4 20-Year Capital Funding Strategy – CIP Alternative A

Year	Capital Expenditures 2012$	Capital Expenditures Escalated	Revenue Bond Financing	Cash Funding	Total Financial Resources
2012	$ 769,000	**$ 769,000**	$ -	$ 769,000	**$ 769,000**
2013	1,000,000	**1,040,000**	-	1,040,000	**1,040,000**
2014	2,012,000	**2,176,179**	1,500,000	676,179	**2,176,179**
2015	1,512,000	**1,700,794**	-	1,700,794	**1,700,794**
2016	1,512,000	**1,768,826**	-	1,768,826	**1,768,826**
2017	2,562,000	**3,117,065**	1,600,000	1,517,065	**3,117,065**
Subtotal	**$ 9,367,000**	**$ 10,571,864**	**$ 3,100,000**	**$ 7,471,864**	**$ 10,571,864**
2018-2031	14,000,000	**23,145,103**	-	23,145,103	23,145,103
Total	**$ 23,367,000**	**$ 33,716,967**	**$ 3,100,000**	**$ 30,616,967**	**$ 33,716,967**

This type of planning looks at average growth over the 20-year period and does not take into consideration the current economic conditions, which can have a negative impact on annual growth. It is assumed that if growth is not occurring at the planned rate the timing of capital projects would be adjusted accordingly.

7.4 Available Funding Assistance and Financing Resources

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund the CIP identified in this Plan. In addition to utility's resources such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources such as grants, low-interest loans, and bond financing. The following is a summary of the City's water utility resources and outside resources.

7.4.1 Utility Resources

Water utility resources appropriate for funding capital needs include accumulated cash in the capital reserve, rate revenues designated for capital spending purposes, and capital-related charges such as connection charges and other connection fees. The first two resources will be discussed in the Fiscal Policies section (7.5.2) of the Financial Forecast. Capital-related charges are discussed below.

7.4.1.1 Capital Connection Charges

A Connection Charge (CC), as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connecting to the utility system. The purpose of the connection charge is two-fold: to promote equity between new and existing customers and to provide a source of revenue to fund capital projects. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects.

7.4.1.2 Local Facilities Charges

While a connection charge is the manner in which new customers pay their share of general facilities costs, local facilities funding is used to pay the costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded up-front by either connecting customers, developers, or through an assessment to properties, but never from rates.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the CC); (b) a developer funds extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID) which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the connection charge authorized through RCW 35.92.025. It is a City-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a City for the cost of a local facility that directly serves a property. It is a form of connection charge and thus can accumulate up to 10 years of interest. It typically applies in instances when no developer-installed facilities are needed through developer extension due to the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the connection charge required and must be built to City standards. The City is authorized to enter into developer extension agreements under RCW 35.91.020. Part of the agreement between the City and the developer planning to extend service might include a late-comer agreement, resulting in a late-comer charge to new connections to the developer extension.

Latecomer charges are a variation of developer extensions whereby new customers connecting to a developer-installed improvement make a payment to the City based on their share of the developer's cost (RCW 35.91.020). The City passes this charge on to the developer who installed the facilities. As part of the developer extension process, this defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement cannot exceed 20 years in duration.

LID/ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities (RCW 35.43.042). Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

7.4.2 Outside Resources

This section outlines various grant, loan and bond opportunities available to the City through federal and state agencies to fund the CIP identified in the Plan.

7.4.2.1 Grants and Low Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State utilities are available from the Department of Community, Trade and Economic Development (CTED). CTED has four grant and loan programs that the City might be eligible for. Each of these programs is described in greater detail below.

Community Development Block Grant (CDBG) General Purpose Grant – These grants are made available to small cities, towns and counties in Washington State carrying out significant community and economic development projects that principally benefit low and moderate income persons.

Eligible applicants are Washington State cities and towns with a population less than 50,000 and counties with a population less than 200,000 that are non-entitlement jurisdictions or are not participants in a Housing and Urban Development (HUD) Urban County Entitlement Consortium.

Eligible projects include public facilities for water, wastewater, storm, and streets. Approximately $11 million was available in 2012 with a maximum single grant amount of $1 million and an application cutoff date on March 1, 2012. The 2013 funding cycle has not yet been finalized, but is expected to be similar to 2012.

