CITY OF GRANDVIEW

WATER SYSTEM PLAN

Prepared by:

HLA
Huibregtse, Louman Associates, Inc.
Civil Engineering ❖ Land Surveying ❖ Planning

PROJECT NO. 14093

November 2015

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INTRODUCTION

The City of Grandview is located in the lower Yakima Valley, within the south-eastern corner of Yakima County. The City lies along Interstate 82, approximately 8 miles south and east of the City of Sunnyside, and 7 miles north and west of the City of Prosser, in a dry, sunny area consisting of fairly flat and cultivated lands. Incorporated in 1909, Grandview's economy depends largely on the agricultural industry.

Grandview recognizes the need to improve and expand its water system if it is to meet the demands of its system users and to keep pace with other growth-oriented improvements in this vital Yakima County community. Huibregtse, Louman Associates, Inc. (HLA), was authorized by the City of Grandview to prepare this Water System Plan, which represents the culmination of planning and data collection efforts.

PLANNING REQUIREMENTS

Water systems with 1,000 or more services are required to have a water system plan approved by the Washington State Department of Health (DOH) pursuant to the Washington Administrative Code, WAC 246-290-100 and WAC 246-291-140.

In order to assist water utilities in preparing their plans, the Department of Health has published the *Water System Planning Handbook* dated April 1997. This handbook identifies information needed to develop a "well-conceived and clearly-stated" water system plan. The handbook is organized into 10 major chapters, with each chapter representing a basic water system plan component. The 10 chapters are:

1. Description of Water System
2. Basic Planning Data and Water Demand Forecasting
3. System Analysis
4. Water Use Efficiency Program and Water Rights
5. Source Water Protection
6. Operation and Maintenance Program
7. Distribution Facilities Design and Construction Standards
8. Improvement Program
9. Financial Program
10. Miscellaneous Documents

Each chapter is divided into several sections to address specific topics in detail. The City of Grandview *2015 Water System Plan* update has been prepared in the format of the Department of Health's *Water System Planning Handbook*.

OBJECTIVE

The principal goal of water system planning is to make efficient use of available resources. This is accomplished by making decisions about water system capital improvements and operations which are in accordance with overall system policies and directions expressed in a utility's water system plan.

An equally important reason for developing a water system plan is to assure orderly growth of the system while maintaining reliable delivery of high quality water. The plan is intended to guide water utility actions in a manner consistent with other activities taking place in the community.

The water system plan is intended to look ahead at least 20 years into the future. Development of a definite improvement schedule and financial program is required for the first six-year period, while the planning approach for the second period may be more conceptual. To continually provide adequate guidance to decision makers, the plan requires updating every six years.

Once adopted by the City of Grandview and approved by the Department of Health (DOH), the Water System Plan is considered by DOH "to be a commitment to implement the actions identified in the improvement schedule." Future water system decisions shall be in accordance with the Water System Plan.

PROJECTED WATER DEMANDS

To plan for Grandview's future water needs, the following items were examined:

Basic Planning Data (CHAPTER 2): Land use, future service area boundary, and population growth are used to evaluate demands on the Grandview water system. The City's 2014 service population was estimated to be 11,170 by the Washington State Office of Financial Management (OFM), and the future population is projected to be 12,398 by the year 2021. Grandview's 2013 number of residential water services was 2,521, and the future number of residential services is projected to be 2,840 by the year 2021.

Current Water Demands (CHAPTER 2): Grandview's greatest year of water consumption in the last six years was in 2008 when 598.10 million gallons was consumed. This is equal to an average daily consumption of 1,638,624 gallons. The maximum month of water consumption was experienced in October 2008, when the average daily consumption for the month was 2,548,284 gallons. Maximum day consumption (based upon the maximum day of water production in the month) was 3,289,122 gallons on October 1, 2008, and peak hour consumption was calculated to be 4,111 GPM.

Projected Water Demands (CHAPTER 2): Grandview's water demand forecast for the year 2021, and the City's current source capacity and water rights are below:

	Projected Year 2021 Demand	Current Source Capacity	Current Water Rights
ERUs	7,372	- - - - - - -	- - - - - - -
Annual	676.454 MG	2,275.848 MG	1,511.95 MG
Maximum Day	4.427 MGD	6.235 MGD	10.015 MGD
Peak Hour	5,533 GPM	4,330 GPM	6,955 GPM

SUMMARY OF SYSTEM DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

The following is a listing of the major water system deficiencies and recommended improvements which have been identified in the existing water system. A more detailed description of these deficiencies and related improvements can be found in CHAPTER 8 of this Plan.

SUPPLY

Water Rights – A City's water right status is crucial in determining the amount of possible future growth. Currently, Grandview has annual rights (Q_a) of 4,640 acre-feet per year and instantaneous rights (Q_i) of 6,955 GPM. As discussed in CHAPTER 2 of this Plan, current water rights are adequate in providing for existing and projected year 2035 demands. Should population trends and demand projections change, the water rights may be exceeded by year 2035.

As discussed in CHAPTER 1 of this Plan, the City currently requires that any proposed new development, which will exceed the City's current water right capacity, to transfer any water right the developer may hold to the City, prior to approval of the new development.

Industrial water consumption is still the highest among all user categories and projected future demands will need to be closely monitored by the City.

Source Well Capacity – Grandview's source wells have decreased in capacity since original construction and previous rehabilitation projects. If all source wells were to operate at original capacity, total production would equal 5,855 GPM. However, the current system source well capacity is 4,330 GPM. The year 2015 source capacity is adequate to meet current and anticipated average day and maximum day demands.

STORAGE

Storage Capacity – The City's reservoir storage capacity sufficient for current demands, but inadequate to meet the 20-year projected demand. Based on projected growth, additional water storage capacity will be needed to meet year 2035 system demands and associated storage requirements. Other alternatives may be investigated at the City's request.

Reservoir Cleaning and Maintenance – Both City reservoirs should be inspected and cleaned, based on a five year maintenance cycle. The standpipe reservoir was last cleaned in 2008 and painted in 1990. The elevated reservoir was last rehabilitated in 2007, including interior and exterior painting, new hatch, catwalk, and overflow modifications.

DISTRIBUTION

Fire Flow Capacity – Figure 3-4 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, some locations are deficient based on the computer hydraulic model. Refer to CHAPTER 8 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – Most of the deficiencies identified shown in Figure 3-4 can be addressed by upsizing water mains. Suggested Improvements for water main upsizing are shown in CHAPTER 8.

Pressure – The existing City of Grandview domestic water system consists of one distribution pressure zone between elevations 740 feet and 840 feet above sea level, as shown in Figure 3-1 WATER SYSTEM SERVICE AREA/ELEVATIONS MAP of this Plan. The static pressure level ranges from 44 to 87 psi.

TELEMETRY

Grandview's telemetry control system was updated in 2015 consisting of hardware and software upgrades to the City's existing HMI computer. Additional phases of work are planned to continue improving the City's telemetry system. Phase 2 telemetry improvements will consist of servicing, replacing, and adding chlorination system equipment, submersible level transducers, and door intrusion sensors to existing source controls. Phase 3 telemetry improvements will consist of installing telemetry control panels and radios at sources S01 and S11. Additional information on planned telemetry improvements is available in CHAPTER 8.

PROPOSED WATER SYSTEM FINANCIAL PROGRAM

Recommended system improvements are scheduled for completion in annual increments for the next six (6) years, as shown in Table 8-1 and Table 8-2 in CHAPTER 8 of this Plan. Scheduling of the remaining improvements beyond this six-year period needs to be reviewed yearly as priorities and City growth patterns change and progress. Major recommended improvements for future years (2022 through 2035) have been estimated, but have not been scheduled at this time. The estimated improvement costs are provided in Table 8-1 and Table 8-2, as well as the total projected yearly cost.

In order to fund the recommended water system improvements discussed in this Plan, a proposed financial program has been developed and is provided in Table 9-4 in CHAPTER 9 of this Plan. The proposed financial program incorporates projected operations, improvements, and loan costs for the next six-year period. Projected revenues and expenditures of the water system include growth factors and inflation rates, in addition to the recommended rate increases, to account for estimated growth within the City, as discussed in CHAPTER 9 of this Plan.

The City of Grandview will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the next update of the *Water System Plan*. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

CHAPTER 1 - DESCRIPTION OF WATER SYSTEM

1.1 OWNERSHIP AND MANAGEMENT

1.1.1 Water System Ownership

The City of Grandview, a municipal corporation located within the south-eastern part of Yakima County as shown in Figure 1-1 State Vicinity Map, owns and operates its own water system. Decisions regarding daily water system operations are made by the City Administrator/Public Works Director. Financial decisions regarding major water system improvements and establishment of water rates are made by the Grandview City Council. The following parties are involved in the operation, maintenance, and planning for the Grandview water production, storage and distribution facilities:

WATER SYSTEM NAME, OWNER, OPERATOR, AND IDENTIFICATION NUMBER:

City of Grandview Water System

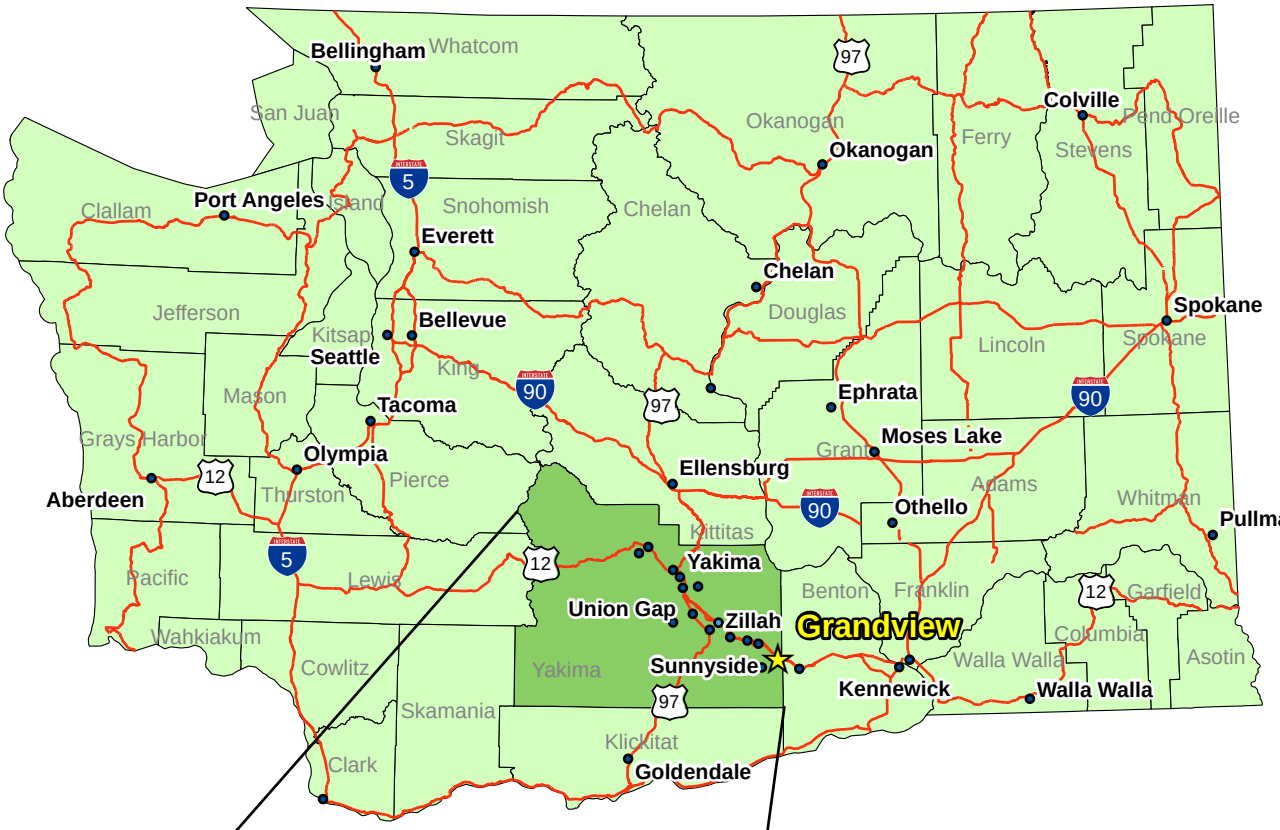
City of Grandview
207 W. 2nd Street
Grandview, WA 98930
Phone: (509) 882-9213

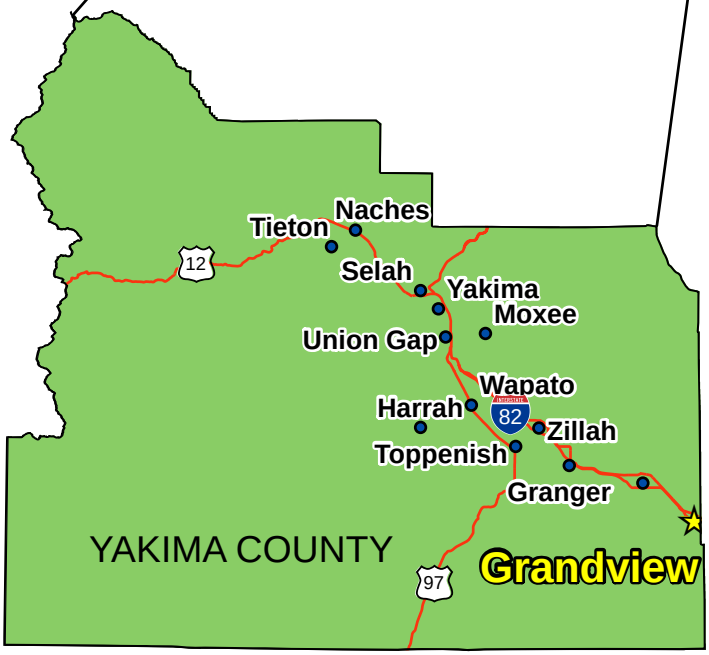
Mayor: Norm Childress
City Administrator/Public Works Director: Cus Arteaga
Assistant Public Works Director: Santos Trevino
Public Works Foreman: Juan Moreno
Water System Identification Number: 28970 J

WATER SYSTEM CONSULTING ENGINEER:

Huibregtse, Louman Associates, Inc. (HLA)
2803 River Road
Yakima, WA 98902
Phone: (509) 966-7000
Project Engineer: Benjamin A. Annen, PE

A description of the City's water system management structure is presented in CHAPTER 6 of this Plan. A copy of the City's Water Facility Inventory (WFI) form is included in CHAPTER 10 of this Plan.





WASHINGTON STATE VICINITY MAP FIGURE 1-1

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1.2 SYSTEM BACKGROUND

1.2.1 History of Water System Development and Growth

Table 1-1 provides some information as to the development of Grandview's water system.

TABLE 1-1 MAJOR WATER SYSTEM IMPROVEMENTS

Year	Improvement Description
1913	City water system completed
1935	Work begun on pressure irrigation system
1945	City furnished 360 families with water adjacent to City Limits
1950	500,000 gallon elevated tank reservoir constructed
1952	Orchard Tract Well constructed
1962	Safeway Well and Springs Well constructed
1965	Cohu Well constructed
1969	Highland Well constructed
1974	Comprehensive Water Plan by Walter Woodward completed
1977	Water System Improvements Study and Utility Rate Study by Vitro Engineering completed
1977	3,000,000 gallon storage tank reservoir constructed
1978	North Willoughby Well constructed
1982	South Willoughby Well constructed
1986	Comprehensive Water Plan Update by Century West Engineering completed
1989	5th Street water main replaced
1989	Interior of 3,000,000 gallon storage tank reservoir painted
1990	Avenue E water main replaced (2nd Street to 5th Street)
1991	Butternut Well constructed
1992	Bonnieview Toad transmission project (Euclid Road to Avenue B) completed
1992	Birch Street – 5th Street – Welch Plant transmission main project completed
1995	Comprehensive Water Plan Update by Huibregtse, Louman Associates completed
1998	Elm Street water main extension project completed
1999	3rd Street water main replacement project completed
1999	Wine Country Road – Viall Road water main project completed
1999	Eastside transmission main project completed
1999	Appleway Road water main replacement project completed
2000	Cohu Well, Highland Well, and Pecan Well rehabilitation project completed
2001	Stover Road water main improvement project completed
2001	Comprehensive Water Plan Update by Huibregtse, Louman Associates completed
2002	Bethany Road water main improvement project completed
2005	Orchard Tracts Well and Springs Well rehabilitation project completed
2006	Balcom Well and Velma Well redevelopment project completed
2007	South Willoughby Well rehabilitation project completed
2007	500,000 gallon elevated tank reservoir rehabilitation project completed
2009	Grandridge Area Street and Water Main Improvements – Water main replacement
2010	"Alive" Downtown Improvement – Water main replacement
2012	North Birch Street Neighborhood – Water main replacement
2013	Euclid Road – Apricot Road to Groom Lane – Water main replacement
2014	Bonnieview Road – Wilson Highway to Madison Drive – Water main replacement

Grandview's first *Comprehensive Water System Plan (*CWP*)*, completed in 1974, provided the City with an in-depth look at its water system, deficiencies, and potential growth. Updates to the 1974 CWP were completed in 1986, 1995, 2001, and again in 2008. This *2015 Water System Plan* is intended to update the *2008 Water System Plan*.

TABLE 1-2 WATER SYSTEM GROWTH SUMMARY

	Year						% Increase 1985-2013
	1985	1993	2000	2007	2010	2013	
Population*	6,344	7,590	8,377	9,408	10,862	11,010	173.5%
Total Water Services	2,150	2,219	2,425	2,796	2,739	2,788	29.7%
Total Annual Metered Consumption (MG)	505	765	681	614	554	582	15.2%
Total Source Capacity (MGD)	5.98	6.84	6.84	6.84	7.85	7.85	31.3%
Total Storage Capacity (MG)	3.5	3.5	3.5	3.5	3.5	3.5	0.0%

* Based on Washington State Office of Financial Management (OFM) census data and estimates.

1.2.2 Geography

The City of Grandview and its Urban Growth Area are located in the Lower Yakima Valley, the south-eastern part of Yakima County, in the south-central portion of Washington State, as shown on Figure 1-1. The City lies along Interstate 82 between the City of Sunnyside, approximately six miles to the northwest, and the City of Prosser, approximately six miles to the southeast.

Grandview lies north of the Yakima River, between the Rattlesnake Hills to the north and the Horse Heaven Hills to the south. The topography in Grandview is relatively flat, sloping generally from the northeast to the southwest. A few rolling hills exist, mostly in the southern areas of the City. Ground elevations vary from 840 feet to 740 feet above sea level within the existing City limits.

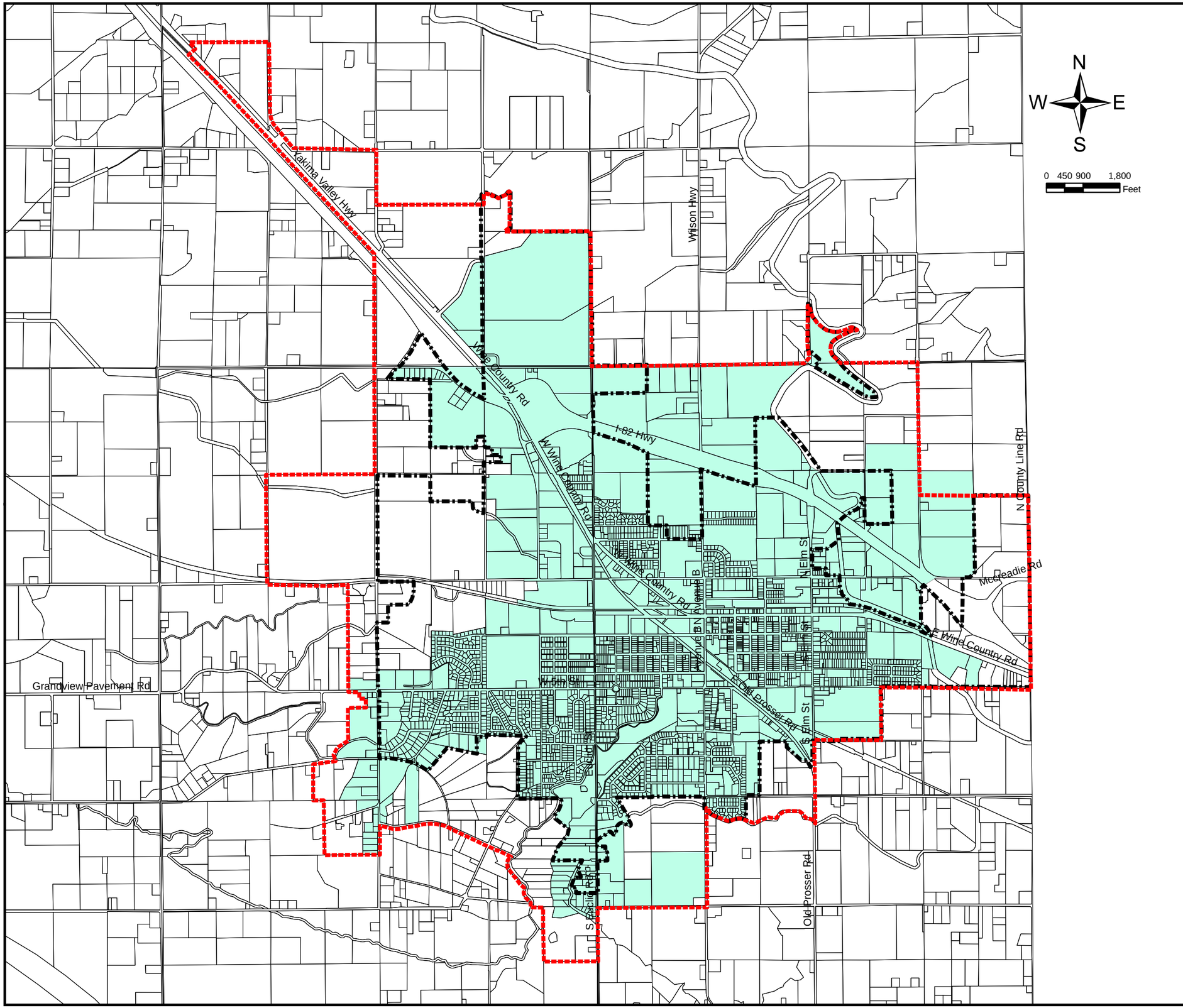
Like the rest of the Yakima Valley, Grandview and its Urban Growth Area have a warm and dry climate. The Cascade Mountain Range acts as a barrier between Yakima County and the Pacific Ocean, Keeping precipitation low and temperatures warm. The mean annual temperature range is from a low of 19.2°F to a high of 93.3°F. The median temperature is 64.3°F and mean annual precipitation is 6.5 inches (*AgWeatherNet*, Grandview NE). With a warm climate and rich volcanic soils, Yakima County is a significant agricultural region, as well as a recreational area.

Grandview's economy depends largely on the agricultural industry. Fruit and produce grown locally are processed, packaged, and shipped from Grandview's industries. The City also has a viable commercial and service business community.

1.2.3 Neighboring/Adjacent Purveyors

Grandview's Existing Service Area is where the water system currently provides service and generally corresponds to the current City Limits, as shown in Figure 1-2 Existing and Future Service Areas. Grandview's Urban Growth Area boundary (the projected future area within which the City may be able to provide and maintain services, including water service) is also shown in Figure 1-2. The City's Future Service Area/Current Service Area/UGA boundary also represents their water rights place of use.

According to Department of Health records, three small water systems are currently operating within Grandview's Urban Growth Area. Information on these small water systems is presented in Table 1-3.



CITY OF GRANDVIEW

Water System Plan Update

EXISTING AND FUTURE SERVICE AREAS

LEGEND

- Grandview Retail Service Area (Grandview City Limits)
- Grandview Future Retail Service Area (UGA Boundary)
- Grandview Water Rights Place of Use
- Existing Grandview Service Area

CITY OF GRANDVIEW

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FIGURE 1-2

TABLE 1-3 NEIGHBORING SMALL WATER SYSTEMS						
Name Location	System ID No.	Group Type	Residential Population	Approved Connections	Number of Sources	Permit Status
Bill Garrison Water System 571 Forrest Road	05180	B	6	2	1	unknown
Wagon Wheel Inn Sec 15 T9N R23E	92064	B	10	undetermined	1	unknown
J & R Apartments 751 E. Bonnieview Road	18117	B	13	undetermined	1	unknown

Other residences currently within Grandview's Urban Growth Area, which are not connected to the City's water system or to one of these other small systems, utilize individual wells for water supply.

Neighboring municipal water systems in the area include the City of Sunnyside's municipal water system, located approximately six miles to the northwest, the City of Mabton's municipal water system, located approximately five miles to the southwest, and the City of Prosser's municipal water system, located approximately six miles to the southeast. Information on these nearby municipal water systems is provided in Table 1-4.

TABLE 1-4 NEIGHBORING MUNICIPAL SMALL WATER SYSTEMS				
Name	System ID No.	Approved Connections	Calculated Connections	Permit Status
City of Sunnyside	85400	unspecified	5,022	Yellow
City of Mabton	49650	671	632	Green
City of Prosser	69750	unspecified	2,800	Green

1.2.4 Ordinances/Bylaws

The City of Grandview operates its water system in accordance with the following municipal code chapters and ordinance(s):

Chapter 13.04 General Provisions
Chapter 13.18 Cross-Connection Control
Chapter 13.24 Water Service Regulations
Chapter 13.28 Rates and Charges
Chapter 13.30 Low-Income Senior Citizens and Low-Income Disabled Persons Utility Rates
Chapter 13.36 Water Use
Chapter 13.40 Capital Facilities Plan for Public Works Facilities
Chapter 13.44 Recommended Standards for Water Works
Ordinance 2014-16 2014 Domestic Water Rates
Resolution 2012-59 Yakima River Basin Integrated Water Resource Management Plan
Resolution 2010-8 Sunnyside Division Water Rights Settlement Agreement
Resolution 2008-5 Water Use Efficiency Goals

Copies of these Grandview Municipal Code chapters and ordinance(s) are included in CHAPTER 10 of this Plan.

1.3 INVENTORY OF EXISTING FACILITIES

1.3.1 General Description of Existing System Facilities and Major Components

The existing City of Grandview domestic water system consists of one distribution pressure zone between elevations 740 feet and 840 feet above sea level, as shown in Figure 3-1 WATER SYSTEM SERVICE AREA/ELEVATIONS MAP of this Plan. The static pressure level ranges from 44 to 87 psi.

The City is supplied water from 14 primary source wells (although three primary source wells are currently inactive) including two City-owned emergency wells. The maximum pumping capacity of the eleven active wells (including emergency wells) is 4,330 GPM or 6.9 million gallons per day. The City's total existing water rights are 6,955 GPM and 4,640 Acre-Feet per Year (1,512 Million Gallons) for existing and future wells.

Water storage is provided by two reservoirs within Grandview's water system. The single distribution pressure zone is served by one 3,017,000 gallon standpipe steel reservoir and one 544,000 gallon elevated steel reservoir, with a combined capacity of 3,561,000 gallons.

The water system is primarily controlled by a comprehensive PLC (Programmable Logic Controller) based telemetry system. PLC telemetry units are located at seven wells and both reservoirs, and are linked via radio communication. The telemetry system's master control station is located at the City's Public Works Shop.

The existing transmission and distribution system is looped where possible and consists of mainly 6-inch or larger ductile or cast iron pipes. Currently, Grandview has no interties with neighboring water purveyors. In 2013, there were 2,788 total services in the Grandview water system. A more detailed description of Grandview's water system is presented in CHAPTER 3 of this Plan. A map of Grandview's existing water system is provided in Figure 3-1 and Map A enclosed in the back pocket of this Plan.

1.4 RELATED PLANS

1.4.1 Previous Comprehensive Water Plans

The City's first Comprehensive Water Plan was completed in 1974, which provided Grandview with an in-depth look at its water system, deficiencies, and potential growth. Updates to the *1974 Comprehensive Water Plan* were completed in 1986, 1995, 2001, and 2008.

1.4.2 Water System Plans for Adjacent Water Systems

No other Group A water systems exist within Grandview's Urban Growth Area. The City of Sunnyside, Grandview's municipal neighbor located six miles northwest of Grandview, adopted its current water system plan in 2005, the City of Mabton, located five miles to the southwest, adopted its current water system plan in 2013, and the City of Prosser, located six miles to the southeast, adopted its current water system plan in 2008. The City of Prosser is currently in the process of updating their Water System Plan. There are currently no water service area agreements between either of these neighboring communities and the City of Grandview.

1.4.3 Urban Growth Area Comprehensive Plan

The City of Grandview completed and adopted its Growth Management Act (GMA) comprehensive plan in 1995, and adopted revisions to that original GMA Plan in 2008. This Plan identifies many of the physical, environmental and economic elements within the City and its Urban Growth Area, and attempts to forecast anticipated changes within that geographical area. Understanding and predicting future changes within the City and its Urban Growth Area are critical in forecasting future demands on the City's water system. The City's existing GMA Plan, and information currently being developed for its future Plan, are important tools and have been used in developing this Comprehensive Water Plan.

1.4.4 Wellhead Protection Program

In 2000, the City of Grandview completed its Wellhead Protection Plan. This plan identifies potential sources of contamination near ground water supplies, proposes management strategies to prevent contamination of those supplies, and develops a contingency plan for contamination mitigation in the event that ground water becomes contaminated. The document contains the following elements:

1. Identification of the wellhead protection areas for each well;
2. An inventory of potential ground water contaminant sources;
3. A contingency plan which includes short and long-term alternate water sources, and emergency and spill response procedures; and
4. A local wellhead protection management plan.

A copy of the Wellhead Protection Plan is available at the Public Works office. Grandview's Wellhead Protection Plan was last updated in 2014.

1.4.5 General Sewer Plans

In 1997, the City of Grandview completed a General Sewer Plan for the City and its Urban Growth Area. The General Sewer Plan was updated in 2011. This document:

1. Describes existing and future sewer service areas (Urban Growth Area);
2. Describes existing conditions including the condition and location of existing trunk and interceptor sewers, pumping stations, the collection system, current system operation and maintenance, and problem areas;
3. Forecasts future wastewater loadings based upon growth projections;
4. Recommends a wastewater system improvement plan and a financial plan; and
5. Includes design standards for recommended wastewater collection system improvements.

The General Sewer Plan provides Grandview with one component of its Capital Improvement Plan for providing future services within both the City and its Urban Growth Area, and is the wastewater counterpart to the Water System Plan.

1.4.6 Watershed Plan

In 1998, the Washington State Legislature passed the Watershed Planning Act (RCW 90.82), providing a framework for developing local solutions to water issues on a watershed basis. Framed around watersheds, this voluntary comprehensive planning process was designed to allow local citizens, governments and tribes to form watershed management planning units to develop watershed management plans.

The watershed planning process consists of three phases. In Phase 1 (Organization), initiating governments (the counties, largest city, and largest water utility in the watershed) identify and appoint Watershed Planning Unit members who represent water resource interests within the watershed. Phase 1 activities also include the development of operating and decision-making structures and goals, and development of a scope of work for Phase 2.

Phase 2 (Technical Assessment), directed by the watershed planning unit, focuses on developing strategies for improving water quality, protecting or enhancing fish habitat, setting instream flow recommendations, and applies for funding for the collection, management and distribution of data. Phase 2 is considered to be at least a one-year process.

Phase 3 (Plan Development and Approval) requires actual development of the watershed plan. The plan must include water supply strategies to meet minimum flows for fish and to provide for future out-of-stream uses. Phase 3 is considered to be at least a one-year process.

The City of Grandview is located in the Lower Yakima River Basin Watershed Planning Area (WRIA 37). In 1998, the Yakima River Basin Watershed Planning Unit was formed to develop a comprehensive watershed management plan for the entire Yakima River Basin and the Naches River Basin watersheds.

In December 2002, the Watershed Planning Unit completed and approved the *Yakima River Basin Watershed Management Plan* (Phase 3 of the planning process) and forwarded the Plan to the county commissioners of Yakima, Benton, Klickitat and Kittitas Counties. In late 2005, Yakima, Benton and Klickitat Counties approved and adopted the Plan, while Kittitas County opted to withdraw from the process. The watershed plan contains no obligations for county or state agencies. There is not an operating lead agency for the purposes of adopted watershed plan implementation needs. Instead, water quantity-related plan implementation needs are being addressed by the Yakima River Basin Water Enhancement Project working group.

In 2009, Ecology and Reclamation formed the Yakima River Basin Water Enhancement Project Working Group to help develop a solution to the basin's water problems. The group includes the Yakama Nation, irrigation districts, federal, state, county, and city governments, and environmental organizations. The group developed the *Yakima River Basin Integrated Water Resource Management Plan* (YBIP). Elements of the YBIP include construction of fish passages at dams, habitat restoration, watershed protection, development of new surface water retention and groundwater storage, enhanced agricultural and municipal water conservation programs, and more effective water banking processes. In total, approximately $3.8 billion is needed to complete the priority projects identified in the YBIP.

The *Final Programmatic Environmental Impact Statement* (FPEIS) was issued in March 2012 for the YBIP. The FPEIS evaluates two alternatives to meet the water supply and environmental needs in the Yakima River Basin; "No Action Alternative" and "Yakima River Basin Integrated Water Resource Management Plan Alternative," the latter as the preferred alternative.

In July 2013, the Legislature approved more than $130 million in state funding to advance the YBIP. The funding will purchase 50,000 acres of privately owned timber land in the Teanaway River basin, east of Cle Elum, helping to preserve the area's watershed.

The City of Grandview's *Water System Plan* is consistent with the YBIP. In showing support of the YBIP, the City Council passed Resolution 2012-59 in December 2012.

1.5 SERVICE AREA AGREEMENTS

There are currently no other large water purveyors within Grandview's Urban Growth Area (UGA) boundary. In addition, Grandview currently has no water service area agreement with its nearest municipal neighbors, the City of Sunnyside, the City of Mabton, or the City of Prosser.

1.6 SERVICE AREA POLICIES

Many policies are established by a utility which affect its growth and development. Some policies deal specifically with drinking water and have a direct impact upon utility development within its future service area. The City of Grandview has identified the following policies which directly or indirectly affect the water system:

1. The City will make every effort to provide domestic water service to new customers within Grandview's future service area (Urban Growth Area) under the following conditions:

    - All costs associated with providing water service, e.g., extending water mains to the site, shall be the responsibility of the proponent/developer. Requirements to be met by proponents/developers when extending the City's water system are identified in "Extension by Developers" which is provided in the Miscellaneous Documents (CHAPTER 10) of this Plan.
    - The City may choose to participate in such improvements through grant, loan, and/or City funding on a case-by-case basis, if it is determined that such an investment is in the interests of the community.
    - The City maintains adequate water rights capacity per DOH's required "water rights self-assessment" to serve the proposed property/properties.
    - The City maintains adequate physical source and/or storage capacity to serve the proposed property/properties.
    - The proponent/developer shall transfer all potable water rights associated with the property/properties to the City.

- The proponent/developer shall “decommission” any and all groundwater wells on the property in accordance with the applicable Washington Administrative Code (WAC) requirements unless a well is to become part of the City’s water system.
- The proponent/developer shall allow the City the opportunity to purchase any irrigation water rights/shares associated with the property/properties prior to offering said irrigation rights/shares to any other interested party.

2. The City may choose to require a water main extension to be oversized for future demand. The difference in material and construction costs between the two sizes may be paid for by the City, or it may enter into an agreement requiring those costs to be repaid by the future users.

3. Service will not be provided to proposed structures which have fire flow requirements greater than the capacity of the system. The cost of upgrading the existing water system which is required by a development to meet fire flow requirements shall be the responsibility of the developer including, but not limited to:

    - Upsizing existing water mains.
    - Looping the distribution system by installing new water mains.
    - Increasing storage and/or pumping capacities.

4. The City will administratively assist property owners who wish to establish a Local Improvement District for the purposes of constructing water system improvements.

5. In accordance with Chapter 13.28.170 of the Grandview Municipal Code, the City has established a Line Extension/Latecomer Provision for extension of water mains. A copy of this ordinance is provided in the Miscellaneous Documents Chapter (CHAPTER 10) of this Plan.

6. The City will not wholesale water to other utilities. The terms and conditions of the service shall be negotiated and formalized in a written agreement at the time service is requested. The City’s water rights will be adjusted as part of the terms and conditions of any wholesaling of water.

7. The City will not allow its mains to be used to transmit another water purveyor's water through the City's system to other non-City water users (wheeling of water).

8. The City may provide water service to properties outside the City Limits in accordance with Chapter 13.28.010 of the City Municipal Code, a copy of which is provided in the Miscellaneous Documents (CHAPTER 10) of this Plan. The “outside customers” will be assessed water rates which are higher than those charged to customers within the City Limits.

9. As a prerequisite to obtaining domestic water service, the City requires property owners of existing lots of record to hook onto sanitary sewers which are within 200 linear feet or less of the nearest property corner. Should sanitary sewer not be available within 200 linear feet, the property owner shall be required to sign a waiver prohibiting the property owner from opposing a future Local Improvement District (LID) for sewer service.

10. The City may choose to manage and operate, or provide specific contract services for a satellite water system outside the City Limits but within the City's service area. In making its decision, the City will take into consideration such factors as:

    - Construction materials, standards, and specifications of the satellite system;
    - Condition of the various components of the satellite system including, but not limited to, pipes, valves, pumps, reservoirs, and sources of supply;
    - Easements and access of the satellite system;
    - Fire protection capability of the satellite system;
    - Cross-connection control of the satellite system;
    - Specific operation, management or contract service responsibilities to be provided; and
    - Conditions for assuming management and operation of the satellite system.

    City operation of satellite systems will be made on a case-by-case basis. In those cases where agreements for City operation are reached between the City and the satellite system, contracts

for ownership, operation, and maintenance will be developed and included within the Miscellaneous Documents (CHAPTER 10) of this Plan.

11. The City shall not accept ownership or operation of existing private water systems annexed into the City unless said systems meet the City of Grandview standards. Substandard systems shall be upgraded or replaced prior to integration into the City's water system.

12. Newly annexed properties will transfer the balance of unused domestic and/or irrigation water rights to the City.

1.7 SATELLITE MANAGEMENT AGENCIES

As discussed previously in Section 1.6, the City of Grandview may, in the future, choose to manage and operate a satellite water system outside the City Limits, but within the City's Urban Growth Area boundary. However, the City has no specific plans at this time to become a satellite management agency. If and when Grandview has specific plans to manage and/or operate a satellite water system, the City will develop a Satellite Management Program.

1.8 CONDITIONS OF SERVICE

The City of Grandview has a water service application form, available at City Hall, which includes water service charges and billing information. Other information regarding conditions of service such as developer extension requirements, meter and material specifications, connection fee schedule, cross-connection control requirements, and latecomer payback provisions (if applicable) are presented to builders and developers when they apply to the City for building permits.

1.9 COMPLAINTS

Grandview operates and maintains a written record of water system complaints. This system is administered by the City's Public Works Department. Grandview's complaint response program is discussed in more detail in CHAPTER 6 of this Plan.

1.10 DUTY TO SERVE

The City of Grandview recognizes that municipal water suppliers have a duty to provide service to all new connections within their retail service area when sufficient water rights and capacity exists, when the service request is consistent with the City code, and when service can be provided in a timely and reasonable manner. Each of these factors is discussed within this *Water System Plan*.

The City of Grandview is committed to providing water service to those persons and commercial and industrial establishments in accordance with City Municipal Code Chapters 13.04, 13.18, 13.24, 13.28, 13.30, 13.36, 13.40, and 13.44. Copies of these City codes and ordinances are included in CHAPTER 10 of this Plan.

The Public Works Department receives and reviews service requests for consistency with adopted local plans and development regulations such as the City's *Water System Plan*, *GMA Comprehensive Plan,* and the *Extension by Developers Policy*. The requested service's location is compared to the City's Retail Service Area, City Limits, and Urban Growth Area Boundary. Large water service requests (i.e. a new industry, residential development, etc.) are reviewed by the City's Engineer for consistency with water rights, pressures, and fire flows.

The following is a summary of the City's procedures for addressing requests for water service:

Service Requests – Applications for water service within the City and within the UGA are addressed (either by an approval or through a request for additional information) within thirty (30) days and in accordance with City Code Chapter 13.24.010. Applicants are required to complete a request for service form furnished by the City.

Water Rights Adequacy – Each application for water service is reviewed by the City to determine the amount of water requested, and that the City has sufficient water rights and capacity to provide service.

Conditions of a Non-Technical Nature – Conditions for connection to the City's water system are addressed in accordance with City Code Chapters 13.04, 13.24, 13.28, 13.30, and 13.36. Copies of these City code chapters are included within the Miscellaneous Documents (CHAPTER 10) of this Plan.

Procedures for Handling Time Extensions, Disputes, and Appeals – The City currently has no procedures established for addressing denial of water service, as denials have never occurred. Such procedures will be developed as needed.

CHAPTER 2 - BASIC PLANNING DATA

2.1 EXISTING SERVICE AREA

The existing water system serves a combination of residential, commercial, industrial, and public users. The boundary of the Existing Service Area is shown in Figure 1-2 Existing and Future Service Areas. The Existing Service Area is approximately 3,363 acres, a majority of which is within the Grandview City Limits. Figure 3-1 and Map A as provided in the back pocket of this Plan, show the existing Grandview water system, including the general location of water mains, valves, fire hydrants, wells, and reservoirs.

The Grandview City Limits includes an area of approximately 3,506 acres including the wastewater treatment plant area. Existing zoning within the City is presented in Table 2-1, and is shown in Figure 2-1 Existing Zoning and Future Land Use Map.

TABLE 2-1 EXISTING ZONING WITHIN GRANDVIEW CITY LIMITS

Land Use Category	Total Acreage*	Percent of Total
Single-Family Residential (R-1)	590.83	16.85%
Single Family Residential Mobile Home (R-1M)	13.82	0.39%
Duplex-Family Residential (R-2)	72.65	2.07%
Multi-Family Residential (R-3)	102.03	2.91%
Mobile Home, Platted (MR-1)	7.19	0.21%
Mobile Home Park (MR-2)	66.13	1.89%
Light Commercial (C-1)	2.73	0.08%
Commercial (C-2)	189.20	5.40%
Light Industrial (M-1)	692.60	19.75%
Heavy Industrial (M-2)	32.15	0.92%
Agricultural Forest (AF-1)	336.64	9.60%
Public Facility (PF)	1,398.56	39.89%
PUD	1.84	0.05%
TOTAL	3,506.37	100.0%

* Source: Yakima County Geographic Information Services, September, 2013.

As shown in Table 2-1, Public Facility (PF) is the largest zoning total within the City, comprising approximately 1,398 acres (39.9% of the land within the City Limits), which is largely the wastewater treatment plant area. Light Industrial (M-1) is the second-largest area, totaling approximately 693 acres (19.9%). Of the residential lands, Single-Family Residential (R-1) lands make up the largest area, approximately 591 acres (16.9%) of the total area within the City. Agricultural/Forest (AF-1) land also has a large presence in the City of Grandview, approximately 337 acres (9.6%). Commercial (C-2) zoned land in the City of Grandview totals approximately 189 acres (5.4%).

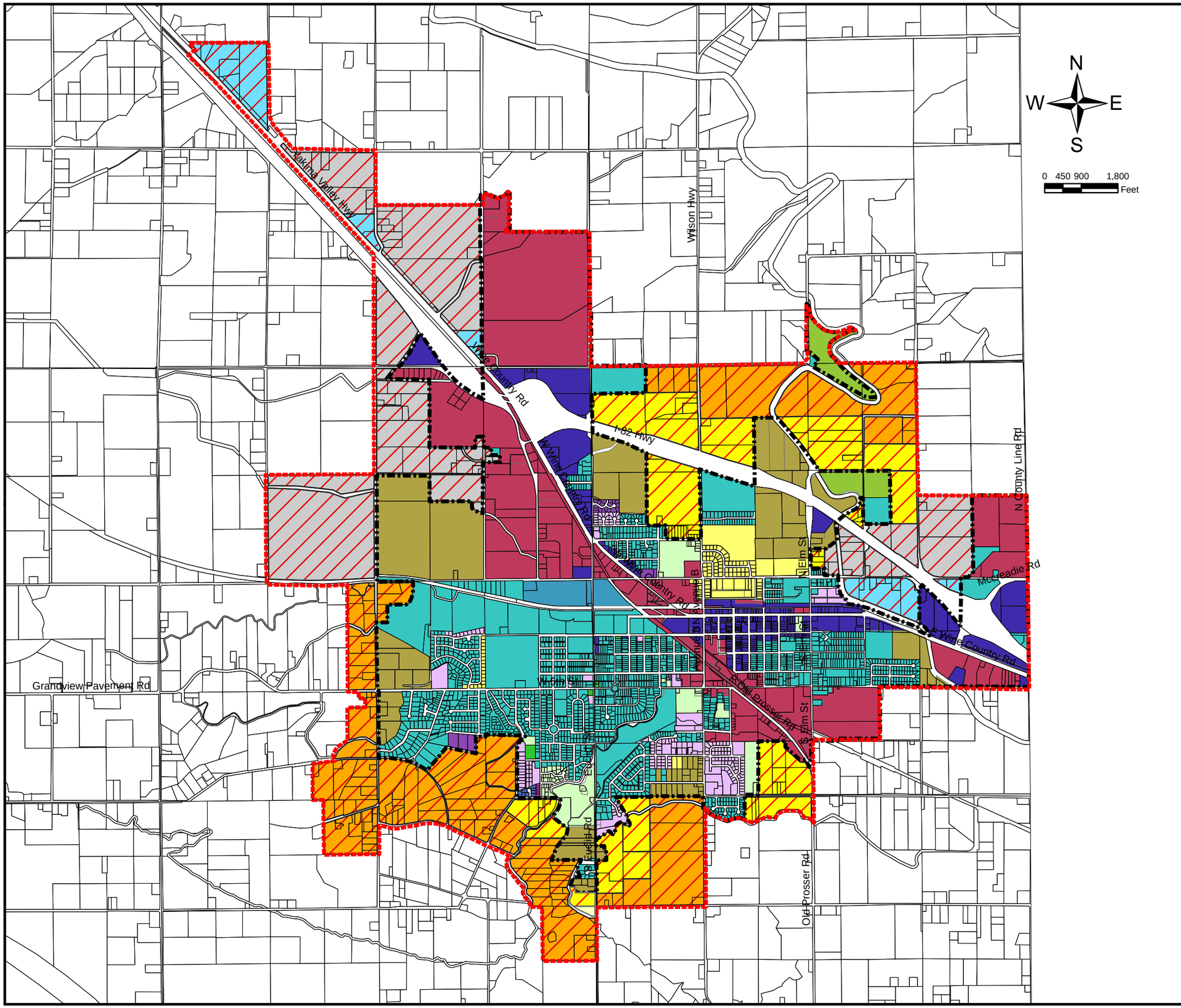
2.2 FUTURE SERVICE AREA

The Future Service Area for the City of Grandview water generally corresponds to the City's Urban Growth Area (UGA), as adopted in the City's *2008 Water System Plan*. The Future Service Area/UGA boundary is shown in Figure 1-2 and Figure 2-1. Future land use within the City's UGA boundary is also shown in Figure 2-1, and is consistent with existing zoning in the City Limits. The City of Grandview UGA includes an area of approximately 4,792 acres total, 2,000 acres of which is outside the City Limits. The wastewater treatment plant is designated as within City Limits, but not within the UGA. A breakdown of future land use within the City Limits is provided in Table 2-2 and future land use within the UGA is presented in Table 2-3.

TABLE 2-2 FUTURE LAND USE WITHIN GRANDVIEW CITY LIMITS*		
Land Use Category	Total Acreage*	Percent of Total
Residential	991	28%
Low Density Residential	70	2%
Commercial	203	6%
Industrial	870	25%
Public	1,367	39%
TOTAL	3,506	100.0%
* Source: Yakima County Geographic Information Services, September, 2014.		

TABLE 2-3 FUTURE LAND USE WITHIN GRANDVIEW UGA*		
Land Use Category	Total Acreage*	Percent of Total
Residential	365	21%
Low Density Residential	637	37%
Commercial	107	6%
Industrial	614	36%
Public	0	0%
TOTAL	1,723	100.0%
* Source: Yakima County Geographic Information Services, September, 2014.		

As shown in Table 2-2, Public area is the largest future land use within Grandview's City Limits comprising approximately 1,367 acres (39%), and as shown in Table 2-3, Low Density Residential area is the largest future land use within Grandview's UGA, comprising approximately 637 acres (37%) of the land within the UGA.



CITY OF GRANDVIEW

Water System Plan Update

EXISTING ZONING AND FUTURE LAND USE MAP

LEGEND

- Grandview Retail Service Area (Grandview City Limits)
- Grandview Future Retail Service Area (UGA Boundary)

CITY ZONING

- Single-Family Residential (R-1)
- Single Family Residential Mobile Home (R-1M)
- Duplex Residential (R-2)
- Multi-Family Residential (R-3)
- Mobile Home, Platted (MR-1)
- Mobile Home Park (MR-2)
- Light Commercial (C-1)
- Commercial (C-2)
- Light Industrial (M-1)
- Heavy Industrial (M-2)
- Agriculture\Forest (AF-1)
- Public Facilities (PF)
- Planned Unit Development (PUD)

COUNTY ZONING

- Industrial
- Low Density Residential
- Commercial
- Residential

HLA
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02-03-15
Path: P:\arcview\2014\14093\FIG 2-1.mxd

FIGURE 2-1

2.3 POPULATION

2.3.1 Current Population

According to the U.S. Census Bureau, the 2010 population of the City of Grandview was 10,862, an increase of 29.7%, or 2,485 people since 2000. The resulting average annual growth rate for the period 2000-2010 is approximately 2.6%. This ten-year growth rate is relatively consistent with previous decades. Population trends in the City of Grandview, Yakima County, and the State of Washington for the period 1910 through 2010 are presented in Table 2-4.