Further detail is available at http://www.commerce.wa.gov

Community Economic Revitalization Board (CERB) – CERB primarily offers low-cost loans; grants are made available only to the extent that a loan is not reasonably possible. 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. A local match of 25 percent is targeted.

Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes, and municipal corporations. Before submitting a project, contact CERB staff to discuss the project and evaluate your eligibility. A relationship with staff early in the project's development is key to strengthening the proposed project.

For 2011-2013 CERB received $5 million in appropriation authority to assist local governments and federally recognized Indian Tribes in meeting the public infrastructure needs of business and industry. CERB awards will consider the return to the public facilities construction loan revolving fund without putting an undue financial burden on the applicant. The CERB Board oversees three financing programs: Planning/Feasibility Grants; Committed Partner Construction Loans, and Prospective Development Construction Loans.

Further detail is available at http://www.choosewashington.com

Public Works Trust Fund (PWTF) – Cities, towns, counties and special purpose districts are eligible to receive loans from the PWTF for water, sewer, storm, roads, bridges and solid waste/recycling construction projects to address critical needs. Due to current funding restrictions and funding allocations, the Public Works Board has suspended the non-Construction Programs. As the economy builds, the Board will attempt to re-institute these programs. Currently, Construction Loans are available only for drinking water, sanitary sewer, storm water, and solid waste/recycling.

PWTF loans are available at interest rates ranging from 0.50 to 2.00 percent depending on the repayment term. The standard loan offer is 1.00 percent interest repaid over a 20 year term. All loan terms are subject to negotiation and Board approval. Due to changes in 2012, a local match is no longer required.

There was approximately $400 million available and the maximum loan amount was $15 million per jurisdiction for the 2014 loan cycle, with the possibility of additional funds being awarded on a per project basis at the Public Works Board’s discretion. The 2014 Construction Loan application cycle closed in May, 2012. A new loan cycle is being planned for next year and the application will be developed later this year. The deadline has not yet been set for the next cycle and will depend on the amount available for loans when the application becomes available.

Further detail is available at http://www.pwb.wa.gov.

Drinking Water State Revolving Fund (DWSRF) Loan Program – Funding historically targets protection of public health, compliance with drinking water regulations and assistance for small and disadvantaged communities. Low interest rates provided are 1.0 - 1.5 percent and no local match is required.

A new 2012 Washington State law requires all public water systems that receive loans or grants for infrastructure to complete an Investment Grade Efficiency Audit (IGEA). This is an effort to

apply energy efficiency to water systems, similar to DOH's Green Projects that was started in 2009, and may be financed as part of the DWSRF loan.
The 2012 DWSRF Loan Program closed in March, 2012. There were 105 applicants requesting over $218 million. After the scoring and ranking process that addressed the most serious risks to public health 54 applicants were approved for $130 million, including 13 approved to receive principle forgiveness. The 2013 funding cycle will be announced in late fall 2012.

Further detail is available at http://www.doh.wa.gov.

7.4.2.2 Bond Financing

General Obligation Bonds – General Obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

RCW 39.36.020 states:

> *"(a) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.*
>
> *(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein."*

While bonding capacity can limit availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs; and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds – Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the City's other revenue sources. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The City agrees to satisfy these requirements by ordinance as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

Build America Bonds – The Recovery Act of 2009 (the Act) created an innovative new tool for municipal financing called Build America Bonds (BABs), which are taxable bonds for which the US Treasury Department paid a direct subsidy of 35 percent of the interest costs to the issuer. This funding source was available from 2009 through 2010 and the President's FY2013 Budget proposes to reinstate the BABs program.

The Act created two types of BABs. The first type of BABs provided a Federal subsidy to investors equal to 35 percent of the interest payable by the issuer ("Tax Credit BABs"). The second type of BABs provided a direct Federal subsidy that was paid to state and local governments in an amount equal to 35 percent of the interest ("Direct Payment BABs").