TABLE 2-4 POPULATION TRENDS*

Year	City of Grandview		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
1910	320		41,709		1,141,990	
1920	1,011	215.9%	63,710	52.7%	1,356,621	18.8%
1930	1,085	7.3%	77,402	21.5%	1,563,396	15.2%
1940	1,449	33.5%	99,019	27.9%	1,736,191	11.1%
1950	2,503	72.7%	135,723	37.1%	2,378,963	37.0%
1960	3,366	34.5%	145,112	6.9%	2,853,214	19.9%
1970	3,605	7.1%	145,212	0.1%	3,413,244	19.6%
1980	5,615	55.8%	172,508	18.8%	4,132,353	21.1%
1990	7,169	27.7%	188,823	9.5%	4,866,692	17.8%
2000	8,377	16.9%	222,581	17.9%	5,894,121	21.1%
2010	10,862	29.7%	243,231	9.3%	6,724,540	14.1%

* Source: U.S. Census Bureau

Every year, the Washington State Office of Financial Management (OFM) develops population estimates for the state, individual counties, and all cities. OFM population estimates for Grandview, Yakima County, and the State of Washington for the period 2011 through 2014 are presented in Table 2-5.

TABLE 2-5 OFM POPULATION ESTIMATES*

Year	City of Grandview		Yakima County		State of Washington	
	Population	% Change	Population	% Change	Population	% Change
2011	10,920	0.5%	244,700	0.6%	6,767,900	0.6%
2012	11,000	0.7%	246,000	0.5%	6,817,770	0.7%
2013	11,010	0.1%	247,250	0.5%	6,882,400	0.9%
2014	11,170	1.5%	248,800	0.6%	6,968,170	1.2%

* Source: Washington State Office of Financial Management (OFM)

The OFM estimated that the total population within the City of Grandview in 2014 was 11,170, which is approximately a 0.7% annual increase over the 2010 census value. The City's GMA Comprehensive Plan includes three population projection annual growth rate percentage scenarios; low at 0.4%, medium at 1.1%, and high at 1.9%. As discussed in the next section, an annual population growth rate of 1.5% will be utilized in this Plan, which is consistent with the latest OFM estimate, and between the medium and high growth rates presented in the City's GMA Comprehensive plan.

In 2014 there was an average of 2,116 Single-Family Residential water services, 270 Mobile Home Residential water services, 84 Outside Residential water services, and 54 Multi-Family Residential water

services. Assuming the average household sizes of these services are similar, the average persons per residential service would be 11,170 ÷ (2,116 + 270 + 84 + 54) = 4.43 persons per residential service. This is the basis for projecting the future population and future water service demands in both the City and UGA.

2.3.2 Future Population

The Yakima County Planning Division has provided the County-Wide Planning Policy Committee population projections for each community within Yakima County for the year 2025. A population estimate for the year 2025 of 12,279 was made for Grandview, based on the County's "High Projected Growth." The "Medium Projected Growth" of 10,684 for 2025 has already been surpassed. The County also projected the City population to be 9,620 in 2010, but the City's population was actually 10,862, according to the 2010 Census results provided by the U.S. Census Bureau.

Projecting Grandview's population growth has been proven difficult due to inconsistent and widely-ranged growth over the past few decades. Future population will be projected at 1.5%, as shown in Table 2-6 below.

TABLE 2-6 CITY POPULATION PROJECTIONS

Year	Future Population	% Increase from Previous Year	Year	Future Population	% Increase from Previous Year
2014	11,170	1.5%	2025	13,159	1.5%
2015	11,338	1.5%	2026	13,356	1.5%
2016	11,508	1.5%	2027	13,556	1.5%
2017	11,681	1.5%	2028	13,759	1.5%
2018	11,856	1.5%	2029	13,965	1.5%
2019	12,034	1.5%	2030	14,174	1.5%
2020	12,215	1.5%	2031	14,387	1.5%
2021	12,398	1.5%	2032	14,603	1.5%
2022	12,584	1.5%	2033	14,822	1.5%
2023	12,773	1.5%	2034	15,044	1.5%
2024	12,965	1.5%	2035	15,270	1.5%

2.4 CURRENT AND FUTURE WATER SERVICES

2.4.1 Current Water Services

The location and user category of each water service is a critical component in assessing water system demands throughout a water system. In addition to determining population locations and related residential water services, it is important to understand the location of all other water service users. Water services are divided into user categories as shown in Table 2-7.

TABLE 2-7 WATER USER CATEGORIES
User Category
Single-Family Residential
Outside Residential
Multi-Family Residential
Mobile Home Residential
Commercial
Industrial
Government
Standpipe

The number of water services by user category projected for the year 2015 is shown in Table 2-8.

TABLE 2-8 YEAR 2015 WATER SERVICES BY USER CATEGORY	
User Category	Total
Single-Family Residential	2,180
Outside Residential	85
Multi-Family Residential	55
Mobile Home Residential	278
Commercial	199
Industrial	31
Government	45
Standpipe	0
Total	2,873

2.4.2 Future Water Services

The number of residential water services within the City Limits is anticipated to increase consistent with the 1.5% population growth rate projection. However, locations of increases in population will vary depending on the availability of undeveloped land, and potential for new construction. Locations of anticipated future residential water services for the years 2021, 2025, and 2035 were determined by identifying vacant lots and development patterns using aerial imagery and the Yakima County Assessors GIS map.

In reviewing future population and housing projections, the Grandview City Council became aware of the impacts on the City's existing water rights and reservoir storage capacity that providing water service to residents of the City and the UGA would create. As a result, the Grandview City Council determined the City would only provide water service to new customers within Grandview's UGA under the following conditions:

1. All costs associated with providing water service, e.g., extending water mains to the site, shall be the responsibility of the proponent/developer;

2. The City maintains adequate water rights capacity per DOH's required "water rights self-assessment," to serve the proposed property/properties;

3. The City maintains adequate physical source and/or storage capacity to serve the proposed property/properties;

4. The proponent/developer shall transfer all potable water rights and irrigation water rights/shares associated with the property/properties to the City;

5. The proponent/developer shall "decommission" any and all groundwater wells on the property in accordance with the applicable Washington Administrative Code (WAC) requirements, unless a well is to become part of the City's water system; and

6. Service will not be provided to proposed structures which have fire flow requirements greater than the capacity of the system. The cost of upgrading the existing water system to meet fire flow requirements, required by a development shall be the responsibility of the developer, including, but not limited to:

    a. Upsizing existing water mains;
    b. Looping of the distribution system by installing new water mains; and
    c. Increasing storage and/or pumping capacities.

It is difficult to predict how population increases within the City and the UGA will affect increases in other user categories. The water service totals in remaining user categories were projected to increase at a rate equal to the population growth rate. The future service locations were determined based on the existing zoning and future land uses within the City. Future water services by user category for the years 2021, 2025, and 2035 are shown in Table 2-9.

TABLE 2-9 FUTURE WATER SERVICES BY USER CATEGORY

User Category	Year 2021 Total	Year 2025 Total	Year 2035 Total
Single-Family Residential	2,384	2,530	2,936
Outside Residential	93	99	114
Multi-Family Residential	60	63	73
Mobile Home Residential	304	323	375
Commercial	218	231	268
Industrial	34	36	42
Government	49	52	60
Standpipe	0	0	0
Total	3,141	3,328	3,848

2.5 CURRENT WATER CONSUMPTION AND PRODUCTION

Current and historical metered water consumption and production data records are the preferred method for determining demand trends and establishing a basis for forecasting future demand. All water system sources and services in the City of Grandview are metered. Production meters are typically read daily and consumption meters are read monthly.

2.5.1 Current Water Consumption

Currently, water consumption data is maintained by a computer database at Grandview City Hall. Services are divided and billed based upon meter size, user category, and consumption. User categories are as shown in Table 2-7.

The number of metered water services by user category for the period 2008 through 2013 is presented in Table 2-10.

TABLE 2-10 AVERAGE METERED WATER SYSTEM SERVICES BY USER CATEGORY 2008-2013							
User Category	2008	2009	2010	2011	2012	2013	Average
Single-Family Residential	2,068	2,082	2,092	2,106	2,122	2,116	2,098
Outside Residential	76	78	78	78	79	83	79
Multi-Family Residential	49	49	49	49	49	53	50
Mobile Home Residential	265	266	269	269	268	270	268
Commercial	187	190	187	191	194	193	190
Industrial	28	29	29	31	32	30	30
Government	36	36	34	43	44	44	40
Standpipe	3	0	0	0	0	0	0
TOTAL	2,709	2,729	2,739	2,767	2,788	2,788	2,753

The annual volume of water consumed (in million gallons per year) by user category for the period 2008 through 2013 is presented in Table 2-11, including six-year and three-year averages.

TABLE 2-11 ANNUAL WATER CONSUMPTION BY USER CATEGORY 2008-2013 (values are in million gallons per year)								
User Category	2008	2009	2010	2011	2012	2013	2008-2013 Avg.	2011-2013 Avg.
Single-Family Residential	188.03	188.69	181.78	178.79	177.63	173.78	181.45	176.73
Outside Residential	8.56	7.65	6.77	7.03	7.01	7.28	7.38	7.10
Multi-Family Residential	37.66	39.39	35.27	34.17	35.82	35.92	36.37	35.30
Mobile Home Residential	29.13	32.70	31.20	26.94	28.00	26.39	29.06	27.12
Commercial	34.62	35.85	33.43	41.51	31.53	32.58	34.92	35.20
Industrial	268.94	264.90	243.66	212.23	235.59	280.87	251.03	242.90
Government	24.43	23.37	21.53	23.00	27.61	25.46	24.29	25.46
Standpipe	6.73	0.00	0.00	0.00	0.00	0.00	1.12	0.00
TOTAL	598.10	592.55	553.62	523.96	543.19	582.27	565.62	549.81

During the period 2008 through 2013, the total number of services increased from 2,709 to 2,788 (a 2.9% increase), and the volume of water consumption decreased from 598.10 MG to 565.62 MG (a 5.7% decrease).

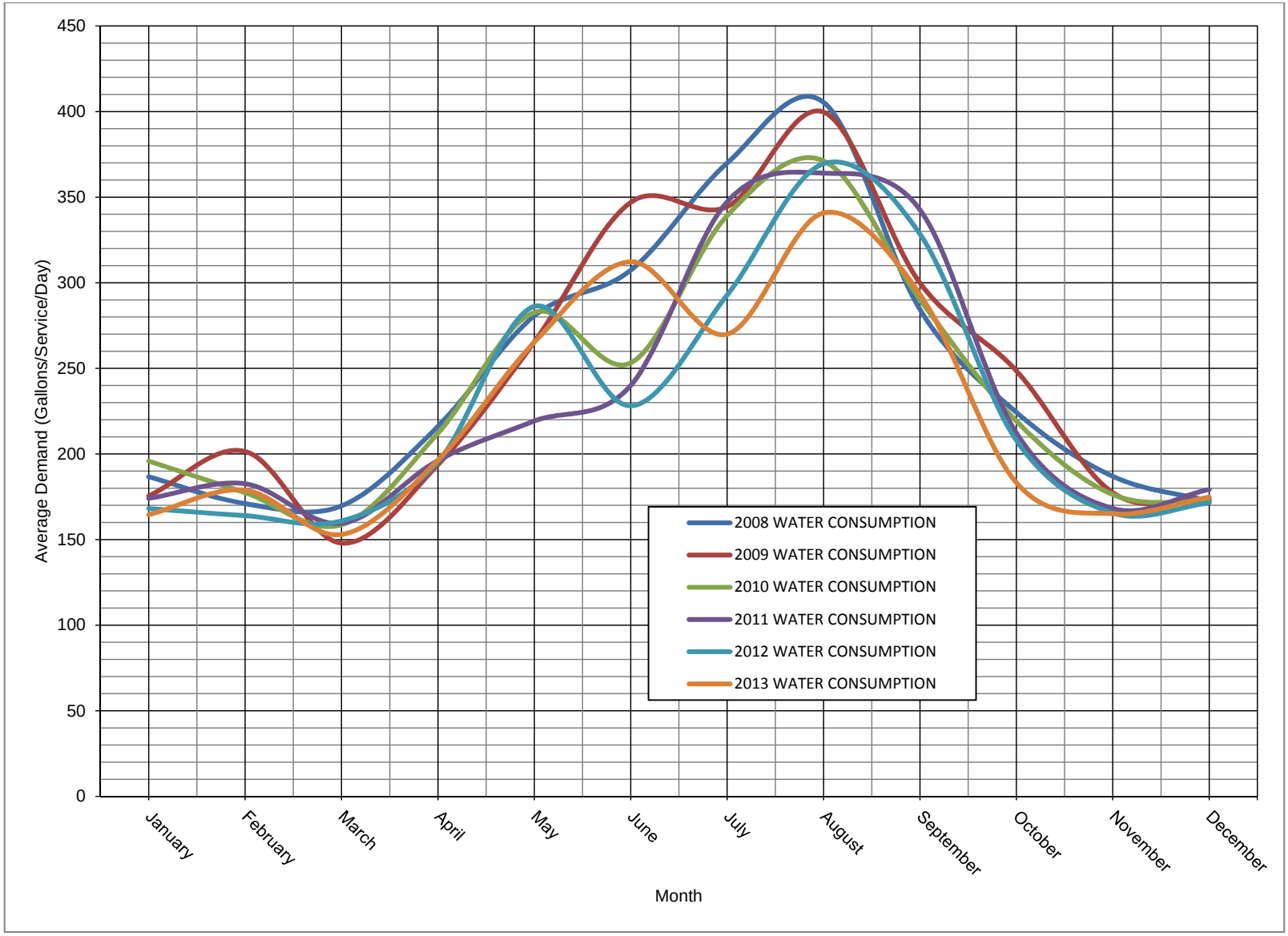
The average day water consumption per service by user category (in gallons per service per day) for the period 2008 through 2013 including averages is presented in Table 2-12. It can be seen from Table 2-12 that the average day consumption per service for the all Residential and Government user categories has generally decreased from 2008 to 2013. Commercial and Industrial users do not appear to be increasing, but inconsistencies are evident over the years. The 2011-2013 average is generally lower than the 2008-2013 average as shown in Table 2-12.

TABLE 2-12 AVERAGE DAY WATER CONSUMPTION BY USER CATEGORY 2008-20013 (values are in gallons per service per day)								
User Category	2008	2009	2010	2011	2012	2013	2008-2013 Avg.	2011-2013 Avg.
Single-Family Residential	248	248	237	232	229	225	237	229
Outside Residential	309	270	236	246	242	242	258	243
Multi-Family Residential	2,103	2,203	1,967	1,905	2,018	1,860	2,009	1,928
Mobile Home Residential	301	337	317	273	285	268	297	275
Commercial	506	516	489	594	444	462	502	500
Industrial	26,088	25,317	22,956	18,507	20,274	25,299	23,073	21,360
Government	1,846	1,795	1,713	1,466	1,705	1,604	1,688	1,592
Standpipe	6,896	0	0	0	0	0	0	0
TOTAL	603	595	552	517	532	572	562	541

2.5.2 Season Water Consumption

Water consumption in the City of Grandview varies throughout the year with the seasons, primarily due to irrigation use in the summer months. A very small separate non-potable irrigation system exists within the City, but domestic water is used for irrigation by most residences. Most services use a single meter for domestic and irrigation uses, resulting in increased consumption during the months of June, July, August, and September. Figure 2-2 shows the seasonal change in residential consumption per service from 2008 through 2013.

FIGURE 2-2 RESIDENTIAL SEASONAL CONSUMPTION



2.5.3 Maximum and Peak Consumption

Between the years 2008 and 2013, the largest annual consumption took place in 2008, with a total measured consumption of 598.10 million gallons (MG). The second largest annual consumption took place in 2009, with a measured consumption of 592.55 MG. Annual consumption for 2010 through 2012 were all below 555 MG. Annual consumption increased again in 2013 with a system demand of 582.27 MG. October was the maximum month of water consumption in the maximum year of 2008, when 69.09 MG was consumed. A breakdown of water consumption by user category for October 2008 is shown in Table 2-13.

TABLE 2-13 MAXIMUM MONTH WATER CONSUMPTION, OCTOBER 2008

User Category	No. of Services	Maximum Month Consumption (gallons)	Average Day Consumption (gallons)	Maximum Month Consumption per Service (gallons)	Average Day Consumption per Service (gallons)
Single-Family Residential	2,073	14,415,942	465,030	6,954	224
Outside Residential	76	580,957	18,741	7,644	247
Multi-Family Residential	49	3,045,774	98,251	62,159	2,005
Mobile Home Residential	267	2,400,826	77,446	8,992	290
Commercial	189	3,035,773	97,928	16,062	518
Industrial	27	43,082,825	1,389,769	1,595,660	51,473
Government	47	2,531,561	81,663	53,863	1,738
Standpipe	0	0	0	0	0
TOTAL	2,728	69,093,658	2,228,828	25,328	817

The maximum day of recorded water production within the maximum month was October 1, 2008 when 3.679 MG was pumped into the system. Utilizing the percentage breakdown of demand per user category from the October 2008 consumption data, maximum day demand (MDD) was calculated as shown in Table 2-14.

Peak hour demand (PHD), also shown in Table 2-14, was calculated by multiplying the maximum day demand by a factor of 1.8 and dividing by 1,440 minutes per day. A peaking factor of 1.8 is considered reasonably conservative, and is consistent with the *2009 Water System Design Manual (WSDM),* Equation 5-1. Using the maximum day of water production to calculate the MDD and PHD for projection of future system demand will account for the highest possible demand on the system, based upon available historical data.

$PHD = (MDD_{ERU}/1440)[C \times N + F] + 18$ *(WSDM, Equation 5-1)*

C = 1.6, Coefficient associated with range of ERUs, (*WSDM, Table 5-1 >500 ERUs)*
N = 9,936, Number of ERUs (ERUs for the maximum month)
F = 225, Factor associated with range of ERUs, (*WSDM, Table 5-1 >500 ERUs)*
MDD_{ERU} = 331 gpd/ERU, Maximum Day Demand, (*3.289 MG / 9,936 ERUs)*

PHD = 3,724 gpm
Peaking Factor = PHD / MDD_{gpm} => 3,724 gpm / 2,284 gpm = 1.63

For calculations a peaking factor of 1.8 is used.

TABLE 2-14 MAXIMUM DAY AND PEAK HOUR WATER CONSUMPTION, OCTOBER 1, 2008					
User Category	No. of Services	Maximum Day Demand (gallons)	Maximum Day Demand per Service (gallons)	Peak Hour Demand (GPM)	Peak Hour Demand per Service (GPM)
Single-Family Residential	2,073	686,254	331	858	0.4
Outside Residential	76	27,656	364	35	0.5
Multi-Family Residential	49	144,990	2,959	181	3.7
Mobile Home Residential	267	114,288	428	143	0.5
Commercial	189	144,514	765	181	1.0
Industrial	27	2,050,907	75,960	2,564	94.9
Government	47	120,512	2,564	151	3.2
Standpipe	0	0	0	0	0.0
TOTAL	2,728	69,093,658*	1,206	4,111	1.5
* 3,678,800 gallons production less 10.59% DSL (2008 average DSL) to arrive at a maximum daily consumption of 3,289,122 gallons.					

2.5.4 Water Production

Annual water production by source well for the period 2008 through 2013 is presented in Table 2-15. As can be seen from this table, the City has 14 wells, three of which are inactive. The primary wells are North Willoughby, Olmstead A, Butternut, West Main, and Velma.

TABLE 2-15 GRANDVIEW ANNUAL WATER PRODUCTION 2008-2013 (values are in million gallons)						
Source	2008	2009	2010	2011	2012	2013
West Main (S01)	75.38	83.67	90.17	86.02	81.52	80.25
Balcom (S02)	17.18	17.24	11.12	0.85	9.38	24.72
Velma (S03)	53.19	42.67	58.32	50.21	62.42	67.66
Euclid (S06) (Inactive)	0.00	0.00	0.00	0.00	0.00	0.00
Olmstead A (S07)	120.70	117.03	85.13	98.55	107.92	108.78
Appleway (S08) (Inactive)	0.00	0.00	0.00	0.00	0.00	0.00
North Willoughby (S10)	170.72	122.63	164.19	164.02	160.60	159.61
Highland (S11)	29.23	28.86	26.37	23.88	24.44	16.32
Pecan A (S12)	64.22	72.78	52.34	58.45	49.54	0.00
South Willoughby (S13)	10.21	15.22	38.08	1.62	0.18	0.00
Butternut (S14)	81.61	109.10	53.32	73.56	88.25	96.19
Olmstead B (S16) (Inactive)	0.00	0.00	0.00	0.00	0.00	0.00
Ashael Curtis (S17)	49.83	0.00	0.42	0.16	0.00	0.00
Pecan B (S18)	0.00	0.00	0.00	0.00	0.00	52.49
TOTAL	672.29	609.20	579.46	556.43	584.24	606.01

2.5.5 Distribution System Leakage (DSL)

Table 2-16 shows annual water production, annual metered water consumption, and the difference between production and total consumption (DSL), including the DSL percentage. Water production from Grandview's source wells for the period 2008 through 2013 totaled 3,604.3 MG. Metered consumption

during that same time period totaled 3,393.7 MG. Estimated unmetered consumption includes water usage for fire-fighting, waterline breaks, and other related activities. The difference between production and metered consumption for that period was 210.6 MG, or 5.84% of total water production for the period. The average DSL for the past three years (2011-2013) is slightly lower at 5.57%.

TABLE 2-16 GRANDVIEW WATER PRODUCTION AND CONSUMPTION 2008-2013

Year	Production	Consumption	DSL	% DSL
2008	668,957,227	598,097,748	70,859,479	10.59%
2009	609,202,080	592,551,156	16,650,924	2.73%
2010	579,457,206	553,623,284	25,833,922	4.46%
2011	556,426,009	523,962,256	32,463,753	5.83%
2012	584,243,860	543,186,971	41,056,889	7.03%
2013	606,014,200	582,270,622	23,743,578	3.92%
TOTAL	3,604,300,582	3,393,692,037	210,608,545	5.84%
3-Year Average	582,228,023	549,806,616	32,421,407	5.57%

The City will continue to track the difference between production and total authorized consumption, and will work towards further reducing the volume of DSL through the implementation of supply-related water use efficiency measures. Water use efficiency measures are discussed in further detail in CHAPTER 4 of this Plan.

2.5.6 Current Equivalent Residential Units

An Equivalent Residential Unit (ERU) is defined as the amount of water consumed by a typical full-time single-family residence. The actual quantity of water represented by an ERU is related to the type of demand (average day or peak) being considered. As discussed previously, maximum day and peak hour demands were calculated from the maximum day of production in the maximum month of consumption for the period between 2008 and 2013, while average day demand (ADD) is an actual measurement for a specified time period. As a result, the peaking factor from an average day demand (ADD) to a maximum day demand (MDD) is not the same for all service categories. Therefore, ERU values for ADD, MDD, and PHD have been calculated as shown in Table 2-17. This ERU information is useful for forecasting and analyzing future water system demand.

Residential ADD per service values from the 2008 to 2013 period vary from a low of 225 gallons per service per day in 2013 to a high of 248 gallons per service per day in 2008 and 2009. Similar variation in consumption per service occurs in the other user categories. The City has generally seen consistent demands over the past three years, providing a suitable representation of existing conditions. The average ADD from each user category for the 3-year period 2011 through 2013 as shown in Table 2-12, where used in producing Table 2-17.

The maximum day demand per service and peak hour demand per service provided in Table 2-17 are based upon the calculated demand for October 1, 2008, which was the maximum day of production for the maximum month of consumption from 2008 through 2013.

TABLE 2-17 EQUIVALENT RESIDENTIAL UNIT FACTORS (ERUS)						
User Category	ADD (2011-2013)		MDD (October 2008)		PHD (October 2008)	
	GPD/ Service[a]	ERUs	GPD/ Service[b]	ERUs	GPM/ Service[b]	ERUs
Single-Family Residential	229	1.0	331	1.0	0.41	1.0
Outside Residential	243	1.1	364	1.1	0.45	1.1
Multi-Family Residential	1,928	8.4	2,959	8.9	3.70	8.9
Mobile Home Residential	275	1.2	428	1.3	0.54	1.3
Commercial	500	2.2	765	2.3	0.96	2.3
Industrial	21,360	93.5	75,960	229.5	94.95	229.5
Government	1,592	7.0	2,564	7.7	3.21	7.7
Standpipe	0	0.0	0	0.0	0.00	0.0

[a] ADD values based upon 2011 through 2013 average.
[b] Peak Day Demand is based upon calculated demand for October 1, 2008 as provided in Table 2-14.

2.6 FORECAST OF FUTURE WATER DEMAND

Water use is contingent upon a number of varying and uncertain factors, which makes forecasting future demand difficult. Of primary importance are the following factors:

1. Population;
2. Type of residential development (i.e., single-family, multi-family, rural, large or small lot);
3. Per capita income;
4. Types of commercial and industrial enterprises;
5. Climate;
6. Irrigation use of water; and
7. Price charged for water and type of rate structure (i.e. the base water quantity and cost for individual service meters).

Forecasting future system demands is based upon the projected number of single-family residential, outside single-family residential, multi-family residential, mobile home residential, commercial, industrial, government, and standpipe water services, and the annual average day, maximum day, and peak hour water demand.