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

Direct Payment BABs offered a larger Federal subsidy than Tax Credit BABs; however, they were subject to more restrictions. In general, Direct Payment BABs could be issued to finance capital expenditures for any governmental purpose for which tax-exempt government bonds could be issued, excluding private activity bonds and excluding refunding bonds. Costs of issuance paid from Direct Payment BABs proceeds were limited to 2 percent. In order to receive a Federal subsidy, issuers were required to submit a payment request form no earlier than 90 days, and no later than 45 days, before each interest payment date. Issuers received the requested payment within 45 days of the date the form was 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.treasury.gov.

7.5 Financial Forecast

The financial forecast, or revenue requirement analysis, forecasts the amount of annual revenue that needs to be generated by water rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, the revenue needs of the utility also include debt covenant requirements and specific fiscal policies and financial goals of the City.

The analysis determines the amount of revenue needed in a given year to meet that year's expected financial obligations. For this analysis, two revenue sufficiency tests have been developed to reflect the financial goals and constraints of the City: cash needs must be met, and 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 City in each year of the planning period. Typically these include O&M expenses, debt service payments, depreciation 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 projected cash revenues using the current rate structure. Any projected revenue shortfalls are identified and the rate increases necessary to make up the shortfalls are established.

Coverage Test – The coverage test is based on a commitment made by the City when issuing revenue bonds and some other forms of long-term debt. For purposes of this analysis, revenue

bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City would be 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 that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, plus an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be use for any utility purpose, including funding capital projects. Targeting a higher coverage factor can help the City achieve a better credit rating and provide lower interest rates for future debt issues.

In determining the annual revenue requirement, both the cash and coverage sufficiency test must be met and the test with the greatest deficiency drives the level of needed rate increase in any given year.

7.5.1 Current Financial Structure

The city maintains a fund structure and implements financial policies that target management of a financially viable and fiscally responsible enterprise fund utility.

7.5.2 Fiscal Policies

A brief summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program are discussed below.

Minimum Fund Balances – Operating reserves are designed to provide a liquidity cushion to ensure that adequate cash working capital will be maintained to deal with significant cash balance fluctuations, such as seasonal fluctuations in billings and receipts, unanticipated cash expenses, or lower than expected revenue collections. The City's current policy is to maintain a minimum balance in the Operating Fund equal to 90 days of O&M. This target is reasonable for a water utility, given the variability in revenue collections due to changing weather patterns that can significantly affect revenue collections during the summer season.

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. The reserve also could be used for other unanticipated capital needs including capital project cost overruns. Industry practices range from maintaining a balance equal to 1 to 2 percent of fixed assets, an amount equal to a 5-year rolling average of CIP costs, or an amount determined sufficient to fund equipment failure (other than catastrophic failure). The final target level should balance industry standards with the risk level of the City. The City's current policy is to maintain a minimum of 1 percent of fixed assets in the Capital Fund.

System Reinvestment – 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 measured for reporting purposes through annual depreciation expense, which is based on the original cost of the asset. While this reported 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 expenses.

The City historically has not been funding this expense, but plans to begin doing so in 2013. The CIP budget in the analyses includes $1 million dollars in annual rate funded system reinvestment throughout the 20-year forecast.

Debt Management – It is prudent to consider policies related to debt management as part of broader utility financial policy structure. Debt management policies should be evaluated and formalized including the level of acceptable outstanding debt, debt repayment, bond coverage and total debt coverage targets. The City's existing bond covenants require a 1.25 debt coverage test. The City has an internal target of 1.50.

7.5.2.1 Financial Forecast

The financial forecast is developed from 2012 budget documents along with other key factors and assumptions to develop a complete portrayal of the water utility's annual financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast:

- **Revenue** – The City has two general revenue sources: revenue from charges for service (rate revenue) and miscellaneous (non-rate) revenue. In the event of a forecasted annual shortfall, rate revenue can be increased to meet the annual revenue requirement. Non-rate revenues are forecast to increase with inflation.

- **Growth** – Rate revenue was escalated based on the growth rates provided in Chapter 2 of this Plan, which range from 1.27 to 1.95 percent per year. The growth rates in this plan seem to be higher than the recent trends experienced by the City. Therefore, actual growth should be closely monitored.

- **Expenses** – O&M expense projections are based on the 2012 budget and are forecasted to increase with general cost inflation of 2.23 percent, construction cost inflation of 4.0 percent, labor cost inflation of 2.0 percent, and benefit cost inflation of 5.5 percent. Budget 2012 figures were used for 2012 taxes; future taxes are calculated based on forecasted revenues and prevailing tax rates.

- **Existing Debt** – The City currently has a total of two outstanding revenue bonds that expire in 2027 and 2030; the water utility is currently paying for one third of the total bond payments with annual payments ranging from approximately $571,000 to $338,000 if the one third payment continues.

- **Future Debt** – The capital financial strategy developed for this Plan forecasts the need to issue new debt in the amount of $1.5 million in 2014 regardless of the CIP alternative chosen, as well as new debt in 2017 in the amount of $1.6 million for Alternative A, $4.0 million for Alternative B, or $4.65 million for Alternative C. This would result in annual debt service of $134,000 in 2014 and total annual debt service starting in 2017 of $276,000 for Alternative A, $491,000 for Alternative B, or $548,000 for Alternative C. The analysis performed assumes all revenue bond financing.

- **Revenue Bond Assumptions** – The forecast assumes a revenue bond interest rate of 5.0 percent, an issuance cost of 2.0 percent and a term of 20 years.

- **Transfers to Capital** – Any Operating Fund balance above the minimum requirement is assumed to be available to fund capital projects and is projected to be

transferred to the Capital Fund unless it will be needed to fund operating costs in the following years. The 2012 Operating Fund balance is expected to end the year at 180 days of O&M; above the 90 day minimum target for that year, but needed for operating expenses in the following year. The Capital Fund balance is expected to end the year above the $194,000 target at approximately $500,000.

Although the financial plan is completed for the 20-year time horizon of this Plan, the rate strategy focuses on the shorter term planning period 2012 through 2017. It is imperative that the City revisit the proposed rates every 2 to 3 years to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates adjusted as needed.

Table 7-5 summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances and fiscal policies, using CIP Alternative A.

Table 7-5 6-Year Financial Forecast – CIP Alternative A

Revenue Requirement	2012	2013	2014	2015	2016	2017
Revenues						
Rate Revenues Under Existing Rates	$ 3,844,589	$ 3,897,916	$ 3,951,982	$ 4,006,799	$ 4,062,375	$ 4,118,723
Non-Rate Revenues	359,240	359,673	334,027	345,509	353,147	360,859
Total Revenues	**$ 4,203,829**	**$ 4,257,588**	**$ 4,286,010**	**$ 4,352,307**	**$ 4,415,523**	**$ 4,479,582**
Expenses						
Cash Operating Expenses	$ 2,322,141	$ 2,391,890	$ 2,449,272	$ 2,508,533	$ 2,569,509	$ 2,632,261
Water Purchase	2,170,466	2,218,794	2,268,198	2,318,702	2,370,331	2,423,109
Existing Debt Service	571,221	564,288	338,687	338,388	337,921	337,971
New Debt Service	-	-	133,774	133,774	133,774	276,466
Rate Funded System Reinvestment	-	200,000	600,000	1,124,864	1,169,859	1,216,653
Total Expenses	**$ 5,063,828**	**$ 5,374,972**	**$ 5,789,932**	**$ 6,424,261**	**$ 6,581,393**	**$6,886,460**
Net Surplus (Deficiency)	**$ (859,998)**	**$ (1,117,383)**	**$ (1,503,922)**	**$ (2,071,954)**	**$ (2,165,870)**	**$ (2,406,878)**
Additions to Meet Coverage	-	-	-	-	-	-
Total Surplus (Deficiency)	**$ (859,998)**	**$ (1,117,383)**	**$(1,503,922)**	**$ (2,071,954)**	**$ (2,165,870)**	**$(2,406,878)**
% of Rate Revenue	**22.37%**	**28.67%**	**38.05%**	**51.71%**	**53.32%**	**58.44%**
Annual Rate Adjustment	**0.00%**	**15.00%**	**9.50%**	**9.50%**	**9.50%**	**0.00%**
Cumulative Annual Rate Adjustment	**0.00%**	**15.00%**	**25.93%**	**37.89%**	**50.99%**	**50.99%**
Rate Revenues After Rate Increase	$ 4,359,292	$ 5,082,722	$ 5,642,778	$ 6,264,547	$ 6,954,826	$ 7,051,294
Additional Taxes from Rate Increase	$ 25,884	$ 59,584	$ 85,030	$ 113,542	$ 145,461	$ 147,479
Net Cash Flow After Rate Increase	**(371,180)**	**7,839**	**101,844**	**72,252**	**581,119**	**378,214**
Coverage After Rate Increases	**0.50**	**1.39**	**2.53**	**3.59**	**4.74**	**3.61**