As discussed previously in this chapter, the population projections for the City of Grandview were estimated based on reviewing past population trends and confirming with the City Administrator, and are based on an annual growth of 1.5%. Future water services are based upon the projected population growth within the City and the UGA. However, based upon impacts to Grandview's existing water rights and reservoir storage capacity, the City Council has determined the City will only provide water service to new customers within their UGA under specific conditions (previously specified within this Plan).

Other factors such as income, climate, and water cost will be assumed to remain consistent with current trends. Climate does have a major influence on Grandview's water consumption during summer months due to use of domestic water supply for irrigation purposes. However, the area's climate has generally remained consistent with historical averages.

2.6.1 Future ERUs and ADD

The projected number of water system services, ERUs, and ADD, are calculated from the current water services by user category as shown in Table 2-9, and the average 2011 through 2013 demand per service for each user category, provided in Table 2-17.

The calculated future number of services, ERUs, and projected ADD for years 2021, 2025, and 2035 are presented in Table 2-18, Table 2-19, and Table 2-20, respectively. To accommodate for uncertainties in

projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the ADD projections, as shown.

TABLE 2-18 YEAR 2021 ERU AND ADD					
User Category	No. of Services	ERUs/Service	ADD/Service (gallons)	Total ERUs	Total ADD (gallons)
Single-Family Residential	2,384	1.0	229	2,383.7	544,803
Outside Residential	93	1.1	243	99.0	22,626
Multi-Family Residential	60	8.4	1,928	502.8	114,909
Mobile Home Residential	304	1.2	275	366.5	83,760
Commercial	218	2.2	500	476.3	108,852
Industrial	34	93.5	21,360	3,202.1	731,872
Government	49	7.0	1,592	341.2	77,994
Standpipe	0	0.0	0	0.0	0
Subtotal	3,141			7,371.5	1,684,816
10% Contingency					168,482
TOTAL	3,141			7,371.5	1,853,298

TABLE 2-19 YEAR 2025 ERU AND ADD					
User Category	No. of Services	ERUs/Service	ADD/Service (gallons)	Total ERUs	Total ADD (gallons)
Single-Family Residential	2,530	1.0	229	2,529.9	578,234
Outside Residential	99	1.1	243	105.1	24,015
Multi-Family Residential	63	8.4	1,928	533.6	121,960
Mobile Home Residential	323	1.2	275	389.0	88,900
Commercial	231	2.2	500	505.5	115,532
Industrial	36	93.5	21,360	3,398.6	776,782
Government	52	7.0	1,592	362.2	82,779
Standpipe	0	0.0	0	0.0	0
Subtotal	3,334			7,823.9	1,788,203
10% Contingency					178,820
TOTAL	3,334			7,823.9	1,967,023

TABLE 2-20 YEAR 2035 ERU AND ADD					
User Category	No. of Services	ERUs/Service	ADD/Service (gallons)	Total ERUs	Total ADD (gallons)
Single-Family Residential	2,936	1.0	229	2,936.1	671,064
Outside Residential	114	1.1	243	121.9	27,870
Multi-Family Residential	73	8.4	1,928	619.3	141,540
Mobile Home Residential	375	1.2	275	451.4	103,172
Commercial	268	2.2	500	586.6	134,079
Industrial	42	93.5	21,360	3,944.2	901,487
Government	60	7.0	1,592	420.3	96,069
Standpipe	0	0.0	0	0.0	0
Subtotal	3,869			9,079.9	2,075,282
10% Contingency					207,528
TOTAL	3,869			9,079.9	2,282,810

2.6.2 Future MDD and PHD

Future Maximum Day Demand (MDD) and Peak Hour Demand (PHD) on the water system were calculated for the years 2021, 2025, and 2035 using the projected number of services for each user category and the MDD per service for October 1, 2008 as discussed in Section 2.5.3. Calculated future MDD and PHD values for 2021, 2025, and 2035 are presented in Table 2-21, Table 2-22, and Table 2-23, respectively. To accommodate for uncertainties in projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the MDD and PHD projections, as shown.

TABLE 2-21 YEAR 2021 MDD AND PHD							
User Category	No. of Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	2,384	1.0	2383.7	331	789,095	986.4	0.4
Outside Residential	93	1.1	102.2	364	33,818	42.3	0.5
Multi-Family Residential	60	8.9	532.8	2,959	176,386	220.5	3.7
Mobile Home Residential	304	1.3	393.2	428	130,152	162.7	0.5
Commercial	218	2.3	502.6	765	166,383	208.0	1.0
Industrial	34	229.5	7862.1	75,960	2,602,688	3,253.4	94.9
Government	49	7.7	379.5	2,564	125,646	157.1	3.2
Standpipe	0	0.0	0.0	0	0	0.0	0.0
Subtotal	3,141		12,156.0		4,024,170	5,030	
10% Contingency					402,417	503	
TOTAL	3,141		12,156.0		4,426,586	5,533	

TABLE 2-22 YEAR 2025 MDD AND PHD							
User Category	No. of Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	2,530	1.0	2529.9	331	837,517	1,046.9	0.4
Outside Residential	99	1.1	108.4	364	35,894	44.9	0.5
Multi-Family Residential	63	8.9	565.5	2,959	187,210	234.0	3.7
Mobile Home Residential	323	1.3	417.3	428	138,138	172.7	0.5
Commercial	231	2.3	533.4	765	176,593	220.7	1.0
Industrial	36	229.5	8344.5	75,960	2,762,399	3,453.0	94.9
Government	52	7.7	402.8	2,564	133,356	166.7	3.2
Standpipe	0	0.0	0.0	0	0	0.0	0.0
Subtotal	3,334		12,901.9		4,271,107	5,339	
10% Contingency					427,111	534	
TOTAL	3,334		12,901.9		4,698,218	5,873	

TABLE 2-23 YEAR 2035 MDD AND PHD							
User Category	No. of Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	2,936	1.0	2936.1	331	971,973	1,215.0	0.4
Outside Residential	114	1.1	125.8	364	41,656	52.1	0.5
Multi-Family Residential	73	8.9	656.3	2,959	217,264	271.6	3.7
Mobile Home Residential	375	1.3	484.3	428	160,315	200.4	0.5
Commercial	268	2.3	619.1	765	204,944	256.2	1.0
Industrial	42	229.5	9684.1	75,960	3,205,876	4,007.3	94.9
Government	60	7.7	467.5	2,564	154,766	193.5	3.2
Standpipe	0	0.0	0.0	0	0	0.0	0.0
Subtotal	3,869		14,973.2		4,956,794	6,196	
10% Contingency					495,679	620	
TOTAL	3,869		14,973.2		5,452,473	6,816	

2.6.3 Future Demand Summary and ERU/Physical Capacity

Table 2-24 summarizes the year 2015 and projected six-year, 10-year, and 20-year water demands for the City of Grandview, and compares the future demand to the City's current and future source capacity, and instantaneous and annual water rights.

TABLE 2-24 CURRENT AND FUTURE DEMAND, SOURCE CAPACITY AND WATER RIGHTS SUMMARY										
Year	System Water Demand					Existing Source Capacity		Existing Water Rights*		
	# of ERUs (ADD)	Total Annual Demand	ADD	MDD	PHD	Max. Day Capacity	Pumping Capacity	Water Rights (Q_i)		Water Rights (Q_a)
		MG/Year	MGD	MGD	GPM	MGD	GPM	GPM	MGD	MG/Year
2015	6,742	562.405	1.541	3.680	4,600	6.235	4,330	6,955	10.015	1,511.95
2021	7,372	676.454	1.853	4.427	5,533	6.235	4,330	6,955	10.015	1,511.95
2025	7,824	717.963	1.967	4.698	5,873	6.235	4,330	6,955	10.015	1,511.95
2035	9,080	833.226	2.283	5.452	6,816	6.235	4,330	6,955	10.015	1,511.95
* Refer to CHAPTER 4 for further discussion of existing water right capacity.										

The system's current and future physical capacity (ERUs), in terms of water rights, source capacity, and storage capacity is summarized in Table 2-25 below. Further information on current water rights, source and reservoir capacities are provided in CHAPTER 3 and CHAPTER 4 of this Plan.

The physical supply capacity water rights in Table 2-25 is based upon comparing the ADD per ERU to the current and/or future total annual (Q_a) water right quantity and the MDD per ERU to the current and/or future total instantaneous (Q_i) water right quantity. Similarly, source physical capacity is based upon comparison of the MDD per ERU to the current and/or future well pumping capacity. At a minimum, the total source capacity should be able to replenish depleted fire suppression storage in 72 hours while supplying system MDD in order to eliminate the need for excessive equalizing storage capacity. The water sources should also be able to supply ADD with the largest source of supply out of service.

The storage physical capacity in Table 2-25 is based on two of the primary storage components, equalizing storage (ES) and standby storage (SB). Physical capacity of the City's reservoirs is not based upon operational storage (OS) or fire suppression storage (FSS) because these normally do not change with the number of ERUs. The Department of Health (DOH) equations for determining storage physical capacity were simplified, based upon the characteristics of metered and calculated annual and peak demands for the City of Grandview. Therefore, current and future equalizing and standby storage capacities were calculated from the following equations:

$ES = (150\ MIN.)[PHD(N) - Q_s]$ (*2009 Water System Design Manual*, Page 117)

Where,
ES = Equalizing Storage (gallons)
PHD = Peak Hourly Demand per ERU (GPM) = 0.4 GPM from Table 2-14
N = Number of ERUs
Q_s = Total flow of all permanent sources (GPM)

$SB = (200\ \text{gallons})(N)$ (*2009 Water System Design Manual*, Page 117)

Where,
SB = Standby Storage (gallons), minimum recommended
N = Number of ADD ERUs

Since N and ES are unknown, the above equations were rearranged and the equation for total storage (TS = OS+ES+SB+FSS) and 0.4 GPM for PHD per ERU were used to yield the following equation which solves for the existing and/or future ERU capacity (N):

$$N = \frac{TS - OS + 150Q_s - FSS}{260}$$

Where,
TS = Total Storage (gallons)

OS = Operational Storage (gallons)
FSS = Fire Suppression Storage (gallons)
N = Number of ERUs
Q_s = Total flow of all permanent sources (GPM)

Water systems can exclude the SB or FSS component, whichever is smaller, from a water system's total storage requirement if the local fire authority approves "nesting," and Grandview's fire department has elected to do so. Because Grandview has a very high FSS volume requirement (1,440,000 gallons), the SB volume is initially nested within the FSS volume. However, as service demands increase, the SB becomes the controlling storage volume required, as further discussed in Section 3.4 of this Plan. When nesting the SB volume within FSS volume (*SB* + *FSS* = *FSS*), the ERU capacity equation is reduced to the following:

$$N = \frac{TS - OS + 150Q_s - FSS}{60}$$

When nesting the FSS volume within SB volume (*SB* + *FSS* = *SB*), the ERU capacity equation is reduced to the following:

$$N = \frac{TS - OS + 150Q_s}{260}$$

Table 2-25 summarizes the water system capacity, in ERUs, based on current supply (water rights), source, and storage capacity. Projected system demands and calculated system capacities shown in other tables of this Plan are based on demand per service and do not directly correlate to the calculated demand per ERU for all service categories under different demand conditions (e.g. ADD, MDD, PHD). Values shown in Table 2-25 are therefore, only estimates based upon calculated demands per ERU for ADD, MDD, and PHD from historical source and supply meter records. Further system analysis should be performed to determine the system's available capacity with regard to proposed development type (i.e. type of service category) to account for variations in average and peak demands of individual service categories.

TABLE 2-25 SUMMARY OF CURRENT AND FUTURE PHYSICAL CAPACITY (ERUS)

System Component	Current Capacity	Future Capacity	Demand/ ERU[a]	Year 2015 ERU Capacity	Year 2035 ERU Capacity[b]	Year 2015 Available ERU Capacity[c]	Year 2035 Available ERU Capacity[d]
Supply, Water Rights							
Annual (Q_a)[e]	1,512 MG	1,512 MG	0.09 MG	16,476	16,476	9,735	7,396
Instantaneous (Q_i)[e]	6,955 GPM	6,955 GPM	0.23 GPM	30,253	30,253	19,136	15,280
Source							
ADD	2,840 GPM	2,840 GPM	0.17 GPM	16,266	16,266	9,525	7,187
MDD	4,330 GPM	4,330 GPM	0.25 GPM	17,123	17,123	6,006	2,149
Storage (Effective)							
Equalizing	3.561 MG	3.561 MG	Varies	41,998	15,230	30,881	257
Standby	3.561 MG	3.561 MG	200 Gal				

[a] Reference Table 2-18 and Table 2-21.
[b] Based on future system capacities without recommended system improvements in place.
[c] Year 2015 available ERU capacity equals Year 2015 ERU capacity minus the Year 2015 number of ERUs.
[d] Year 2035 available ERU capacity equals Year 2035 ERU capacity minus the Year 2035 number of ERUs.
[e] Annual demand is based on average day demand per ERU and instantaneous demand is based on maximum day demand per ERU.

It can be seen from Table 2-25 that of the existing system components, water storage is the limiting factor in determining the physical capacity of the City of Grandview water system. Water storage improvements are addressed in CHAPTER 8.

CHAPTER 3 - SYSTEM ANALYSIS

3.1 SYSTEM DESIGN STANDARDS

Standardized performance and design criteria are essential for the efficient evaluation, construction and operation of a water utility. Establishing minimum criteria assures a base level of system reliability and enhances the utility's ability to assess system deficiencies and to plan for future improvements.

The City of Grandview has established the following performance and design criteria for their water system:

1. Water Quality – The quality of water supplied to the system shall meet or exceed the requirements of the latest edition of the Department of Health (DOH) publication entitled *State Board of Health - Drinking Water Regulations*.

2. Average Daily Demand (ADD) – This demand shall be equivalent to the daily consumption per service in a user category averaged for the period 2008-2013, except as otherwise adjusted to account for recent changes in demand trends as discussed in CHAPTER 2 of this Plan. The ADD values for Grandview are presented in Table 2-12.

3. Maximum Daily Demand (MDD) – This demand shall be equivalent to the maximum day of consumption per service in a user category, as calculated using the volume of water from the maximum day of production as described in CHAPTER 2. The MDD values are presented in Table 2-14.

4. Peak Hour Demand (PHD) – This demand shall be equivalent to the peak hour consumption per service in a user category, as calculated using a conservative estimate of 1.8 times the MDD as shown in Table 2-14.

5. Storage Requirements – Storage requirements shall be based on providing minimum operational, equalizing, standby, and fire suppression storage for the entire water system as calculated using the *DOH Water System Design Manual* equations. The specific storage requirements for the City of Grandview are presented later in this chapter.

6. Flow Rates and Velocities – Pipelines shall be sized for a maximum allowable water flow velocity of eight feet per second (fps) for system demands, which equals the maximum instantaneous demand (PHD). Pipeline velocities for fire flow conditions shall be permitted to exceed eight fps. The basis for pipe size design shall be per computer model analysis.

7. Multiple Sources – The City of Grandview currently has 14 source wells, 11 of which are in service, and two are currently emergency wells. The City will apply for new water rights and develop new sources as demand requires.

8. Fire Suppression Storage Requirements – Storage requirements for fire flow shall be based on providing 6,000 GPM for a 4-hour duration (the minimum flow required by the Grandview Fire Department for the largest Kenyon Zero Storage facility), which equals 1,440,000 gallons. Additional fire suppression storage and fire flow capacity requirements are discussed later in this chapter.

9. System Pressures – The City of Grandview water system currently has one pressure zone. The minimum service pressure under maximum instantaneous domestic demand conditions shall be 30 pounds per square inch (psi), as specified in WAC 246-290-230(5). Under fire flow conditions, the minimum fire hydrant flow pressure shall be 20 psi. Additional information regarding system pressure requirements under specific hydraulic analysis scenarios is presented later in this chapter.

10. Minimum Pipe Sizes - The minimum pipe size allowed within the system shall be eight-inch diameter. Where fire flow requirements exceed 1,000 GPM, the minimum pipeline size shall be determined by hydraulic analysis.

Standards for water main construction in the City of Grandview are included in CHAPTER 10 of this Plan.

3.2 WATER QUALITY

A public water utility must supply safe and aesthetically pleasing water to its customers. However, source waters of most water utilities vary in the types and amounts of impurities which have been acquired during their passage through atmosphere, ground surfaces, or underground strata. To assure that all drinking waters maintain a standard level of quality, acceptable limits of contaminants have been established in WAC Chapter 246-290, *Group A Public Water Supplies*, March 30, 2012, specifically WAC 246-290-310 effective January 4, 2010.

These standards of acceptability establish "maximum contaminant levels" (MCLs) and "Maximum Residual Disinfectant Levels" (MRDLs) for bacteriological, inorganic chemical and physical, and other elements. The Regulations also set forth procedures to be followed if the MCL limits are exceeded.

The City of Grandview monitors its system's water quality in accordance with the requirements of WAC 246-290-300, and 246-290-310. Follow-up action, if required, is completed in accordance with the requirements of WAC 246-290-320 and the Groundwater Rule (GWR). Bacteriological monitoring is performed at ten (10) locations within the water system in accordance with the City's *Coliform Monitoring Plan*. Lead and copper distribution system monitoring is completed in accordance with the City's lead and copper monitoring program. Inorganic chemical (IOC), volatile organic chemical (VOC), synthetic organic chemical (SOC), and radionuclide testing are performed on the City's source wells. All source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and previously at Sources S10 North Willoughby and S13 South Willoughby. S13 South Willoughby is an emergency source, and has not been used since early 2012, so currently no blending occurs at this location. These source wells are plumbed with isolation valves to allow individual and blended testing.

3.2.1 Water Source Sampling and Testing

Inorganic Chemical (IOC) Monitoring: Water quality monitoring for primary IOCs, secondary IOCs and physical parameters is required from each source generally once every compliance cycle. Compliance cycles are nine years, per 40 CFR 141.23. Grandview collects water samples for IOCs and physical parameters prior to introduction into the distribution system chlorination at each well.

Certain chemical characteristics must be monitored more frequently than the general monitoring requirements. For example, Nitrate and Nitrite must be monitored annually. Other chemical characteristics monitoring requirements may be waived by the Department of Health.

Results of Grandview's latest source IOC and physical analysis, summarized in Table 3-1 and Table 3-2, show the City to be in compliance with State standards. Copies of the most recent test results for the source wells are provided in the CHAPTER 10 of this Plan. Additional inorganic testing of wells occurred in previous years. Copies of these test results are furnished in CHAPTER 10 of this Plan, and are shown in Table 3-3 through Table 3-12. The results indicate that water quality in each of the wells has not significantly changed over time.

TABLE 3-1 INORGANIC (PRIMARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY

Chemical or Physical Property	MCL (mg/l)	S01 West Main 8/10/10	S02 Balcom & Moe 4/15/09	S03 Velma 4/20/10	S06 Euclid (Emrgncy Source)	S07 Olmstead A 9/11/07	S10 North Willoughby 9/11/07	S11 Highland 4/17/07	S13 South Willoughby (Emrgncy Source) 9/8/10	S14 Butternut 11/11/09	S16 Olmstead B 8/10/10	S18 Pecan B 7/23/13
Antimony (Sb)	0.0060	<0.005	<0.005	<0.005	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0001
Arsenic (As)	0.010	0.005	0.0028	<0.002	---	0.0048	0.0026	0.0022	<0.002	<0.002	0.0034	0.00288
Barium (Ba)	2.0	0.047	0.060	0.061	---	0.053	0.069	0.066	<0.002	0.003	0.049	0.01267
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047	---	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.00089
Copper (Cu)*	1.3	<0.002	0.0132	<0.002	---	<0.002	<0.002	<0.002	<0.002	0.00295	<0.002	0.00295
Cyanide (HCN)	0.2	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.0500	<0.01	<0.01
Fluoride (F)	4.0	0.48	0.41	0.45	---	0.45	0.35	0.38	2.19	<0.2000	0.45	0.47
Lead (Pb)*	0.015	<0.0005	<0.0005	0.0006	---	<0.0005	<0.0005	<0.0005	<0.0005	<0.0020	<0.0005	0.00015
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0003	<0.0002
Nickel (Ni)	0.10	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0001
Nitrate (as N)	10.0	6.80	5.06	4.73	---	7.48	9.04	6.58	<0.05	<0.07	6.28	2.56
Nitrite (as N)	1.0	<0.05	<0.05	<0.05	---	<0.05	<0.05	<0.05	<0.05	<0.07	<0.05	<0.05
Selenium (Se)	0.050	<0.005	<0.005	<0.005	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00207
Sodium (Na)*	20	18.8	24.6	17.7	---	22.6	16.9	16.2	85.1	91.0	24.9	15.9
Thallium (Tl)	0.0020	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	0.00014

* No DOH established MCL. Represents EPA established “action levels” for lead and copper, and recommended level for sodium.

TABLE 3-2 INORGANIC (SECONDARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY												
Chemical or Physical Property	MCL (mg/l)	S01 West Main 8/10/10	S02 Balcom & Moe 4/15/09	S03 Velma 4/20/10	S06 Euclid (Emrgncy Source)	S07 Olmstead A 9/11/07	S10 North Willoughby 9/11/07	S11 Highland 4/17/07	S13 South Willoughby (Emrgncy Source) 9/8/10	S14 Butternut 11/11/09	S16 Olmstead B 8/10/10	S18 Pecan B 7/23/13
Chloride (Cl)	250.0	16.6	19.4	12.5	---	16.6	21.9	24.1	16.1	23.1	15.3	9.83
Fluoride (F)	2.0	0.48	0.41	0.45	---	0.45	0.35	0.38	2.19	0.97	0.45	0.47
Iron (Fe)	0.3	<0.0097	0.120	0.0135	---	0.0358	0.053	<0.0097	<0.0097	0.0311	<0.0097	<0.0097
Manganese (Mn)	0.05	<0.002	0.0094	<0.002	---	<0.002	0.0024	<0.002	<0.002	<0.002	0.0024	0.00023
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047	---	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0001
Sulfate (SO_4)	250.0	43.4	50.9	45.4	---	49.1	65.4	69.5	<0.1	1.0	47.4	29.7
Zinc (Zn)	5.0	0.0146	<0.02	<0.02	---	<0.02	0.031	<0.02	<0.005	<0.02	0.0205	0.00138
Color	15 Color Units	<4	<4	<4	---	<4	<4	<4	<4	<4	<4	<4
Specific Conductivity	700 umhos/cm	494	531	427	---	591	564	564	376	393	551	352
Total Dissolved Solids (TDS)	500	364	366	298	---	368	372	400	244	304	374	202

Table 3-3 through Table 3-12 present both the latest, and previously conducted IOC analysis test results for each primary source well.

TABLE 3-3 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WEST MAIN (S01)

Chemical or Physical Characteristics	MCL (mg/l)	8/10/2010	8/13/2007	8/11/2004	12/23/1997
Primary Substances					
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.010	0.005	0.0044	0.0043	<0.0100
Barium (Ba)	2.0	0.047	0.0470	0.0460	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003	0.0020
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	<0.002	<0.0020	<0.0020	<0.2000
Cyanide (HCN)	0.2	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4.0	0.48	0.4200	0.4500	0.5000
Lead (Pb)*	0.015	<0.0005	<0.0005	<0.0005	0.0140
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.10	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10.0	6.80	6.6800	6.3600	6.600
Nitrite (as N)	1.0	<0.05	<0.0500	<0.0500	---
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	18.8	20.0000	19.4000	20.0000
Thallium (Tl)	0.002	<0.001	<0.0010	<0.0010	<0.0020
Secondary Substances					
Chloride (Cl)	250.0	16.6	14.80000	15.20000	<20.0000
Fluoride (F)	2.0	0.48	0.4200	0.4500	0.5000
Iron (Fe)	0.3	<0.0097	0.0178	0.0275	<0.1000
Manganese (Mn)	0.05	<0.002	<0.0020	<0.0020	<0.0100
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250.0	43.4	41.1000	41.8000	41.0000
Zinc (Zn)	5.0	0.0146	<0.0200	<0.0200	<0.2000
Color	15 Color Units	<4	<4.0000	<4.0000	<20.0000
Specific Conductivity	700 umhos/cm	494	249	491	---
Total Dissolved Solids (TDS)	500	364	342	326	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-4 INORGANIC CHEMICAL ANALYSIS RESULTS FOR BALCOM & MOE (S02)					
Chemical or Physical Characteristics	MCL (mg/l)	4/15/2009	7/17/2007	7/1/2003	10/17/2000
Primary Substances					
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.010	0.0028	<0.0020	0.0022	<0.0100
Barium (Ba)	2.0	0.060	0.0260	0.0440	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003	<0.0020
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	0.0132	0.0158	<0.0025	<0.2000
Cyanide (HCN)	0.2	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4.0	0.41	1.2000	0.6100	0.8700
Lead (Pb)*	0.015	<0.0005	<0.0005	<0.0005	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.10	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10.0	5.06	0.3200	2.6600	<0.5000
Nitrite (as N)	1.0	<0.05	0.0700	<0.0700	<0.5000
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	24.6	56.5000	28.8000	56.0000
Thallium (Tl)	0.002	<0.001	<0.0010	<0.0010	<0.0020
Secondary Substances					
Chloride (Cl)	250.0	19.4	16.1000	16.1000	<20.0000
Fluoride (F)	2.0	0.41	1.2000	0.6100	0.8700
Iron (Fe)	0.3	0.120	0.1130	0.0128	<0.1000
Manganese (Mn)	0.05	0.0094	0.0246	0.0022	0.0410
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250.0	50.9	11.7000	50.0000	14.0000
Zinc (Zn)	5.0	<0.02	<0.0200	<0.0200	1.7000
Color	15 Color Units	<4	<4.0000	<4.0000	<5.0000
Specific Conductivity	700 umhos/cm	531	408	484	410
Total Dissolved Solids (TDS)	500	366	272	302	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-5 INORGANIC CHEMICAL ANALYSIS RESULTS FOR VELMA (S03)				
Chemical or Physical Characteristics	MCL (mg/l)	4/20/2010	4/17/2007	7/1/2003
Primary Substances				
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050
Arsenic (As)	0.010	<0.002	0.0028	0.0029
Barium (Ba)	2.0	0.061	0.0600	0.0440
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	<0.002	0.0038	<0.0020
Cyanide (HCN)	0.2	<0.01	<0.0100	<0.0100
Fluoride (F)	4.0	0.45	0.4300	0.5100
Lead (Pb)*	0.015	0.0006	0.0024	<0.0005
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003
Nickel (Ni)	0.10	<0.01	<0.0100	<0.0100
Nitrate (as N)	10.0	4.73	4.5100	3.9500
Nitrite (as N)	1.0	<0.05	<0.0500	<0.0700
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	17.7	16.1000	16.6000
Thallium (Tl)	0.002	<0.001	<0.0020	0.0014
Secondary Substances				
Chloride (Cl)	250.0	12.5	13.2000	10.2000
Fluoride (F)	2.0	0.45	0.4300	0.5100
Iron (Fe)	0.3	0.0135	0.0112	<0.0097
Manganese (Mn)	0.05	<0.002	<0.0020	<0.0020
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250.0	45.4	42.6000	46.2000
Zinc (Zn)	5.0	<0.02	<0.0200	<0.0200
Color	15 Color Units	<4	<4.0000	<4.0000
Specific Conductivity	700 umhos/cm	427	415	387
Total Dissolved Solids (TDS)	500	298	308	252

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-6 INORGANIC CHEMICAL ANALYSIS RESULTS FOR OLMSTEAD A (S07)		
Chemical or Physical Characteristics	MCL (mg/l)	9/11/2007
Primary Substances		
Antimony (Sb)	0.006	<0.005
Arsenic (As)	0.010	0.0048
Barium (Ba)	2.0	0.053
Beryllium (Be)	0.004	<0.0002
Cadmium (Cd)	0.005	<0.0003
Chromium (Cr)	0.1	<0.0047
Copper (Cu)*	1.3	<0.002
Cyanide (HCN)	0.2	<0.01
Fluoride (F)	4.0	0.45
Lead (Pb)*	0.015	<0.0005
Mercury (Hg)	0.0020	<0.0003
Nickel (Ni)	0.10	<0.01
Nitrate (as N)	10.0	7.48
Nitrite (as N)	1.0	<0.05
Selenium (Se)	0.05	<0.005
Sodium (Na)*	20	22.6
Thallium (Tl)	0.002	<0.001
Secondary Substances		
Chloride (Cl)	250.0	16.6
Fluoride (F)	2.0	0.45
Iron (Fe)	0.3	0.0358
Manganese (Mn)	0.05	<0.002
Silver (Ag)	0.1	<0.0047
Sulfate (SO_4)	250.0	49.1
Zinc (Zn)	5.0	<0.02
Color	15 Color Units	<4
Specific Conductivity	700 umhos/cm	591
Total Dissolved Solids (TDS)	500	368
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium		

TABLE 3-7 INORGANIC CHEMICAL ANALYSIS RESULTS FOR NORTH WILLOUGHBY (S10)			
Chemical or Physical Characteristics	MCL (mg/l)	9/11/2007	12/23/1997
Primary Substances			
Antimony (Sb)	0.006	<0.005	<0.0050
Arsenic (As)	0.010	0.0026	<0.0100
Barium (Ba)	2.0	0.069	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0020
Chromium (Cr)	0.1	<0.0047	<0.0100
Copper (Cu)*	1.3	<0.002	<0.2000
Cyanide (HCN)	0.2	<0.01	<0.0500
Fluoride (F)	4.0	0.35	0.4000
Lead (Pb)*	0.015	<0.0005	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0005
Nickel (Ni)	0.10	<0.01	<0.0400
Nitrate (as N)	10.0	9.04	9.3000
Nitrite (as N)	1.0	<0.05	---
Selenium (Se)	0.05	<0.005	<0.0050
Sodium (Na)*	20	16.9	16.0000
Thallium (Tl)	0.002	<0.001	<0.0020
Secondary Substances			
Chloride (Cl)	250.0	21.9	37.0000
Fluoride (F)	2.0	0.35	0.4000
Iron (Fe)	0.3	0.053	<0.1000
Manganese (Mn)	0.05	0.0024	<0.0100
Silver (Ag)	0.1	<0.0047	<0.0100
Sulfate (SO_4)	250.0	65.4	69.0000
Zinc (Zn)	5.0	0.031	<0.2000
Color	15 Color Units	<4	---
Specific Conductivity	700 umhos/cm	564	---
Total Dissolved Solids (TDS)	500	372	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-8 INORGANIC CHEMICAL ANALYSIS RESULTS FOR HIGHLAND (S11)				
Chemical or Physical Characteristics	MCL (mg/l)	4/17/2007	5/5/2003	5/19/1999
Primary Substances				
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050
Arsenic (As)	0.010	0.0022	0.0074	<0.0100
Barium (Ba)	2.0	0.066	0.0620	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0030	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0020	<0.0020
Chromium (Cr)	0.1	<0.0047	0.0160	<0.0100
Copper (Cu)*	1.3	<0.002	<0.2000	<0.2000
Cyanide (HCN)	0.2	<0.01	<0.0500	<0.0500
Fluoride (F)	4.0	0.38	0.2300	0.8000
Lead (Pb)*	0.015	<0.0005	0.0018	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0005	<0.0005
Nickel (Ni)	0.10	<0.01	<0.0400	<0.0400
Nitrate (as N)	10.0	6.58	7.2500	6.4000
Nitrite (as N)	1.0	<0.05	<0.5000	---
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	16.2	16.7000	20.0000
Thallium (Tl)	0.002	<0.002	<0.0020	<0.0020
Secondary Substances				
Chloride (Cl)	250.0	24.1	26.3000	<20.0000
Fluoride (F)	2.0	0.38	0.2300	0.8000
Iron (Fe)	0.3	<0.0097	0.0120	0.1100
Manganese (Mn)	0.05	<0.002	<0.0100	<0.0100
Silver (Ag)	0.1	<0.0047	<0.0100	<0.0100
Sulfate (SO_4)	250.0	69.5	79.6000	46.0000
Zinc (Zn)	5.0	<0.02	0.0320	<0.2000
Color	15 Color Units	<4	<5.0000	<20.0000
Specific Conductivity	700 umhos/cm	564	585	---
Total Dissolved Solids (TDS)	500	400	416	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-9 INORGANIC CHEMICAL ANALYSIS RESULTS FOR SOUTH WILLOUGHBY (S13)					
Chemical or Physical Characteristics	MCL (mg/l)	9/8/2010	2/1/2007	10/17/2006	12/13/1994
Primary Substances					
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.010	<0.002	0.0127	<0.0020	<0.0100
Barium (Ba)	2.0	<0.002	0.0060	0.0070	0.0120
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0020	<0.0020	<0.0020
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	<0.002	0.0047	0.0124	<0.2000
Cyanide (HCN)	0.2	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4.0	2.19	2.1600	1.9900	1.9100
Lead (Pb)*	0.015	<0.0005	0.0012	0.0039	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.10	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10.0	<0.05	<0.0500	0.0800	0.1400
Nitrite (as N)	1.0	<0.05	0.0500	<0.0500	<0.5000
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	85.1	80.5000	85.0000	83.9000
Thallium (Tl)	0.002	<0.001	<0.0020	<0.0020	<0.0020
Secondary Substances					
Chloride (Cl)	250.0	16.1	17.2000	18.2000	18.2000
Fluoride (F)	2.0	2.19	2.1600	1.9900	1.91000
Iron (Fe)	0.3	<0.0097	0.0438	0.0675	0.0590
Manganese (Mn)	0.05	<0.002	0.0026	0.0023	<0.0100
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250.0	<0.1	3.5800	1.4600	6.2800
Zinc (Zn)	5.0	<0.005	<0.0200	<0.0200	<0.2000
Color	15 Color Units	<4	<4.000	<4.0000	<5.0000
Specific Conductivity	700 umhos/cm	376	409	412	342
Total Dissolved Solids (TDS)	500	244	268	274	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-10 INORGANIC CHEMICAL ANALYSIS RESULTS FOR BUTTERNUT (S14)					
Chemical or Physical Characteristics	MCL (mg/l)	11/11/2009	12/21/2000	12/23/1997	12/13/1994
Primary Substances					
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050	<0.0030
Arsenic (As)	0.010	<0.002	<0.0100	<0.0100	<0.0050
Barium (Ba)	2.0	0.003	<0.1000	<0.1000	0.0140
Beryllium (Be)	0.004	<0.0002	<0.0030	<0.0003	<0.0040
Cadmium (Cd)	0.005	<0.0003	<0.0020	<0.0020	<0.0040
Chromium (Cr)	0.1	<0.0047	<0.0100	<0.0100	<0.0200
Copper (Cu)*	1.3	0.00295	<0.2000	<0.2000	0.0120
Cyanide (HCN)	0.2	<0.0500	<0.0500	<0.0500	<0.0050
Fluoride (F)	4.0	<0.2000	<0.2000	2.6000	2.8700
Lead (Pb)*	0.015	<0.0020	<0.0020	<0.0020	0.0050
Mercury (Hg)	0.0020	<0.0005	<0.0005	<0.0005	<0.0002
Nickel (Ni)	0.10	<0.01	<0.0400	<0.0400	<0.0300
Nitrate (as N)	10.0	<0.07	<0.5000	<0.5000	0.1200
Nitrite (as N)	1.0	<0.07	<0.5000	<0.5000	<0.0500
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	91.0	82.0000	81.0000	94.0000
Thallium (Tl)	0.002	<0.001	<0.0020	<0.0020	<0.0020
Secondary Substances					
Chloride (Cl)	250.0	23.1	<20.0000	<20.0000	20.9000
Fluoride (F)	2.0	0.97	<0.2000	2.6000	2.8700
Iron (Fe)	0.3	0.0311	<0.1000	<0.1000	0.2050
Manganese (Mn)	0.05	<0.002	<0.0100	<0.0100	<0.0200
Silver (Ag)	0.1	<0.0047	<0.0100	<0.0100	<0.0100
Sulfate (SO_4)	250.0	1.0	<10.0000	<10.0000	3.4100
Zinc (Zn)	5.0	<0.02	<0.2000	<0.2000	0.0270
Color	15 Color Units	<4	<5.0000	<5.0000	<15.0000
Specific Conductivity	700 umhos/cm	393	390	540	352
Total Dissolved Solids (TDS)	500	304	---	---	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-11 INORGANIC CHEMICAL ANALYSIS RESULTS FOR OLMSTEAD B (S16)				
Chemical or Physical Characteristics	MCL (mg/l)	8/10/2010	8/9/2006	9/24/2003
Primary Substances				
Antimony (Sb)	0.006	<0.005	<0.0050	<0.0050
Arsenic (As)	0.010	0.0034	<0.0020	0.0126
Barium (Ba)	2.0	0.049	0.0320	0.0350
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	<0.002	<0.0020	<0.0020
Cyanide (HCN)	0.2	<0.01	<0.0100	<0.0100
Fluoride (F)	4.0	0.45	0.5200	0.5300
Lead (Pb)*	0.015	<0.0005	<0.0005	<0.0005
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003
Nickel (Ni)	0.10	<0.01	<0.0100	<0.0100
Nitrate (as N)	10.0	6.28	1.5300	2.8900
Nitrite (as N)	1.0	<0.05	<0.0500	<0.0500
Selenium (Se)	0.05	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	24.9	41.6000	38.2
Thallium (Tl)	0.002	<0.001	<0.0010	<0.0010
Secondary Substances				
Chloride (Cl)	250.0	15.3	8.5700	11.0000
Fluoride (F)	2.0	0.45	0.5200	0.5300
Iron (Fe)	0.3	<0.0097	<0.0097	0.1090
Manganese (Mn)	0.05	0.0024	0.0104	0.0163
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250.0	47.4	29.9000	38.6000
Zinc (Zn)	5.0	0.0205	<0.0200	0.0281
Color	15 Color Units	<4	<4.0000	<4.0000
Specific Conductivity	700 umhos/cm	551	353	412
Total Dissolved Solids (TDS)	500	374	240	258

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-12 INORGANIC CHEMICAL ANALYSIS RESULTS FOR PECAN B (S18)			
Chemical or Physical Characteristics	MCL (mg/l)	7/23/13	6/14/2006
Primary Substances			
Antimony (Sb)	0.006	<0.0001	<0.0050
Arsenic (As)	0.010	0.00288	0.0053
Barium (Ba)	2.0	0.01267	0.0180
Beryllium (Be)	0.004	<0.0001	<0.0002
Cadmium (Cd)	0.005	<0.0001	<0.0003
Chromium (Cr)	0.1	0.00089	<0.0047
Copper (Cu)*	1.3	0.00295	<0.0020
Cyanide (HCN)	0.2	<0.01	<0.0100
Fluoride (F)	4.0	0.47	0.4400
Lead (Pb)*	0.015	0.00015	<0.0005
Mercury (Hg)	0.0020	<0.0002	<0.0003
Nickel (Ni)	0.10	<0.0001	<0.0100
Nitrate (as N)	10.0	2.56	2.4800
Nitrite (as N)	1.0	<0.05	<0.0500
Selenium (Se)	0.05	0.00207	<0.0050
Sodium (Na)*	20	15.9	17.5000
Thallium (Tl)	0.002	0.00014	<0.0010
Secondary Substances			
Chloride (Cl)	250.0	9.83	9.6300
Fluoride (F)	2.0	0.47	0.4400
Iron (Fe)	0.3	<0.0097	<0.0097
Manganese (Mn)	0.05	0.00023	<0.0020
Silver (Ag)	0.1	<0.0001	<0.0047
Sulfate (SO_4)	250.0	29.7	35.2000
Zinc (Zn)	5.0	0.00138	<0.0200
Color	15 Color Units	<4	<4.0000
Specific Conductivity	700 umhos/cm	352	349
Total Dissolved Solids (TDS)	500	202	238

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

Arsenic Monitoring: The maximum contaminant levels (MCL) for arsenic is 0.010 mg/l. Current testing results from Grandview's wells show arsenic concentrations to be below the standard of 0.010 mg/l. However, past samples have tested above the MCL including South Willoughby well (S13) which had an arsenic concentration of 0.0127 mg/l from a sample collected in February 2007, and Olmstead B well (S16) which had a concentration of 0.0126 mg/l from a sample collected in September 2003. Arsenic monitoring requirements are consistent with IOC monitoring at all wells with the exception of Olmstead A, which requires quarterly arsenic sampling.

Nitrate/Nitrite Monitoring: The City of Grandview conducts annual monitoring for Nitrate and Nitrite on all well sources, and quarterly monitoring on three of its wells. The maximum contaminant levels (MCL) for Nitrate and Nitrite are 10.0 mg/l and 1.0 mg/l, respectively. Nitrates exceeding this concentration in drinking water can be a health hazard, especially to infants below six months of age.

Test results for the period 2009 through 2014, summarized in Table 3-13, show the City to be in compliance with State standards. A copy of Nitrate/Nitrite analysis test results are provided in the CHAPTER 10 of this Plan.

As mentioned previously, all source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending allows wells with higher nitrate concentrations to combine with wells having lower nitrate concentrations to meet MCL standards. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and previously at Sources S10 North Willoughby and S13 South Willoughby. S13 South Willoughby is an emergency source, and has not been used since early 2012, so currently no blending occurs at this location. These source wells are plumbed with isolation valves to allow individual and blended testing. Table 3-14 shows the blended nitrate concentrations at these wells.

TABLE 3-13 NITRATE / NITRITE CHEMICAL ANALYSIS RESULTS						
	2014	2013	2012	2011	2010	2009
West Main (S01)						
Nitrate (NO_3-N)	7.52	7.98	7.32	6.70	5.76	6.66
Nitrite (NO_2-N)	<0.05	<0.07	<0.1	<0.1	<0.1	<0.1
Total Nitrate/Nitrite	7.52	7.98	7.32	6.70	5.76	6.66
Balcom & Moe (S02)						
Nitrate (NO_3-N)	4.91	0.40	5.14	5.16	4.86	5.06
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.05	<0.05	<0.05
Total Nitrate/Nitrite	4.91	0.40	5.14	5.16	4.86	5.06
Velma (S03)						
Nitrate (NO_3-N)	4.56	4.87	4.72	4.84	4.74	4.66
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.05	<0.05	<0.05
Total Nitrate/Nitrite	4.56	4.87	4.72	4.84	4.74	4.66
Olmstead A (S07)						
Nitrate (NO_3-N)	8.81	8.28	8.17	8.08	7.32	8.26
Nitrite (NO_2-N)	<0.07	<0.1	<0.17	<0.1	<0.1	<0.07
Total Nitrate/Nitrite	8.81	8.28	8.17	8.08	7.32	8.26
North Willoughby (S10)						
Nitrate (NO_3-N)	9.25	8.86	9.01	9.06	8.52	9.32
Nitrite (NO_2-N)	<0.05	<0.1	<0.07	<0.1	<0.1	<0.07
Total Nitrate/Nitrite	9.25	8.86	9.01	9.06	8.52	9.32
Highland (S11)						
Nitrate (NO_3-N)	7.80	7.63	6.98	7.06	7.21	6.96
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.10	<0.07	<0.1
Total Nitrate/Nitrite	7.80	7.63	6.98	7.06	7.21	6.96
South Willoughby (S13)						
Nitrate (NO_3-N)	---	---	<0.05	<0.05	<0.05	<0.07
Nitrite (NO_2-N)	---	---	<0.05	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	---	---	0.00	0.00	0.00	0.00
Butternut (S14)						
Nitrate (NO_3-N)	<0.05	0.87	<0.07	<0.05	<0.05	<0.07
Nitrite (NO_2-N)	<0.05	<0.07	<0.07	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	0.00	0.87	0.00	0.00	0.00	0.00
Olmstead B (S16)						
Nitrate (NO_3-N)	0.60	0.88	0.89	0.90	0.90	0.68
Nitrite (NO_2-N)	<0.05	<0.05	<0.07	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	0.60	0.88	0.89	0.90	0.90	0.68
Pecan B (S18)						
Nitrate (NO_3-N)	2.56	2.56	2.54	2.58	2.57	2.40
Nitrite (NO_2-N)	<0.05	<0.05	<0.10	<0.05	<0.05	<0.1
Total Nitrate/Nitrite	2.56	2.56	2.54	2.58	2.57	2.40

TABLE 3-14 NITRATE / NITRITE CHEMICAL ANALYSIS BLENDED RESULTS						
	2014	2013	2012	2011	2010	2009
Olmstead A (S07) and Olmstead B (S16) Blend						
Nitrate (NO_3-N)	7.42	7.04	6.93	7.16	6.06	7.25
Nitrite (NO_2-N)	<0.05	<0.1	<0.07	<0.10	<0.10	<0.07
Total Nitrate/Nitrite	7.42	7.04	6.93	7.16	6.06	7.25
North Willoughby (S10) and South Willoughby (S13) Blend						
Nitrate (NO_3-N)	---	---	---	---	6.68	---
Nitrite (NO_2-N)	---	---	---	---	<0.10	---
Total Nitrate/Nitrite	---	---	---	---	6.68	---

Volatile Organic Chemical Monitoring: Volatile Organic Chemical (VOC) monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no VOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The Department of Health may grant waivers for monitoring requirements. Grandview conducted VOC testing on its source wells as shown in Table 3-15.

TABLE 3-15 SOURCE WELL VOC TESTING				
Source	Month/Year			
West Main (S01)	04/2009	07/2007	08/2004	04/2004
Balcom & Moe (S02)	04/2009	07/2007	08/2004	04/2000
Velma (S03)	04/2009	04/2007	04/2003	
Olmstead A (S07)	04/2009	05/2006		
North Willoughby (S10)	10/2014	06/2006	11/2004	02/2003
Highland (S11)	04/2009	12/2006	08/2002	05/2002
South Willoughby (S13)	05/2009	06/2006	08/2004	04/1997
Butternut (S14)	04/2009	08/2004	04/1997	
Olmstead B (S16)	04/2009	12/2006	09/2006	05/2006
Pecan B (S18)	04/2013	10/2007	09/2007	06/2007

Test results show the City to be in compliance with State standards. The City tests for trihalomethanes (TTHM) along with VOC testing, and test results showed no presence of any of these substances in the water from the City's wells. Copies of the VOC and trihalomethanes test results are provided in CHAPTER 10 of this Plan.

Synthetic Organic Chemical (SOC) Monitoring: SOC monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The Department of Health may grant waivers for monitoring requirements. Grandview conducted SOC testing on its source wells as shown in Table 3-16.

TABLE 3-16 SOURCE WELL SOC TESTING				
Source	Month/Year			
West Main (S01)	07/2007			
Balcom & Moe (S02)	04/2013	03/2008	06/2001	12/1998
Velma (S03)	03/2008	06/2007		
Olmstead A (S07)	09/2007	12/1998	10/1995	
North Willoughby (S10)	07/2007	12/1998		
Highland (S11)	04/2012	03/2008	06/2007	12/2006
South Willoughby (S13)	09/2009	12/1998		
Butternut (S14)	04/2009	12/1998		
Olmstead B (S16)	09/2007			
Pecan B (S18)	03/2007			

Test results show the City to be in compliance with State standards, and showed no presence of any of these substances in the water from the City's wells. A copy of the SOC analysis test results is provided in CHAPTER 10 of this Plan.

Radionuclide Monitoring: For the City of Grandview, radionuclide sampling from each source is generally required once every three years. However, the Department of Health may reduce monitoring requirements to once every six or nine years based on criteria set forth in 40 CFR 141.26. Grandview has completed radionuclide testing on its source wells as shown in Table 3-17.

TABLE 3-17 SOURCE WELL RADIONUCLIDE TESTING				
Source	Month/Year			
West Main (S01)	06/2010	10/2007	09/2007	10/2005
Balcom & Moe (S02)	04/2011	04/2009	10/2007	09/2007
Velma (S03)	05/2009	10/2007	09/2007	05/2007
Olmstead A (S07)	04/2012	09/2009	12/2007	09/2007
North Willoughby (S10)	06/2014	04/2012	09/2009	10/2007
Highland (S11)	04/2011	11/2009	09/2007	06/2007
South Willoughby (S13)	11/2009	11/2005	05/2005	05/2003
Butternut (S14)	04/2010	12/2005	06/2005	05/2003
Olmstead B (S16)	08/2012	05/2010	12/2005	07/2005
Pecan B (S18)	06/2010	09/2007	06/2006	

Test results show the City to be in compliance with State standards. A copy of the radionuclide analysis test results is provided in CHAPTER 10 of this Plan.

3.2.2 Distribution System Sampling and Testing

Bacteriological: Drinking water samples are required to be collected monthly at various locations throughout the water distribution system for bacteriological analysis in accordance with the City's *Coliform Monitoring Plan*. The minimum number of samples required for collection by a water utility is based on the population served. The Department of Health regulations require water systems serving a population of 8,501 to 12,900 to take a minimum of ten (10) samples per month when no samples with a coliform presence are collected previous month. The City of Grandview is required to sample a minimum of ten (10) locations within the distribution system. The *Coliform Monitoring Plan* and representative copies of bacteriological analysis results are provided in CHAPTER 10 of this Plan.

Disinfection Byproducts (DBPs): Grandview adds chlorine to its drinking water to kill or inactivate harmful organisms that may cause various diseases, and this process is known as disinfection. However, chlorine is a very active substance and it reacts with naturally occurring substances to form compounds known as disinfection byproducts. The most common disinfection byproducts formed when chlorine is used are trihalomethanes (TTHMs) and haloacetic acids (HAA5).

In 2006, EPA enacted new rules for disinfection byproducts monitoring, known as the Stage 2 Rule. Under the Stage 2 Rule, water systems must monitor at locations with the highest averages of total trihalomethanes (TTHMs) and haloacetic acids (HAA5). To determine these locations, the Stage 2 Rule required many systems to complete an Initial Distribution System Evaluation (IDSE). However, the City of Grandview was exempt from the IDSE requirement as its 40/30 certification was approved by EPA, demonstrating low historical TTHM and HAA5 distribution system concentrations. Two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually to meet Stage 2 Rule standards. The City has identified the sampling locations and schedules in the *Stage 2 DBP Monitoring Plan* provided in CHAPTER 10 of this Plan. The compliance determination for the Stage 2 Rule is based on a locational running annual average (LRAA), meaning compliance must be met at each monitoring location instead of the system-wide running annual average (RAA) used under the Stage 1 Rule.