The city has adopted a rate plan in Ordinance 2887 with a 15.0 percent rate increase that is reflected in the budgeted rate revenue for 2012 followed by a 15.0 percent rate increase in 2013, and 9.5 percent annual rate increases in 2014 – 2016. The planned rate increases are required to cover the increasing level of O&M expenses, maintain adequate ending fund balance targets and meet the debt service requirements related to the capital program. No additional rate increase is needed in 2017 if CIP Alternative A is used, but a 1.0 percent increase would be needed for CIP Alternatives B and C.

7.5.3 City Funds and Reserves

Table 7-6 shows a summary of the projected Operating and Capital Fund ending balances through 2017 based on the rate forecasts presented above using CIP Alternative A. The Operating Fund has a minimum target balance of 90 days of O&M expenses and remains above that throughout the forecast for CIP Alternative A, or dips down to 89 days in 2030 for Alternative B or C. The Capital Fund target balance is set at 1 percent of fixed assets ranging from $194,000 in 2012 to $315,000 in 2017 for Alternative A and would increase to $321,000 in 2017 for Alternative C. The Capital Fund balance dips below the minimum target balance in 2016, but escalates back above target levels by 2017 for Alternative A, 2023 for Alternative B, or 2028 for Alternative C.

Table 7-6 Ending Cash Balance Summary – CIP Alternative A

Ending Fund Balances	2012	2013	2014	2015	2016	2017
Operating Fund	$2,209,479	$1,136,881	$1,163,212	$1,190,277	$1,214,715	$1,246,530
Capital Fund	499,798	755,229	777,220	273,806	243,748	301,061
Total	**$2,709,277**	**$1,892,110**	**$1,940,432**	**$1,464,083**	**$1,458,463**	**$1,547,591**
Combined Minimum Target Balance	*1,298,387*	*1,340,928*	*1,389,021*	*1,433,094*	*1,475,220*	*1,538,205*

7.6 Current and Projected Rates

7.6.1 Current Rates

The City's current rate structure consists of two rate components, a fixed monthly charge and a variable monthly charge per hundred cubic feet (ccf). Rates differ by class and are described in detail below.

- The single-family class has a fixed monthly rate that includes 5 ccf of usage. The variable monthly rate is an two block structure, with a lower rate for over 5 – 20 ccf and an increased rate for over 20 ccf.
- The multiple/mobile-unit class has a fixed monthly rate that includes 5 ccf of usage per meter. The variable monthly rate is the same for all usage above the 5 ccf allowance.
- The commercial/industrial fixed monthly rate is based on meter size and includes 5 ccf of usage. The variable monthly rate is the same for all meter sizes and for all usage above the 5 ccf allowance.
- In addition, the single-family class has a low income discount of 40 – 50 percent based on the household income level compared to the state poverty level. Table 7-7 shows the existing rate structure.

Table 7-7 2012 Existing Rate Structure

Meter	Billed ccf	Monthly	Volume
Single-Family			
Within Threshold	≤5	$ 14.29	$ -
Block 1	>5-20		1.64
Block 2	>20		2.47
Multiple/Mobile-Unit	>5	5.80	1.27
Commercial/Industrial			
5/8"-3/4"	>5	$ 15.76	$ 1.92
1"	>5	34.13	1.92
1.5"	>5	64.33	1.92
2"	>5	99.78	1.92
3"	>5	186.43	1.92
4"	>5	305.89	1.92
6"	>5	607.85	1.92

Notes:
(1) Low-income discounts are 40-50 percent of the single-family monthly rate

7.6.2 Projected Rates

As stated above, the city has adopted a rate plan in City Code 13.20.010 that includes 15.0 percent annual rate increases in 2012 and 2013 followed by 9.5 percent annual rate increases in 2014 – 2016. Based on CIP Alternative A, no additional increases would be needed in 2017; however, a 1.0 percent increase would be needed for CIP Alternatives B and C. Table 7-8 shows the proposed rates for the 6-year planning period based on CIP Alternative A.