Results from the latest (2014) monitoring indicated that none of the samples exceeded the federal action levels of 0.080 mg/l for TTHMs and 0.060 mg/l for HAA5 under the Stage 1 DBP Rule. Table 3-18 provides a summary of the 2012 and 2011 TTHMs and HAA5 monitoring results, which are also provided in CHAPTER 10 of this Plan.

TABLE 3-18 TTHM AND HAA5 PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Year	Sample Locations	TTHM	HAA5
2014	1260 Appleway Road	0.0123	0.0013
	940 East Wine Country Road	0.0405	0.0034
2013	1260 Appleway Road	0.0053	0.0011
	940 East Wine Country Road	0.0285	0.0045
	2013 Hill Drive	0.0061	ND
	207 West 2nd Street	0.0069	ND
	1005 Grandridge Road	0.0100	0.0014
	308 Westridge Road	0.0032	ND
	546 Woodall Road	0.0074	0.0014

* ND means not detected

Lead and Copper: Lead and copper sampling is required once every three years as approved by the Department of Health, per 40 CFR 141.86. In 1992, Grandview began a tap water lead and copper monitoring program to determine the lead and copper concentrations in drinking water to which its customers may be exposed. In 2014, thirty (30) samples were collected from various locations throughout the water system and tested for concentrations of lead and copper. Results from the latest

(2014) monitoring indicated that none of the samples exceeded the federal action levels of 1.3 mg/l for copper and 0.015 mg/l for lead. Table 3-19 provides a summary of the 2014 copper and lead monitoring results, which are also provided in CHAPTER 10 of this Plan. Test results from the 1998, 2000, 2005, 2008, and 2011 are also provided in CHAPTER 10.

TABLE 3-19 LEAD AND COPPER MONITORING PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Sample Number	Sample Location	Year 2014	
		Copper (Federal Action Level 1.3 mg/l)	Lead (Federal Action Level 0.015 mg/l)
1	701 Washington #10	0.158	0.00015
2	1005 Monty Python	0.00835	0.00018
3	218 Jackson	0.0736	0.00020
4	702 Larson	0.00954	0.00035
5	403 Westridge	0.00516	0.00025
6	209 West Bonnieview	0.0982	0.00043
7	1810 Young Street	0.0054	0.00030
8	701 Washington SQ 317	0.124	0.00027
9	308 Westridge	0.0155	0.00016
10	212 Jackson	0.0814	0.00034
11	214 Jackson	0.0865	0.00044
12	701 Washington #1	0.166	0.00017
13	306 Westridge	0.0278	0.00094
14	1816 W 2nd	0.0106	<0.0001
15	1812 W 2nd	0.0146	0.00019
16	1806 W 2nd	0.00694	0.00019
17	207 Westridge	0.0126	0.00052
18	202 Westridge	0.0185	0.00060
19	207 Madison	0.0736	0.00035
20	219 Jackson	0.0470	0.00032
21	701 Washington	0.103	0.00027
22	1800 W 2nd	0.00899	0.00013
23	1402 S Euclid	0.00511	0.00081
24	1105 Apache	0.0347	0.00053
25	516 Satterfield	0.122	0.00076
26	601 Washington #1	0.0491	0.00023
27	305 E 2nd	0.0177	0.00022
28	701 Washington #4	0.175	0.00018
29	602 Washington #9	0.0220	0.00035
30	1911 Queen Street	0.00727	0.00109

3.2.3 Future Source Water and Distribution System Sampling and Testing

A summary of future source and distribution system monitoring requirement frequencies, dates and sample status, as provided in the City's *Water Quality Monitoring Report for the Year 2015* (WQMR), is provided below in Table 3-20 and Table 3-21, respectively. A copy of the City's 2015 WQMR is provided in CHAPTER 10 of this Plan.

TABLE 3-20 FUTURE SOURCE WATER SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
West Main (S01)				
Nitrate/Nitrite	Once/Year	June 2014	June 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	August 2010	August 2019	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	July 2007	July 2016	Within MCLs
Pesticides	Once/9 Years	July 2007	July 2016	Within MCLs
Gross Alpha	Once/6 Years	June 2010	June 2016	Within MCLs
Radium 228	Once/3 Years	June 2010	June 2016	Within MCLs
Balcom & Moe (S02)				
Nitrate/Nitrite	Once/Year	June 2014	June 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	April 2009	April 2018	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	April 2008	April 2017	Within MCLs
Pesticides	Once/9 Years	April 2013	April 2022	Within MCLs
Gross Alpha	Once/6 Years	April 2011	April 2017	Within MCLs
Radium 226 + 228	Once/6 Years	April 2011	April 2017	Within MCLs
Velma (S03)				
Nitrate/Nitrite	Once/Year	June 2014	June 2015	Within MCLs
Inorganic Chemicals (IOCs)*	Once/9 years	April 2010	August 2019	Within MCLs
Volatile Organic Chemicals (VOCs)*	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	June 2007	June 2016	Within MCLs
Pesticides	Once/9 Years	June 2007	June 2016	Within MCLs
Gross Alpha	Once/6 Years	June 2014	June 2020	Within MCLs
Radium 228	Once/6 Years	May 2009	May 2015	Within MCLs
Olmstead A (S07)				
Nitrate/Nitrite	Once/Quarter	November 2014	February 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	September 2007	September 2016	Within MCLs
Arsenic	Once/Quarter	November 2014	February 2015	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	September 2007	September 2016	Within MCLs
Pesticides	Once/9 Years	September 2007	September 2016	Within MCLs
Gross Alpha	Once/3 Years	April 2012	October 2016	Within MCLs
Radium 226 + 228	Once/6 Years	May 2009	May 2015	Within MCLs
North Willoughby (S10)				
Nitrate/Nitrite	Once/Quarter	November 2014	February 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	September 2007	September 2016	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/Year	October 2014	October 2015	Within MCLs
Herbicides	Once/9 Years	July 2007	July 2016	Within MCLs
Pesticides	Once/9 Years	July 2007	July 2016	Within MCLs
Gross Alpha	Once/3 Years	April 2012	September 2015	Within MCLs
Radium 228	Once/3 Years	June 2014	June 2017	Within MCLs

Sample Type	Frequency	Last Sample	Next Sample	Status
Highland (S11)				
Nitrate/Nitrite	Once/Year	June 2014	June 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	April 2007	April 2016	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/3 Years	April 2012	April 2016	Within MCLs
Pesticides	Once/3 Years	March 2008	April 2015	Within MCLs
Gross Alpha	Once/3 Years	April 2011	October 2016	Within MCLs
Radium 228	Once/6 Years	April 2011	April 2017	Within MCLs
Butternut (S14)				
Nitrate/Nitrite	Once/Year	September 2014	September 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	November 2009	September 2018	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	April 2009	April 2018	Within MCLs
Pesticides	Once/9 Years	April 2009	April 2018	Within MCLs
Gross Alpha	Once/6 Years	April 2010	April 2016	Within MCLs
Radium 228	Once/6 Years	April 2010	April 2016	Within MCLs
Olmstead B Well (S16)				
Nitrate/Nitrite	Once/Quarter	November 2014	November 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	August 2010	August 2019	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/3 Years	September 2007		Within MCLs
Pesticides	Once/9 Years	September 2007		Within MCLs
Gross Alpha	Once/6 Years	August 2012	July 2015	Within MCLs
Radium 226 + 228	Once/6 Years	August 2012	July 2015	Within MCLs
Pecan B (S18)				
Nitrate/Nitrite	Once/Year	September 2014	September 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	July 2013	July 2022	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2013	April 2019	Within MCLs
Herbicides	Once/3 Years	March 2007		Within MCLs
Pesticides	Once/9 Years	March 2007		Within MCLs
Gross Alpha	Once/6 Years	June 2010	June 2016	Within MCLs
Radium 226 + 228	Once/6 Years	June 2010	June 2016	Within MCLs

TABLE 3-21 FUTURE DISTRIBUTION SYSTEM SAMPLING REQUIREMENTS

Sample Type	Frequency	Last Sample	Next Sample	Status
Coliform Bacteria	10/Month	January 2015	January 2015	Within MCLs
Disinfection Byproducts*	2 dual sample sets/Year	October 2014	October 2015	Within MCLs
Lead & Copper	1 set of 30 samples/3 Years	September 2014	September 2017	No Exceedance
Asbestos	1/9 Years	September 2009	September 2018	Within MCLs
* Two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually, Stage 2 Rule.				

Future sampling requirements are discussed further in CHAPTER 6 of this Plan. The City's 2015 and future WQMRs should be consulted regarding the dates for future testing.

3.3 SYSTEM DESCRIPTION AND ANALYSIS

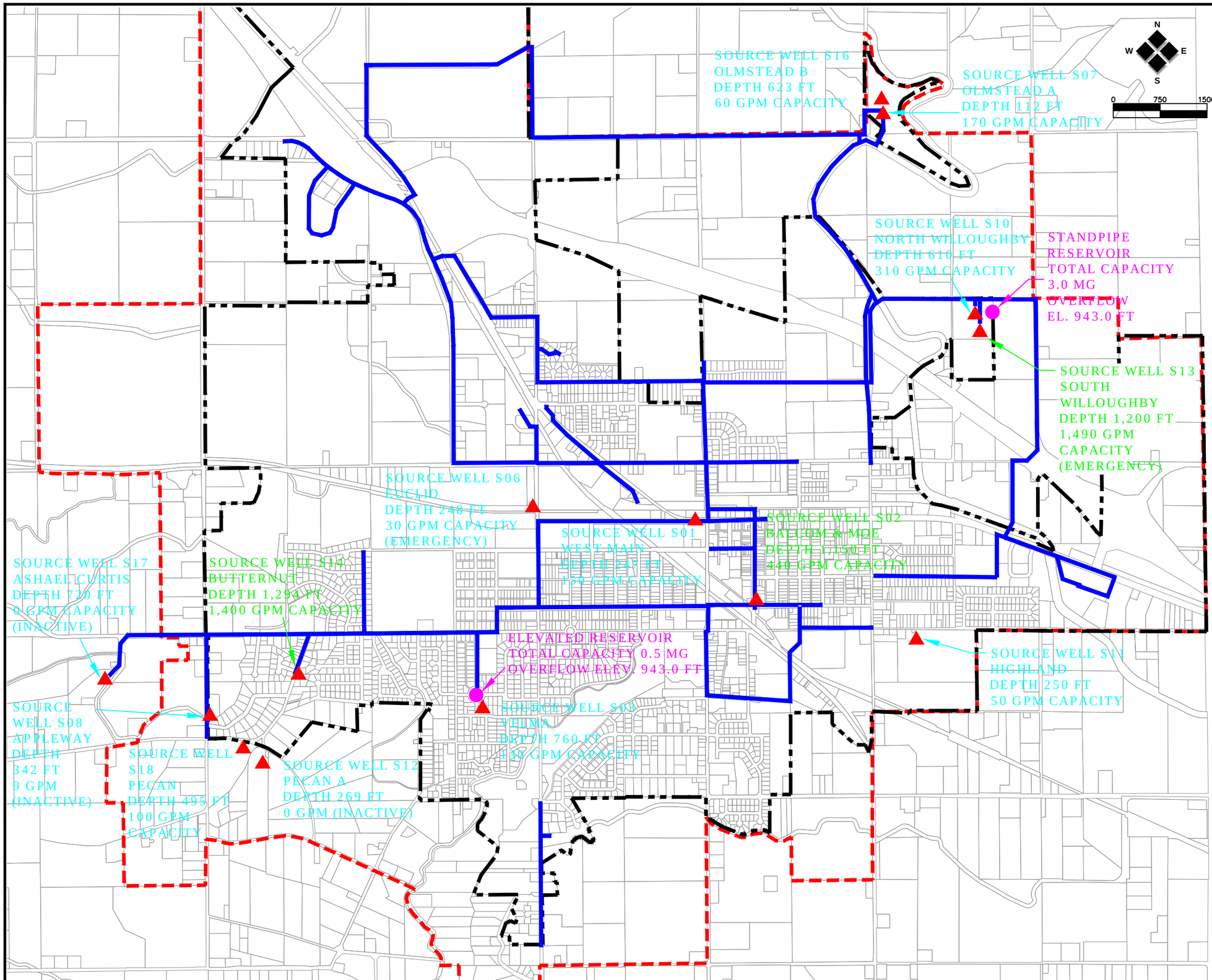
The existing City of Grandview domestic water system consists of one distribution pressure zone, as shown in Figure 3-1, which provides a minimum of 30 psi static service elevation, as required by Department of Health. Information on Grandview's pressure zone including the service elevations, and pressure range is also provided in Figure 3-1.

The City is supplied water from fourteen (14) primary source wells, three of which are no longer in service. The maximum pumping capacity of the 11 active primary wells is 4,330 gallons per minute (GPM) or 6.24 million gallons per day (MGD), which includes two emergency sources. Water rights allow source capacity to increase to 6,955 GPM or 10.02 MGD. Further discussion on the City's existing water rights is provided in CHAPTER 4 of this Plan.

Grandview's water storage is provided by a 3.017 million gallon (MG) standpipe reservoir and a 0.544 MG elevated reservoir, totaling 3.561 MG. During normal operation, static pressures throughout the existing water distribution system range from a low of 30 psi to a high of 85 psi, based upon the reservoir overflow elevations and well telemetry controls. Future water services within locations of static pressures above 87 psi should consider use of individual pressure reducing valves (PRV's). The City will advise developers and property owners within these areas that high pressures are likely and will recommend the use of PRV's at each lot per the Uniform Plumbing Code Chapter 608. The property owner is responsible for ownership, operations, maintenance, installation, and testing of the PRV's. PRV's will be installed by the property owner on the customer side of the water meter, inside the customer property lines. The devices shall be installed and tested per manufacturer's recommendations.

The entire water system is controlled by a comprehensive PLC (Programmable Logic Controller) based telemetry system. PLC telemetry units are located at most system wells and both reservoirs, and are linked via radio communication. The telemetry system's master control station is located at the City's Public Works Shop.

Grandview's water transmission and distribution system is comprised of over 261,000 lineal feet of pipe, ranging in diameter from under 2-inch to 16-inch. The system is looped where possible, and a majority of the material is 6-inch or larger ductile iron, cast iron pipe, and PVC pipe. The layout of Grandview's water distribution system, including pipe sizes and valve, hydrant, reservoir, and well locations is shown in Figure 3-1. The maximum water service elevation of the system is also indicated in Figure 3-1. An enlarged map (Map A) of the water system is included in CHAPTER 10 of this Plan. Figure 3-2 Water System Major Components Map, provides a schematic depicting the interrelationship between the major water system components.



CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM MAJOR COMPONENTS MAP

LEGEND

- CITY LIMITS
- FUTURE SERVICE AREA
- WATER MAINS (10" AND LARGER)
- STORAGE RESERVOIR
- GROUNDWATER WELL
- SADDLE MOUNTAIN BASALT AQUIFER
- WANAPUM BASALT AQUIFER

CITY OF GRANDVIEW

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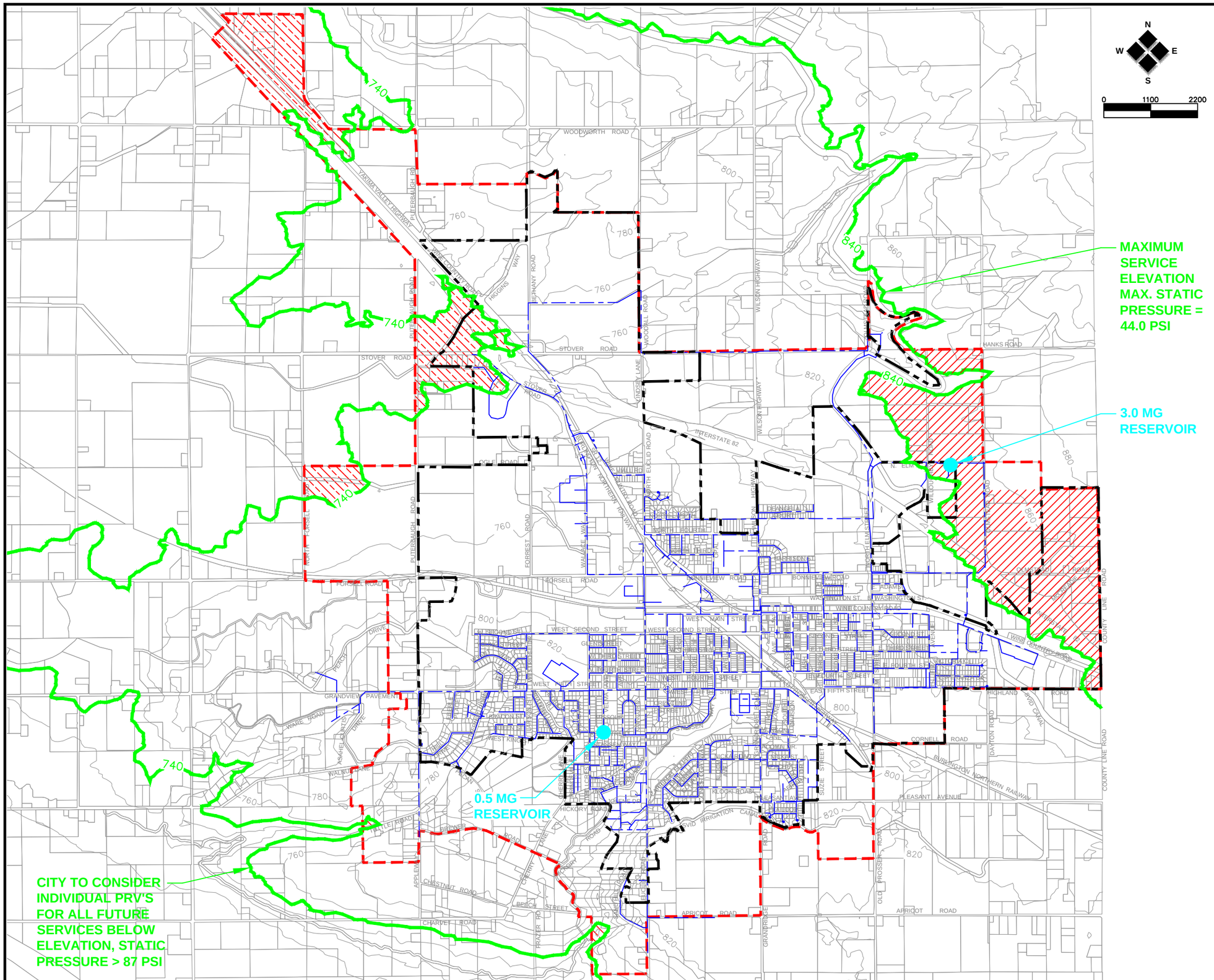
FIGURE 3-2

CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM SERVICE AREA/ELEVATIONS MAP



LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- 800 — SERVICE ELEVATION CONTOUR
- WATER MAINS
- RESERVOIR
- 800 — YAKIMA COUNTY 20' CONTOURS
- SERVICE AREA ABOVE ELEVATION 840 FT.
- SERVICE AREA BELOW ELEVATION 740 FT.

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FIGURE 3-1

3.3.1 Water Sources

The City of Grandview has fourteen (14) source wells, all located on City-owned properties within a single service pressure zone, as shown in Figure 3-1 and Map A, enclosed in the back of this Plan. The following are descriptions of the City's wells and pump installations.

Source No. S01 (West Main Well, previously known as the Old Shop Well): This well is located at the northwest corner of the intersection of Wine Country Road and Wilson Highway as shown on Map A. Drilled in 1977 to a depth of 247 feet, the well has a 10-inch casing from the surface to a depth of 212 feet, and an 8-inch casing from 212 feet to 247 feet. The well is equipped with a Franklin 50 hp, 3-phase, 460 volt submersible pump installed in 2007. The well's initial capacity was 290 GPM, but its current production is 150 GPM. A 2-inch air release valve, 4-inch check valve, 4-inch butterfly valve, and 4-inch Badger Recordall II flow meter are installed on the discharge piping.

The well is housed in a 14-foot by 14-foot plywood and sheet metal pumphouse which was constructed in 2001. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses an Advance 200 Series gas chlorinator (Model No. VR6020) for disinfection, a Wallace Tiernan AcuTec 35 gas detection system, and a Scaletron digital scale for measuring chlorine usage. The well is equipped with an Onan 1800 rpm auxiliary diesel generator (Model No. DGDB3375673) for emergency well operation.

Source No. S02 (Balcom & Moe Well): This well is located at 311½ Division Street, immediately north of the City library, as shown on Map A. Drilled in 1944 to a depth of 1,154 feet and reconditioned in 2006, the well has a 12-inch casing from the surface to a depth of 253 feet. The well is equipped with an ITT Goulds 5-stage submersible turbine pump, Model 8RJHC, with a Franklin Electric submersible 100 hp, 3-phase, 460 volt, 3525 rpm motor, installed in 2006. The well's initial capacity was 690 GPM, but its current production is 440 GPM. A 2-inch air release valve and 8-inch butterfly valve are installed on the discharge piping as well as a 12-inch Ex 80 Series Insertion Electromagnetic flow meter.

The well is housed in a 17-foot by 22-foot concrete block pumphouse. Due to the presence of hydrogen sulfide gas in the well water, the well pump discharges through 12-inch piping to a 14-foot by 12-foot aeration building which cascades the water over a series of concrete steps. The water then travels to a wet well under the pump room from which it is pumped by a vertical turbine booster pump equipped with a 30 hp, three phase, 460 volt, 1,800 rpm US Motor. The booster pump discharge piping is equipped with a 2-inch air release valve, 8-inch gate valve, 8-inch check valve, and an 8-inch Ex 80 Series Insertion Electromagnetic flow meter. A Wallace Tiernan S10K gas chlorinator for disinfection, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system are located within the same room as the booster pump and electrical equipment.

Source No. S03 (Velma Well): This well is located at 1206 Velma Avenue, immediately east of the City's 500,000 gallon elevated storage reservoir at Velma Avenue and King Street, as shown on Map A. Originally drilled in 1948 to a depth 1,362 feet, the well was rehabilitated in 2005 and reduced to a depth of 760 feet. The well has a 10-inch casing from the surface to a depth of 308 feet, and an 8-inch casing from 308 feet to 760 feet, equipped with a screen and filter pack. The well is equipped with an ITT Goulds lineshaft 13-stage pump, Model 7CHC, powered by a 30 hp, 3-phase, 460 volt, 1750 rpm U.S. Motor, Model BF39. The well's initial and current capacity is 130 GPM. A 2-inch air release valve and a 4-inch gate valve are installed on the discharge piping as well as a 4-inch Ex 80 Series Insertion Electromagnetic flow meter.

The well is housed in a 15-foot by 22-foot concrete block pumphouse with a sheet metal roof. Within the pumphouse is a separate 5-foot by 6-foot chlorine room which houses a Capital Control Advance 200 series gas chlorinator for disinfection, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system. A sand trap tank (size unknown) is located on the south side of the pumphouse. Associated with the sand trap tank are three 2-inch gate valves assembled in a manifold which connects to a 2-inch blow-out flush line with a 2-inch ball valve.

Source No. S06 (Euclid Well, previously known as Safeway Well): This well is located at 200 Euclid Road, on the west side of Euclid Road just north of the Union Pacific Railroad tracks (600 feet south of Bonnieview Road), as shown on Map A. Drilled in 1962 to a depth of 248 feet, the well has an 8-inch casing from the surface to a depth of 52 feet. The well is equipped with a submersible 30 hp, three phase, 440 volt, 3,450 rpm pump. The well's initial and current capacity is 30 GPM. There are two 4-inch

gate valves on the well's 4-inch discharge piping, and a 2-inch Hersey flow meter is located outside the east side of the well vault.

The well is housed in a 7-foot by 7-foot concrete block vault with a metal roof. There is no disinfection system associated with this well. This source is considered to be an emergency source well.

Source No. S07 (Olmstead A Well, previously known as Springs Well): This well is located at 580 Olmstead Road, at the intersection of Stover Road and Olmstead Road along the Sunnyside Canal, as shown on Map A. Originally drilled in 1963 to a depth of 112 feet, the well has a 12-inch casing from the surface to a depth of 36 feet. The well is equipped with an ITT Goulds 2-stage submersible 20 hp, 460 volt pump (Model No. 7WAHC) with a design capacity of 245 GPM at 225 feet TDH. The pump was installed in 2004, and has a current capacity is 170 GPM. A 2-inch air release valve, two 4-inch butterfly valves, and a 6-inch gate valve are installed on the discharge piping as well as a 6-inch McCrometer flow meter. Water pumped from this well is blended with Source Well No. 16 to reduce nitrate levels below the maximum contaminant level.

The well is housed in a 15-foot by 21-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 7-foot by 10-foot chlorine room which houses a Wallace Tiernan S10K chlorinator and a Wallace Tiernan AcuTec 35 gas detection system. This well shares the building with Source Well No. 16.

Source No. S08 (Appleway Well, previously known as Cohu Well): This well is located at 801 Appleway, along the east side of Appleway approximately 150 feet north of Hill Drive, as shown on Map A. Drilled in 1999 to a depth of 342 feet, the well has a 12-inch casing from the surface to a depth of 134 feet, and an 8-inch casing from 134 feet to 342 feet. The well was equipped with a Goulds model 5CLC 8-stage, 4-inch diameter pump, powered by a Franklin 15 hp, three phase, 460 volt, 3,450 rpm submersible motor (Model 2366139020). Due to biological build-up and subsequent pump failures, the pump has been removed from service and the well is inactive. The well's initial capacity was 93 GPM. A 1-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch McCrometer flow meter.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Capital Control Advance 200 series chlorinator for disinfection, and a Wallace Tiernan AcuTec 35 gas detection system.

Source No. S10 (North Willoughby Well): This well is located east of the North Elm Street and Willoughby Road intersection, adjacent to the City's 3.0 MG storage reservoir, as shown on Map A. Drilled in 1978 to a depth of 610 feet, the well has a 12-inch casing from the surface to a depth of 155 feet, and an 8-inch casing from 155 feet to 610 feet. The well is equipped with a Peabody Floway 10 DKM 9-stage deepwell turbine with a 60 hp, three phase, 460 volt, 1,800 rpm motor. The pump was installed in 1978 and the well's initial capacity was 525 GPM. The pump was reconditioned in 1992, and the well's current capacity is 310 GPM. A 1-inch air release valve, 6-inch check valve, and 6-inch butterfly valve are installed on the discharge piping as well as a McCrometer flow meter.

The well is housed in a 13-foot by 21-foot concrete block, plywood, and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 6-foot chlorine room which houses a Capital Control Advance 200 series gas chlorinator for disinfection, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with a Hercules auxiliary gas engine drive unit for emergency operation.

Source No. S11 (Highland Well): This well is located at 620 Highland Road, along the south side of Highland Road approximately 700 feet east of Elm Avenue, as shown on Map A. Drilled in 1999 (to replace an earlier "Highland" Well) to a depth of 250 feet, the well has a 16-inch casing from the surface to a depth of 165 feet, a 12-inch casing from the surface to a depth of 184 feet, and a 10-inch casing from 184 feet to 250 feet. The well is equipped with an ITT Goulds 7-stage, 4-inch diameter pump, Model 5CLC, powered by a 15 hp, 3-phase, 460 volt, 3,450 rpm Franklin submersible motor, Model 2366139020. The well's initial capacity was 107 GPM, and the well's current capacity is 50 GPM. A 1-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch Water Specialities flow meter.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K chlorinator for

disinfection, a Scaletron digital scale for measuring chlorine usage, and a Capital Control Advance gas detector, model No. 1610.

Source No. S12 (Pecan A Well): This well is located on the south side of Pecan Road about 180 feet southeast of Butternut Road, as shown on Map A. Pecan A Well was originally drilled in 1976, and reconditioned and deepened in 1999. Drilled to a depth of 269 feet, the well has a 12-inch casing from the surface to a depth of 102 feet. The well is equipped with an ITT Goulds 10-stage, 4-inch diameter pump, Model 5CLC, powered by a 20 hp, 3-phase, 460 volt, 3450 rpm Franklin submersible motor, Model 2366149020. This well is currently inactive.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse that it shares with Source No. S18. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron scale, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with a backup generator for emergency operation.

Source No. S13 (South Willoughby Well): This well is located at 601 N. Willoughby Road, along the east side of North Willoughby Road approximately 350 feet south of Well S10, as shown on Map A. Originally drilled in 1982 to a depth of 954 feet, the well was drilled deeper in 2007 to a depth of 1,200 feet. The well has a 16-inch casing from the surface to a depth of 683 feet and a 12-inch casing from 676 feet to a depth of 1,200 feet. The well is equipped with an ITT Goulds 6-stage, submersible pump, Model 14RJMC, with a design capacity of 1,770 GPM at 465 feet TDH, powered by a 250 hp, 3-phase, 460 volt, 1,730 rpm Hitachi motor, Model G2775501H. The well's initial capacity was 1,980 GPM, but current capacity is 1,490 GPM. A 2-inch air release valve, 2-inch check valve, and a 2-inch butterfly valve are installed on the discharge piping as well as a 4-inch Ex 80 Series Insertion Electromagnetic flow meter.

The well is housed in a 38-foot 4-inch by 21-foot 7-inch concrete block and sheet metal pumphouse. Within the pumphouse is a separate 19-foot 4-inch by 10-foot chlorine room which houses a Wallace Tiernan chlorinator, a Scaletron digital scale, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with an Onan 1800 rpm auxiliary diesel generator for emergency operation.

Source No. S14 (Butternut Well): This well is located at 605 Butternut Road, at the east end of Butternut Road and Briar Court, as shown on Map A. Drilled in 1991 to a depth of 1,294 feet, the well has a 16-inch casing from the surface to a depth of 739 feet. The well is equipped with a Peerless 14 MC, 4-stage deepwell turbine with a 200 hp, 3-phase, 460 volt, 1,800 rpm U.S. Motor. The pump was installed in 1991 and has a current capacity of 1,400 GPM.

Due to hydrogen sulfide gas being present in the well water, aeration treatment is performed. Water from the well is conveyed to the aeration room through a 12-inch ductile iron pipe equipped with a butterfly valve. Aeration is performed by cascading the water through a series of trays with ¼-inch diameter holes. Air is circulated across the trays and is exhausted through a roof fan. Following aeration, water flows into a wet well where it is chlorinated and then boosted into the City's distribution system. Two booster pumps are utilized for this task. The lead booster pump is a Peerless 14 MC, 3-stage deepwell turbine pump with a 125 hp, 3-phase, 460 volt, 1,800 rpm U.S. Motor, with a design capacity of 1,500 GPM at 180 feet TDH. Since installation in 1991, this lead booster pump has produced 1,650 GPM. The lead booster pump discharge piping includes a 6-inch deepwell pump control valve, an air release valve, a 12-inch check valve, and a 12-inch butterfly valve. The lag booster pump is operated by float switches in the wet well and is used to maintain a water level range. The lag pump is a Peerless 10 MA, 5-stage deepwell turbine pump equipped with a 30 hp, 3-phase, 400 volt, 1,785 rpm U.S. Motor with a current capacity of 515 GPM. The lag booster pump 6-inch discharge piping includes an air release valve, a 6-inch check valve, and a 6-inch gate valve. Discharge piping from the two pumps combines to a single 12-inch discharge pipe which includes a 12-inch McCrometer flow meter.

The well is housed in a 52½-foot by 43¾-foot concrete block and plywood building which includes a 10-foot by 20½-foot chlorine room, a 10-foot by 20½-foot electrical control panel room, an aeration room, a storage room, and an aeration fan room. Within the chlorine room is a Wallace Tiernan V-100 rotometer tube operated by dual Wallace Tiernan S10K gas chlorinators equipped with an automatic swithover, dual Scaletron scales, and a Chlor Alarm gas detection system.

Source No. S16 (Olmstead B Well): This well is located at 380 Olmstead Road, at the intersection of Stover Road and Olmstead Road along the Sunnyside Canal, as shown on Map A. Drilled in 2004 to a

depth of 623 feet, the well has a 16-inch casing from the surface to a depth of 230 feet, and a 12-inch casing from 219 feet to 623 feet. The well is equipped with an ITT Goulds 5-stage submersible 20 hp, 460 volt pump (Model No. 7RAHC) with a design capacity of 80 GPM at 510 feet TDH. The well's current capacity is 60 GPM. A ½-inch air release valve, 3-inch gate valve, and 2-inch flow control valve are installed on the discharge piping as well as a 3-inch Ex 80 Series Insertion Electromagnetic flow meter. Water pumped from this well is blended with Source Well No. 7 to reduce nitrate levels below the maximum contaminant level.

The well is housed in a 15-foot by 21-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 10-foot by 7-foot chlorine room which houses a Wallace Tiernan S10K chlorinator and a Wallace Tiernan AcuTec 35 gas detection system. This well shares the building with Source Well No. 7.

Source No. S17 (Ashael Curtis Well): This well is located on the east side of Ashael Curtis Road, approximately 100 feet south of Ware Road, as shown on Map A. Drilled in 2004 to a depth of 720 feet, the well has a 16-inch casing from the surface to a depth of 340 feet, and a 12-inch casing from 323 feet to 720 feet. The well is equipped with an ITT Goulds 11-stage submersible 40 hp, 460 volt pump (Model No. 6CLC) with a design capacity of 180 GPM at 610 feet TDH. The well's initial capacity was 180 GPM, but now it is inactive. A 1-inch air release valve, a 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch McCrometer flow meter.

The well is housed in a 10-foot by 23-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 6-foot by 9-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system.

Source No. S18 (Pecan B Well): This well is located on the south side of Pecan Road about 180 feet southeast of Butternut Road, as shown on Map A. Drilled in 2006 to a depth of 495 feet, the well has a 12-inch casing from the surface to a depth of 304 feet, a 10-inch casing from 270 feet to a depth of 495 feet. The well is equipped with an ITT Goulds 4-stage submersible turbine pump, Model 7WAHC, powered by a 40 hp, 3-phase, 460 volt, 3,525 rpm Franklin submersible motor. The well's initial capacity was 180 GPM, but the current capacity is 100 GPM. A 2-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch Water Specialities flow meter. The well is equipped with an Onan 1,800 rpm auxiliary diesel generator for emergency well operation.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse that it shares with Source No. S12. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron scale, and a Wallace Tiernan AcuTec 35 gas detection system.

A summary of Grandview's source wells, including well depth, current static water levels, and capacity is provided in Table 3-22 below.

TABLE 3-22 GRANDVIEW SOURCE WELL INFORMATION SUMMARY

	West Main	Balcom & Moe	Velma	Euclid (Emrgncy Source)	Olmstead A	Apple-way*	North Willoughby	Highland	Pecan A*	South Willoughby (Emrgncy Source)	Butternut	Olmstead B	Ashael Curtis*	Pecan B
Source Number	S01	S02	S03	S06	S07	S08	S10	S11	S12	S13	S14	S16	S17	S18
Date Drilled	1977	1944	2005	1962	1963	1999	1978	1999	1999	2007	1991	2004	2004	2006
Depth	247	1,154	760	248	110	342	610	250	269	1,200	1,294	623	720	496
Casing Depth (ft.)	247	253	760	52	36	342	610	250	102	1,200	739	623	720	496
Static Water Level (ft.)	88	121	119	164	7	82	28	41	83	269	116	76	77	71
Current Capacity (GPM)	150	440	130	30	170	0	310	50	0	1,490	1,400	60	0	100

* Currently inactive.

3.3.2 Water Treatment

Grandview provides no treatment of its water supply sources other than chlorination disinfection, with the exception of Balcom & Moe (S02) and Butternut (S14). Due to the presence of methane and hydrogen sulfide gas, water from these two sources is pumped through aeration treatment facilities located at each of these two wells prior to pumping into the City's distribution system. Information on each of the aeration systems is included along with descriptions of each well.

Until 2007, water from South Willoughby (S13) was also aerated due to the presence of hydrogen sulfide gas. In 2007, the South Willoughby well was drilled deeper and the pumphouse rebuilt, eliminating the aeration facilities. However, discharge piping was configured in a manner to allow for future aeration if necessary. Methane gas has been discovered in the well since being drilled deeper. Currently, methane gas is released to the atmosphere as discharge piping is plumbed directly to the standpipe reservoir.

3.3.3 Storage Facilities

The City's water storage facilities consist of two painted steel reservoirs with a total storage capacity of 3.561 million gallons (MG). The operational storage volume is 0.251 MG due to service pressure requirements and pump shutoff controls being set below reservoir overflow levels. Water is pumped from all wells directly into the water system pipe network (with the exception of Source S10 and Source S13), supplying the two reservoirs. The overflow elevation of both reservoirs is 941.6 feet above sea level. Capacity of the two reservoirs above the 30 psi static pressure level is 774,000 gallons and 2,080,000 gallons above the 20 psi static pressure level.

The City's 3.017 MG steel standpipe reservoir is located east of the North Elm Street and Willoughby Road intersection. The reservoir is 77 feet in diameter and 88 feet in height, and is equipped with access manholes at the base, an access hatch at the top, a screen vent cap at the top, an overflow pipe which discharges to the ground surface, and a 16-inch inlet/outlet pipe.

The reservoir interior was sandblasted and repainted with TNEMEC Epoxy System 20-1 in May 1989. Modifications to the exterior ladder landing at the top of the standpipe were included during the interior painting contract, as was the addition of hand railing to the roof vent. The exterior was painted in 1995, and a City logo placed on the south side.

The City's 0.544 MG elevated storage reservoir was constructed in 1950 and is located at the intersection of Velma Avenue and King Street. The elevated reservoir is 51 feet in diameter and 109 feet to the top with the inlet/outlet pipe extending from the center column. The steel storage tank is 37 feet in height with the bottom elevation 906 feet above sea level. The reservoir is equipped with an access hatch and screened vent cap at the top.

The 0.544 MG elevated storage reservoir was rehabilitated in 2007. The rehabilitation work included epoxy coating of the reservoir interior and exterior, replacement of the reservoir roof framing, replacement of the exterior overflow (piped to within ten feet of the ground where it discharges onto a splash plate), and installation of SAF-T safety equipment to the reservoir's exterior and interior ladders.

Table 3-23 provides a summary of the City's reservoir characteristics.

TABLE 3-23 GRANDVIEW RESERVOIR INFORMATION		
	3.0 MG Reservoir	0.5 MG Reservoir
Type	Standpipe	Elevated Tank
Material	Steel	Steel
Date Constructed	1977	1950
Tank Height	88 feet	37 feet
Diameter	77 feet	51 feet
Base Elevation above mean sea level (msl)	855.0 feet	834.0 feet
Floor Elevation (above msl)	855.0 feet	906.0 feet
Overflow Elevation (above msl)	941.6 feet	941.6 feet
Total Storage Capacity	3,017,000 gallons	544,000 gallons
Storage Capacity Above 30 psi	731,500 gallons	320,900 gallons
Storage Capacity Above 20 psi	1,536,200 gallons	544,000 gallons

See Figure 3-3 Reservoir Storage Levels, for a schematic representation of reservoir storage level elevations for the year 2015 and those anticipated for 2035.

3.3.4 Telemetry Control System

The City of Grandview's water system includes a SCADA (Supervisory Control and Data Acquisition) System for controlling and monitoring portions of the water production and distribution system. The SCADA system utilizes Allen Bradley Micrologix 1200 PLCs at both reservoir sites and at several well sites. The Master PLC, located at City Shop, is an Allen Bradley SLC 5/05 PLC. Sites having telemetry include:

0.5 MG Elevated Tank Reservoir
3.0 MG Standpipe Reservoir
Source S03 Velma
Source S07 Olmstead A
Source S10 North Willoughby
Source S13 South Willoughby
Source S14 Butternut
Source S16 Olmstead B
Source S17 Ashael Curtis
Source S18 Pecan B

The PLC at each of these remote sites communicates as a DFI half-duplex stage using Freewave FGR 115 900MHz unlicensed spread spectrum radios to the Master PLC at the City Shop. The master PLC connects via an Ethernet LAN to a Dell workstation computer (the HMI computer) running Wonderware Intouch version 2014 R2 HMI software. The Wonderware application provides a graphical interface for the SCADA system that allows operators to monitor the system operation and change operational parameters such as start/stop setpoints. WIN-911 version 7.16 is also installed on the Dell workstation computer and is intended to be used as a software alarm dialer. Operators can use a laptop computer to remotely access the HMI computer over a secure SSH connection to monitor the SCADA system during non-business hours.

The HMI computer utilizes Wonderware's DAS ABTCP Driver as the IO server for the HMI computer to communicate with the Master PLC. Data points requested by the Wonderware Intouch HMI application are retrieved by the DAS ABTCP Driver from the Master PLC and provided to the Intouch

application. Setpoints entered by system operators at the HMI are communicated by the DAS ABTCP server to the Master PLC.

The Master PLC makes control decisions such as starting and stopping pumps based on reservoir levels and the operator adjustable setpoints.

The City of Grandview's existing SCADA system is capable of being expanded to include additional well and/or reservoir sites. The HMI computer and software were replaced in the Spring of 2015.

The current telemetry control settings for low and high level alarms and for operating the various well pumps, based on water levels in both reservoirs, is shown on Table 3-24.

TABLE 3-24 EXISTING TELEMETRY CONTROL SETTINGS BASED ON RESERVOIR LEVELS

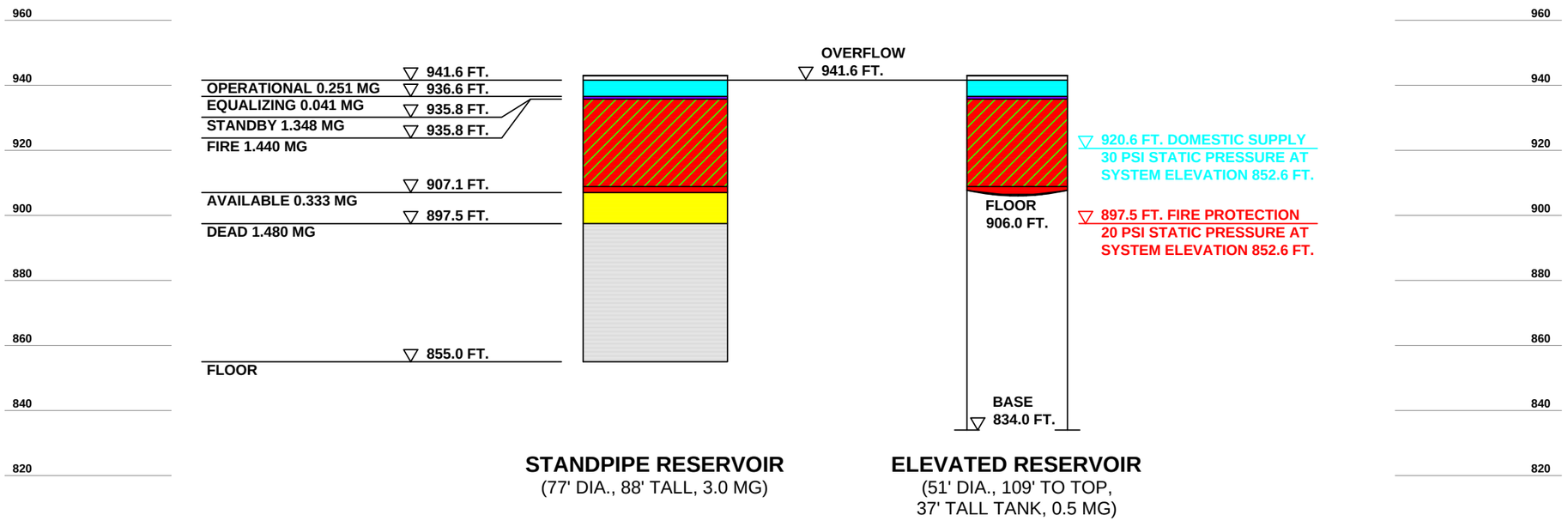
Source Well	Pump On	Pump Off	Control Reservoir
S03 Velma	74 feet	80 feet	3.0 MG
S07 Olmstead A	75 feet	80 feet	3.0 MG
S13 South Willoughby	75 feet	81 feet	3.0 MG
S14 Butternut	92.5 feet	106 feet	0.5 MG
S16 Olmstead B	75 feet	80 feet	3.0 MG
S17 Ashael Curtis	75 feet	81 feet	3.0 MG
S18 Pecan B	76 feet	81 feet	3.0 MG
Reservoir	Low Level Alarm	High Level Alarm	-
0.544 MG Elevated Tank	87.3 feet	105.6 feet	-
3.017 MG Standpipe	50.0 feet	87.9 feet	-

CITY OF GRANDVIEW

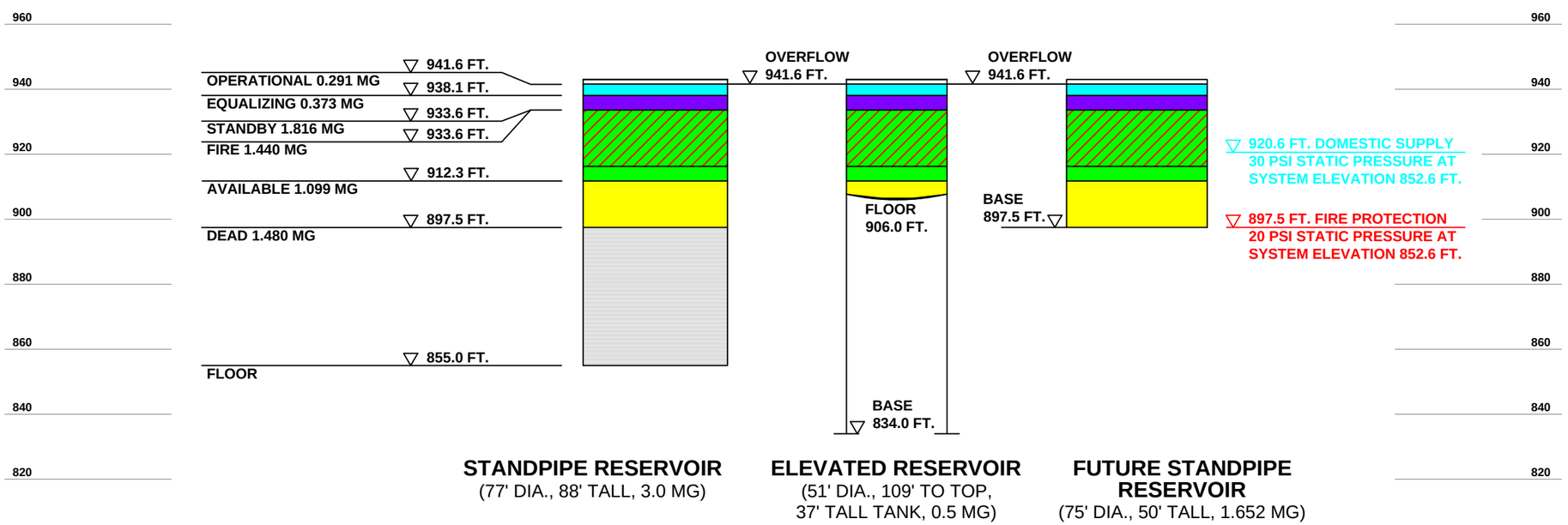
Water System Plan Update

RESERVOIR STORAGE LEVELS

YEAR 2015 STORAGE LEVELS



YEAR 2035 STORAGE LEVELS



LEGEND

- OPERATIONAL STORAGE
- EQUALIZING STORAGE
- STANDBY STORAGE
- STANDBY STORAGE (NESTED WITHIN FIRE SUPPRESSION STORAGE)
- FIRE SUPPRESSION STORAGE
- FIRE SUPPRESSION STORAGE (NESTED WITHIN STANDBY STORAGE)
- AVAILABLE STORAGE
- DEAD STORAGE

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FIGURE 3-3

3.3.5 Transmission and Distribution Systems

The City's existing transmission and distribution system along with water main sizes, valve, and fire hydrant locations are shown on Figure 3-1 and Map A, enclosed in the back pocket of this Plan. Most line sizes within the system are six-inches in diameter or larger. The majority of the City's water mains are constructed of either ductile iron, cast iron pipes, or PVC, and most are looped. An inventory of the total length of Grandview's water distribution system piping, including the length and percentage of each diameter of pipe is presented below in Table 3-25.

TABLE 3-25 WATER DISTRIBUTION SYSTEM PIPE SIZE SUMMARY

Pipe Diameter (inches)	Length (feet)	Percent of Total
< 2	2,125	0.81%
2	7,521	2.88%
3	557	0.21%
4	8,426	3.23%
6	85,710	32.81%
8	60,536	23.17%
10	26,864	10.28%
12	44,186	16.92%
14	4,227	1.62%
16	21,071	8.07%
TOTAL	261,223	100.0%

3.4 STORAGE ANALYSIS

Reservoir facilities are necessary in a water utility's system in order to provide required storage in three critical areas:

1. Standby Storage: Adequate water reserves need to be maintained to meet the system's average daily demand in the event the largest water supply source is out of service. Standby storage may be "nested" within the fire suppression storage volume.

2. Fire Suppression Storage: Adequate water reserves need to be maintained to meet the system's highest fire flow requirement with no assistance from existing water supply sources and at a minimum pressure of 20 psi throughout the distribution system. Fire suppression storage may be "nested" within the standby storage volume.

3. Equalizing Storage: Adequate water reserves need to be maintained to meet that portion of the system's maximum instantaneous demand (peak hour), which exceeds the existing water supply source capacity. Equalizing storage must be available to all service connections at a minimum pressure of 30 psi.

Storage facilities also provide a volume of water for supply to the system between source pumping operations. This "operational" volume is established by each utility and is generally based on limiting, as much as practical, the number of pump cycles per hour.