Table 7-8 6-Year Proposed Rates – CIP Alternative A

Class	Volume (ccf)	2012	2013	2014	2015	2016	2017
Single-Family							
Fixed Rate		$ 14.29	$ 16.14	$ 17.48	$ 18.89	$ 20.45	$ 20.45
Within Threshold	≤5	-	-	-	-	-	-
Block One	>5-20	1.64	1.85	2.00	2.16	2.34	2.34
Block Two	>20	2.47	2.79	3.02	3.26	3.53	3.53
Multiple/Mobile-Unit							
Fixed Rate		5.80	6.47	6.87	7.30	7.74	7.74
Volume Change	>5	1.27	1.42	1.51	1.60	1.70	1.70
Commercial/Industrial							
Fixed Rates							
5/8”-3/4”		15.76	18.76	21.08	23.70	26.61	26.61
1”		34.13	40.62	45.65	51.31	57.62	57.62
1.5”		64.33	76.56	86.05	96.72	108.62	108.62
2”		99.78	118.73	133.46	150.01	168.46	168.46
3”		186.43	221.85	249.36	280.28	314.76	314.76
4”		305.89	364.01	409.15	459.88	516.45	516.45
6”		607.85	723.34	813.03	913.85	1,026.25	1,026.25
Volume Change	>5	1.92	2.28	2.56	2.88	3.23	3.23

Notes:
(1) Low-income discounts are 40 – 50 percent of the single-family monthly rate

Based on the cost-of-service analysis completed by FCS GROUP in September 2010, increases for each class do not exactly match the overall percent increases, but appear to be lower for single-family and multi-family/mobile classes and higher for the commercial class. These changes will gradually transition all classes towards cost-of-service rates by 2016. It has been recommended that the City revisit the study findings periodically to check that the assumptions used are still appropriate and no significant changes have occurred that would alter the results of the study. Table 7-9 shows single-family monthly bill comparisons for the proposed annual increases based on CIP Alternative A. If CIP Alternative B or C were used and rates in 2017 were increased by 1.0 percent, the single-family monthly bill would increase by $0.39 that year.

Table 7-9 Monthly Bill Comparisons – CIP Alternative A

Single-Family	2012	2013	2014	2015	2016	2017
Monthly Bill	$ 27.41	$ 30.94	$ 33.48	$ 36.17	$ 39.17	$ 39.17
$ Difference	$ 3.18	$ 3.53	$ 2.54	$ 2.69	$ 3.00	$ -
Rate Increase	15.00%	15.00%	9.50%	9.50%	9.50%	0.00%

Notes:
(1) Assumes 13 ccf monthly usage

7.7 Affordability

The Department of Health and the Department of Commerce's Public Works Board use an affordability index to prioritize low-cost loan awards depending on whether rates exceed 2.0 percent of the median household income for the service area. The median household income for the City of Lynnwood was $47,920 in 2006 – 2010 according to the U.S. Census Bureau. The 2010 figures are escalated based on the assumed 2.23 percent general cost inflation to show the median household income in future years. Table 7-10 presents the City's rates with the projected rate increases for the forecast period based on CIP Alternative A, tested against the 2.0 percent monthly affordability threshold.

Table 7-10 Affordability Test

Year	Inflation	Median HH Income	2% Monthly Threshold	Projected Monthly Bill
2010		$ 47,920	$ 59.90	
2011	2.23%	48,989	61.24	$ 24.23
2012	2.23%	50,081	62.60	27.41
2013	2.23%	51,198	64.00	30.94
2014	2.23%	52,340	65.42	33.48
2015	2.23%	53,507	66.88	36.17
2016	2.23%	54,700	68.37	39.17
2017	2.23%	55,920	69.90	39.17

Applying the 2.0 percent test, the City's rates are forecasted to remain well within the indicated affordability range through 2017.

7.8 Conclusion

The results of this analysis indicate that the approved rate increases in 2013 – 2016 are sufficient to fund ongoing operating needs and future debt requirements to fund CIP Alternative A. If CIP Alternative B or C were used, a 1.0 percent increase would be needed in 2017. Implementation of the proposed rate increases should provide for continued financial viability while maintaining generally affordable rates. The City has adopted the 2012 – 2016 rate increases through Ordinance 2887 that became effective March 28, 2011.

It is important to remember that the analysis performed in this chapter assumes growth rates from Chapter 2 of this WSP, which are projected to be higher than the trends the City is currently experiencing. If the reduced growth trends continue the proposed annual rate increases may need to be updated and revised.

It is recommended that the City regularly review and update the key underlying assumptions that compose the multi-year financial plan to ensure that adequate revenues are collected to meet the total water utility financial obligations.

Chapter 8 Sustainability

8.1 Introduction

Chapter 8 presents a discussion on sustainability, and how the City's water system can consider sustainable practices per the City's Comprehensive Plan, Subgoal E&S-1.3.

8.2 Sustainability Principles

Subgoal E&S-1.2 of the City's Comprehensive Plan discusses how sustainability principles will be considered within the City's operational plans, including this Plan. The City will seek to establish sustainable practices within City programs, services, operations, and capital projects.

The City has already made some steps towards sustainable practices by means of modifications to the motors, pumps, and blowers at the wastewater treatment plant and updates to lighting and HVAC systems city wide.

8.2.1 Current Practices

Sustainability is currently practiced by the City for the water system. The City employs a water use rate schedule, which emphasizes water conservation. The City also uses a summer lawn watering calendar, that encourages homeowners to water their lawns on certain days only, thus, conserving water during the dry season.

The City's GIS capabilities for the water system improve sustainability by allowing the City to pinpoint water system issues and concerns.

The water system uses minimal energy; the 680 Zone booster pump station requires continual energy. The transmission and distribution mains, hydrants, reservoirs, meters, and valves all operate primarily by gravity.

8.2.2 CIP Alternative Improvements

The CIP chapter focused on Alternatives which provide the City's water customers with the best methods of achieving minimum standards set by the Department of Health (DOH). New infrastructure must be constructed to meet the levels of service standards associated with the Alternatives. Within each Alternative is a rezone improvement, which includes providing water at an appropriate hydraulic gradient relying on gravity rather than being assisted by a pump station or other means of transmission.

Following is a discussion related to each CIP Alternative, and how sustainability factors into each one.

Alternative A: Allows for better hydraulics within the City's water system, by rezoning the 680 and 724 Zones. The booster pump station serving the 680 Zone will be upsized to accommodate the increase in customers due to the rezone; sustainable practices of optimizing the new pumps and pump motors should be considered by the City during this time.

Alternative B: Allows for better hydraulics within the City due to the rezoning of the 635, 680, and 724 Zones. This alternative eliminates the need for a booster pump station serving the 680 Zone. The City will no longer need to supply energy to power the pump station or fuel for personnel to maintain the station. However, the Alderwood Water & Wastewater District

(AWWD) will need to pump the water; therefore, there is no additional energy savings. A new master meter will enable metering of water use to these zones that will provide for greater sustainability as water issues and usage can be tracked.

Alternative C: Allows for better hydraulics within the City by eliminating the 680 and 724 Zones and creating a new 710 Zone. This alternative eliminates the need for a booster pump station serving the 680 Zone. The City will no longer need to supply energy to power the pump station or fuel for personnel to maintain the station. However, AWWD will need to pump the water; therefore, there is no additional energy savings. A new master meter will enable metering of water use to these zones that will provide for greater sustainability as water issues and usage can be tracked.

The City may want to consider using the 2009 Clean Air and Climate Protection (CACP) program to evaluate the greenhouse gas emissions for each of the above alternatives. The 2009 CACP explicitly recognizes emissions from mobile and stationary sources, aiding in the evaluation of which alternative will save the City the most gas production. This information, coupled with the capital and O&M cost considerations, will assist in the determination of the preferred alternative.

8.2.3 Future Practices

The use of Automatic Meter Reading (AMR) also promotes sustainability because this technique for meter reading uses less staff and does not require personnel to drive around the City to take readings, thereby saving fuel and reducing emissions.

Additionally, the City should evaluate increasing GIS use for tracking and evaluating water use issues within the water system. Continuation of the water use rate schedules and the summer lawn watering calendar promotes sustainability. The use of natural gas fired, hybrid, or electric vehicles for O&M purposes will also improve sustainability practices.