3.4.1 System Storage Analysis

Operational Storage: The Department of Health (DOH) defines operational storage as the volume of distribution storage associated with source or booster pump normal cycling times under normal operating conditions and is additive to the equalizing and standby storage components, and to fire flow storage if this storage component exists for any given tank. Currently, the City of Grandview operates its lead source within the upper 5 feet of the water level in the reservoirs. This corresponds to a volume of approximately 250,600 gallons, or 37 gallons per ERU (6,742 for year 2015) for normal operational storage. The operational storage volume required to avoid excessive pump cycling only needs to be

enough to limit the number of pump starts to six per hour. Under year 2015 MDD the source pumps would turn on only once every 98 minutes, and also once every 234 minutes during ADD. The same operational storage levels will be sufficient to meet 20-year MDD projections, while keeping source pump start cycles within an appropriate range of approximately 40 minutes.

Equalizing Storage: The Department of Health (DOH) defines equalizing storage as the volume of storage needed to supplement supply to consumers when the peak hourly demand exceeds the total source pumping capacity. The DOH design method for calculating equalizing storage is 150 times the difference between the system's peak hour demand (PHD) in GPM and the total source production rate in GPM. Based on this method, the current and future equalizing storage requirements for Grandview are as shown in Table 3-26.

TABLE 3-26 EXISTING AND FUTURE EQUALIZING STORAGE REQUIREMENTS

	Year 2015	Year 2021	Year 2025	Year 2035
Peak Hour Demand	4,600 GPM	5,533 GPM	5,873 GPM	6,816 GPM
- Total Source Capacity	- 4,330 GPM	- 4,330 GPM	- 4,330 GPM	- 4,330 GPM
Subtotal	270 GPM	1,203 GPM	1,543 GPM	2,486 GPM
DOH Multiplier	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM
Total Equalizing Storage Required	0.041 MG	0.180 MG	0.231 MG	0.373 MG

Standby Storage: The purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. The Department of Health (DOH) defines standby storage as the volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency.

For communities with multiple sources of supply such as the City of Grandview, the Department of Health's (DOH) 2009 *Water System Design Manual* recommends the volume of standby storage should be calculated based upon the following equation:

$$SBTMS = (2\ days)[(ADD)(N) - t_m (Q_s - Q_L)]$$ (*2009 Water System Design Manual*, Page 103)

Where:
SBTMS = Total standby storage component for a multiple source water system (gallons)
ADD = Average day demand for the design year (GPD/ERUs)
N = Number of equivalent residential users (ERUs)
Q_S = The sum of the source capacities continuously available to the water system (GPM)
Q_L = The largest capacity source available to the water system (GPM)
t_m = Time the remaining sources are pumped on the day when the largest source is not available (minutes). Unless restricted otherwise, assume 1,440 minutes

At no time, however, shall standby storage be less than 200 gallons times the number of equivalent residential users (*2009 Water System Design Manual*, Page 103).

When the above standby storage is applied to the existing and projected average day demand (ADD) and ERUs, the resulting standby storage requirements are as shown in Table 3-27.

TABLE 3-27 EXISTING AND FUTURE STANDBY STORAGE REQUIREMENTS				
	Year 2015	Year 2021	Year 2025	Year 2035
ADD x 2 Days Storage Subtotal	1.541 MGD x 2 Days 3.082 MG	1.853 MGD x 2 Days 3.706 MG	1.967 MGD x 2 Days 3.934 MG	2.283 MGD x 2 Days 4.566 MG
(Source Supply – Largest Source) x 1440 minutes Supply Subtotal	2,840 GPM* x 1440 min 4.090 MG	2,840 GPM* x 1440 min 4.090 MG	2,840 GPM* x 1440 min 4.090 MG	2,840 GPM* x 1440 min 4.090 MG
Total Standby Storage Required	less than 0	less than 0	less than 0	0.476 MG
Equivalent Residential Units (ERUs) x Min. 200 gal Storage Minimum	6,742 x 200 gal 1.348 MG	7,372 x 200 gal 1.474 MG	7,824 x 200 gal 1.565 MG	9,080 x 200 gal 1.816 MG
Minimum Required Standby Storage	1.348 MG	1.474 MG	1.565 MG	1.816 MG
* Existing total source pumping capacity minus South Willoughby Well (largest source).				

Fire Suppression Storage: The Department of Health (DOH) defines fire suppression storage as the volume of stored water available during fire suppression activities to satisfy minimum pressure requirements per WAC 246-290-230. A volume of storage for fire suppression has been established based on fire flow ratings of various structures within Grandview. The storage required is 1,440,000 gallons, which will allow a demand of 6,000 GPM for a 4-hour duration. The fire suppression demand was established by the Grandview Fire Department due to building type and size, and assumes the City will utilize generators if sources should lose power. A letter from the Grandview Fire Department approving this demand is located in CHAPTER 10 of this plan. The DOH minimum fire flow requirement for industrial areas is 1,000 GPM for 60 minutes. The volume of storage necessary to maintain a flow of 6,000 GPM for a 4-hour duration for fire protection is 1,440,000 gallons, which exceeds the DOH industrial requirement of 1,000 GPM for 60 minutes, or 60,000 total gallons (*WAC 246-293-640*) and will, therefore, be used for fire suppression storage planning purposes.

Total Storage: Table 3-28 summarizes the year 2015 and future storage requirements for the water system. The City's existing storage capacity is sufficient to meet current and projected storage requirements for years 2015, 2021, and 2025. However, the future total storage requirement for the year 2035 exceeds the current storage capacity above the required minimum service pressure 20 psi. It can be seen from Table 3-28 the storage capacity above the minimum required 20 psi is sufficient for the current year through year 2025, but is deficient for year 2035.

TABLE 3-28 EXISTING AND FUTURE TOTAL STORAGE REQUIREMENTS
(all storage values are in million gallons)

	Year 2015	Year 2021	Year 2025	Year 2035
Number of ERUs	6,742	7,372	7,824	9,080
Number of Connections	2,873	3,141	3,334	3,869
Operational Storage Requirements[a]	0.251	0.251	0.251	0.251
Equalizing Storage Requirements	0.041	0.180	0.231	0.373
Standby Storage Requirements[b]	1.348	1.474	1.565	1.816
Fire Suppression Storage Requirements[b]	1.440	1.440	1.440	1.440
Total Storage Required	1.732	1.905	2.047	2.440
Total Storage Capacity	3.561	3.561	3.561	3.561
Storage Capacity Above Minimum 30 psi Service				
Available	0.774	0.774	0.774	0.774
- Required	- 0.292	- 0.431	- 0.482	- 0.624
Excess (Deficit)	0.482	0.343	0.292	0.150
Storage Capacity Above Minimum 20 psi Service				
Available	2.080	2.080	2.080	2.080
- Required	- 1.732	- 1.905	- 2.047	- 2.440
Excess (Deficit)	0.348	0.175	0.033	(0.360)

[a] Future operational storage is based upon maintaining a 5-foot operating range.
[b] Fire suppression and standby storage are nested. The greater of the two is the controlling storage requirement.

Further evaluation of storage is recommended in the future to determine when/if additional volume is required.

3.5 FIRE FLOW

The demand fire flows place upon a water system is typically the most significant element when analyzing the piping network. Every water system which is required to have a Water System Plan must address fire flow. At a minimum, a water utility must comply with fire flow standards shown in Table 3-29, established by the Department of Health (DOH). A community may, however, develop its own standards as long as they exceed the DOH minimum requirements.

TABLE 3-29 DOH MINIMUM FIRE FLOW REQUIREMENTS

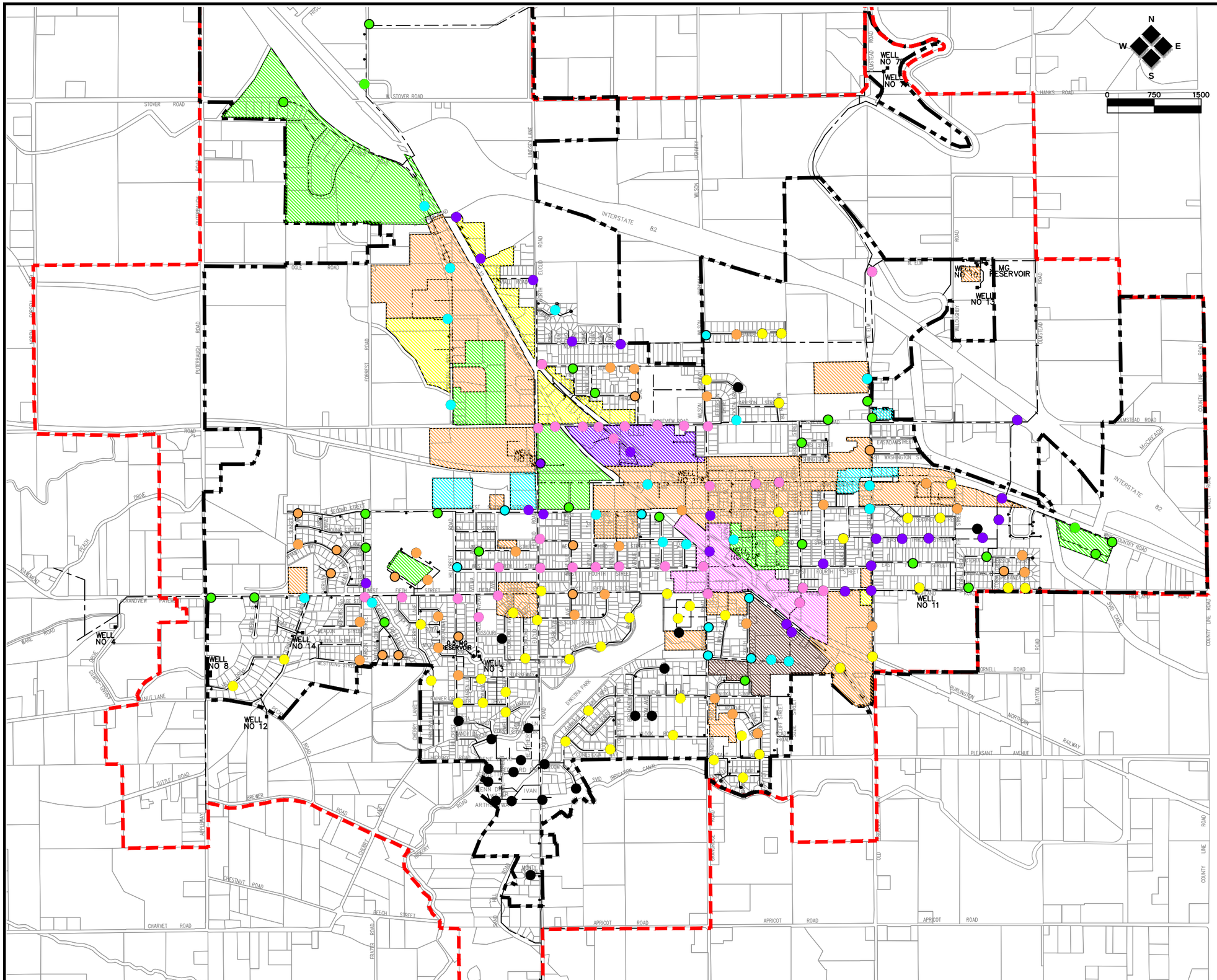
Land Use Type	Flow Requirement
Residential	500 GPM for 30 minutes
Commercial and Multi-Family	750 GPM for 60 minutes
Industrial	1,000 GPM for 60 minutes

Source: *WAC 246-293-640*

The City of Grandview has developed desired fire flows for major structures within the City based on the standards of the Washington Survey and Rating Bureau and the Insurance Services Office (ISO) peak fire flow guidelines. In addition, the Selah Fire Department analyzed fire flow requirements of select buildings based on the *2012 International Fire Code*. Results of the analysis have been used to generate desired fire flow capacities for areas within the City.

In Grandview, the greatest fire flow requirements are within industrial areas, with isolated large demands at locations such as the Kenyon Zero Storage Facility. Fire flow requirements were used to develop Figure 3-4, which shows the locations of required minimum fire flow and the actual calculated fire flow capacity at selected locations within those areas. The Grandview Fire Department has requested that all locations without a specified minimum fire flow range have a minimum fire flow capacity of 1,000 GPM.

A computer hydraulic analysis was used to determine the existing fire flow capacities at certain locations shown in Figure 3-4. The hydraulic analysis parameters are discussed later in Section 3.6. As can be seen in Figure 3-4, the greatest fire flow requirements are within the industrially and commercially-zoned areas and at public schools. It can be seen in Figure 3-4 that most all locations throughout the distribution system are able to provide the required minimum fire flow capacities. Recommended system improvements to correct any fire flow deficiencies are discussed further in CHAPTER 8.



CITY OF GRANDVIEW

Water System Plan Update

YEAR 2015 MAX DAY DEMAND FIRE FLOW CAPACITIES MAP

LEGEND

CITY LIMITS

FUTURE SERVICE AREA

FIRE FLOW RANGE	EXISTING CAPACITY	REQUIRED FLOW
≤ 500 GPM	⊗	
500-1000 GPM	●	MINIMUM 1000 GPM
1000-2000 GPM	●	
2000-3000 GPM	●	
3000-4000 GPM	●	
4000-5000 GPM	●	
5000-6000 GPM	●	
6000-7000 GPM	●	
≥ 7000 GPM	●	

CITY OF GRANDVIEW

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FIGURE 3-4

3.6 HYDRAULIC ANALYSIS

A hydraulic analysis of a water utility system is a method of calculating pressures and flows throughout the distribution network under various conditions of demand at a given instant. Since the advent of personal computers, hydraulic analyses are typically performed by utilizing computer programs which model the piping, reservoir, pumps and specialty valves of a given water system.

Numerous computer programs have been developed for performing network analyses. The program utilized for the modeling and analysis of the City of Grandview water system is called WaterCAD (Version 8i), distributed by Bentley Systems, Inc. WaterCAD can perform instantaneous and extended period simulations of complete distribution networks including reservoirs, source pumps, booster pumps, pressure reducing valves, pressure sustaining valves, check valves, flow control valves, pressure switches, and up to 1,000 pipes and 1,000 nodes (pipe junctions).

The program utilizes Genetic Algorithm calculations (Darwin modules) to solve the pressure networks. All water system components are entered into the computer, supply rates and user demands input, and reservoir water levels are established. Once this base information has been loaded, various options such as increasing system demand, lowering reservoir levels, shutting off source pumps, adding system improvements, and simulating fire flow conditions can be analyzed for their impact on the system.

3.6.1 Assumptions

In order to analyze the water system at a given moment in time, it is necessary to assume certain existing conditions and to program the status of key system components. The following general assumptions have been made for the hydraulic analysis of the City of Grandview water system:

- Roughness coefficients (C values) for most eight-inch or larger pipes were assumed to be 120. Pipes six-inch or smaller were assumed to have a C value equal to 110. Known old or poor condition pipes were assumed at C=100.
- Nominal pipe diameters were input for inside pipe diameters.
- Node elevations are based on available contour and topographic survey elevations.

Table 3-30 identifies the specific parameters used in the hydraulic analysis performed for existing and future peak hour demand (PHD) and for existing and future fire flow capacities at 20 psi residual pressure during maximum day demand (MDD) conditions. The PHD hydraulic analysis assumes that all primary source wells are operating and the equalizing storage volume has been depleted from all tanks. The fire flow analysis, during MDD, assumes that the starting elevation in all tanks is with equalizing and fire suppression storage depleted. The fire flow analysis also assumes that all source wells are operating.

Initial elevations for the hydraulic analysis are calculated from the current and future reservoir pump-off elevations to represent current and future maximum storage conditions. The operational storage range and volume can be operator-adjusted based upon current demand, but the elevations (volumes) used represent normal operating conditions. Lower or higher initial water elevations could affect the calculated results provided in this Plan.

TABLE 3-30 HYDRAULIC ANALYSIS PARAMETERS				
	Hydraulic Analysis Scenario			
Water System Feature	Year 2015 Fire Flow w/MDD [a] (2,556 GPM)	Year 2015 Peak Hour Demand [b] (4,600 GPM)	Year 2035 Fire Flow w/MDD [a] (3,786 GPM)	Year 2035 Peak Hour Demand [b] (6,816 GPM)
3.017 MG Reservoir Levels				
Maximum Elevation	941.6 Ft.	941.6 Ft.	941.6 Ft.	941.6 Ft.
Initial Elevation	912.0 Ft.	940.8 Ft.	905.2 Ft.	934.2 Ft.
Floor / Minimum Elevation	855.0 Ft.	855.0 Ft.	855.0 Ft.	855.0 Ft.
0.544 MG Reservoir Levels				
Maximum Elevation	941.6 Ft.	941.6 Ft.	941.6 Ft.	941.6 Ft.
Initial Elevation	912.0 Ft.	940.8 Ft.	Depleted	934.2 Ft.
Floor / Minimum Elevation	906.0 Ft.	906.0 Ft.	906.0 Ft.	906.0 Ft.
Source Well Status				
West Main (S01)	150 GPM	150 GPM	150 GPM	150 GPM
Balcom (S02)	440 GPM	440 GPM	440 GPM	440 GPM
Velma (S03)	130 GPM	130 GPM	130 GPM	130 GPM
Euclid (S06)	30 GPM	30 GPM	30 GPM	30 GPM
Olmstead A (S07)	170 GPM	170 GPM	170 GPM	170 GPM
Appleway (S08)	0 GPM	0 GPM	0 GPM	0 GPM
North Willoughby (S10)	310 GPM	310 GPM	310 GPM	310 GPM
Highland (S11)	50 GPM	50 GPM	50 GPM	50 GPM
Pecan A (S12)	0 GPM	0 GPM	0 GPM	0 GPM
South Willoughby (S13)	1,490 GPM	1,490 GPM	1,490 GPM	1,490 GPM
Butternut (S14)	1,400 GPM	1,400 GPM	1,400 GPM	1,400 GPM
Olmstead B (S16)	60 GPM	60 GPM	60 GPM	60 GPM
Ashael Curtis (S17)	0 GPM	0 GPM	0 GPM	0 GPM
Pecan B (S18)	100 GPM	100 GPM	100 GPM	100 GPM
Total Supply	4,330	4,330	4,330	4,330

[a] Equalizing and Fire Suppression Storage depleted.
[b] Equalizing Storage depleted.

3.6.2 Analysis Scenarios

The existing water system was first analyzed considering a present peak hour demand of 4,600 GPM, based on the total calculated peak hourly flow on October 1, 2008. All nodes providing domestic service within the system did so with a minimum residual pressure of 30 psi or greater with all source pumps in operation. Pipe velocities remained below the eight (8) feet per second (FPS) maximum velocity design parameter. A copy of the computer printouts of this scenario and all other hydraulic analyses results discussed in this section are provided in CHAPTER 10 of this Plan. Map B in the back of this Plan shows the computer model with the pipe and node numbers for identification.

A future PHD analysis was run on the system using the PHD for the year 2035 of 6,816 GPM. This scenario was conducted with the year 2035 equalizing storage volume depleted. All service pressures were greater than 30 psi and pipe velocities were below eight (8) FPS with all source pumps in operation.

Fire flows were considered at all hydrant locations throughout the pipe network while assuming year 2015 system consumptive demand of 2,556 GPM, based on the total calculated MDD on October 1, 2008. The computer hydraulic model was used to calculate the maximum flow attainable at designated hydrant nodes while providing a positive pressure of 20 psi. Equalizing and fire suppression storage were depleted at the start of the fire flow analysis. The resulting fire flow capacities are shown in Figure 3-4, along with the fire district requested fire flow capacities as previously discussed. Several locations were calculated to be deficient in meeting the specified fire flow capacities, as shown in Figure 3-4. A future fire flow analysis was performed on the system with the 2035 maximum day demands to verify adequate

fire flow capacity is available. Again, the same locations were calculated to be deficient in meeting the current fire flow requirements.

3.6.3 Model Calibration

The City of Grandview has performed fire flow tests at fire hydrants in several different areas of the City under normal operating conditions. These fire flow tests were compared to the computer model under an average day demand scenario with the initial reservoir levels listed in Table 3-30. Ideally, the pressure test results would be compared to a computer model under average day demand with reservoir levels set to the actual reservoir levels at the time of testing, but reservoir levels from the time of testing were not available. Pressures from fire hydrant nodes in the model were generally within five psi of the test pressure readings, verifying that actual system pressures are comparable to the calculated pressures of the computer model. Samples of fire flow test results are compared with fire flow model results shown in Table 3-31.

Available Fire flow was calculated using the measured pressures and flows from the field tests. Fire flow in GPM at 20 psi of residual pressure was calculated using the following equation (simplified Hazen Williams):

$$\text{Available Fire Flow @ 20 psi Residual} = \text{Total Fire Flow} \times \sqrt{\frac{\text{Static Pressure} - 20\text{ psi}}{\text{Static Pressure} - \text{Residual Pressure}}}$$

It is recommended that updated pressure and flow tests be conducted in the future by the City Fire Department at representative locations throughout the distribution system including noting reservoir levels, to more accurately calibrate future system models and provide updated system information for future fire insurance assessments.

TABLE 3-31 FIRE FLOW MODEL CALIBRATION RESULTS									
				Field Test Results			Model Results		
Flow Test No.	Test Year	Location	Node No.	Static Pressure (psi)	Residual Pressure (psi)	Fire Flow @ 20 psi (GPM)	Static Pressure (psi)	Residual Pressure (psi)	Fire Flow @ 20 psi (GPM)
1	2009	501 Stover Rd.	J-9	86	78	4,228	78.2	76.6	3,888
2	2011	2200 Hill Dr.	J-493	62	54	2,431	56.9	52.2	2,214
3	2011	509 Meadowlark Rd.	J-438	58	54	3,666	53.6	51.7	3,547
4	2011	Missouri & W. Concord	J-408	44	34	1,142	40.3	35.1	1,062
5	2010	Nicka & Broadview Dr.	J-308	65	48	1,554	60.5	55.9	1,526

[a] At 20 psi residual pressure.
Note: See Map B for Junction Node Locations.

3.7 SUMMARY OF SYSTEM DEFICIENCIES

The following is a listing and brief description of deficiencies which have been identified in the present water system. The deficiencies have been grouped within three system categories (supply, storage, and distribution) and are generally placed in order of their importance. The deficiencies may be operational in nature (which have been identified by the City's Water Department personnel) or maintenance related, inadequate present or future capacities, and/or system hydraulics problems.

3.7.1 Supply

Water Quality – Grandview currently adds chlorine for treatment of its groundwater sources. The water quality monthly analysis results for the years 2010 through 2014 were reviewed to determine exceedances of the Maximum Contaminant Level (MCL) for the primary and secondary drinking water standards. In general, the water quality is in compliance with State standards. As mentioned previously, all source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending allows wells with higher nitrate concentrations to combine with wells having lower nitrate concentrations to meet MCL standards. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and previously at Sources S10 North Willoughby and S13 South Willoughby. S13 South Willoughby is an emergency source, and has not been used since early 2012, so currently no blending occurs at this location. These source wells are plumbed with isolation valves to allow individual and blended testing. The City will continue blending these sources to maintain acceptable nitrate levels. No changes to the existing system are proposed at this time.

Water Rights – Currently, Grandview has annual rights (Q_a) of 4,640 acre-feet per year and instantaneous rights (Q_i) of 6,955 GPM. As discussed in CHAPTER 2 of this Plan, current water rights are adequate in providing for existing and projected year 2035 demands. Should population trends and demand projections change, the water rights may be exceeded by year 2035.

Industrial water consumption is still the highest among all user categories and projected future demands will need to be closely monitored by the City.

Source Well Capacity – Grandview's source wells have decreased in capacity since original construction and previous rehabilitation projects. If all source wells were to operate at original capacity, total production would equal 5,855 GPM. However, the current system source well capacity is 4,330 GPM. The year 2015 source capacity is adequate to meet current and anticipated average day and maximum day demands.

Source Well Reliability – The Department of Health's Water System Design Manual recommends on-site back-up power equipment be installed at the water system sources to improve system reliability. The City of Grandview currently has back-up power equipment at five of its existing source wells (S01, S10, S12, S13, and S18). The source wells with back-up power are capable of delivering 2,050 GPM, which equates to approximately 2.95 MGD in the event of a long term power outage. Back-up power needs for additional water system sources are not anticipated for the next 20 years.

Protective Covenants – Though the City owns all of its well sites, not all source wells have a "Declarations of Covenant" establishing the required 100-foot sanitary radius of protection around the well. Well sources still needing "Declarations of Covenants" established are: S02 (Balcom & Moe), S06 (Euclid), S10 (North Willoughby), S11 (Highland), S13 (South Willoughby), S14 (Butternut), and S18 (Pecan B). The City needs to execute and record "Declarations of Covenant" for each of the source wells.

3.7.2 Storage

Storage Capacity – The City's reservoir storage capacity sufficient for current demands, but inadequate to meet the 20-year projected demand. Based on projected growth, additional water storage capacity will be needed to meet year 2035 system demands and associated storage requirements. Other alternatives may be investigated at the City's request.

Reservoir Cleaning and Maintenance – Both City reservoirs should be inspected and cleaned, based on a five year maintenance cycle. The standpipe reservoir was last cleaned in 2008 and painted in 1990.

The elevated reservoir was last rehabilitated in 2007, including interior and exterior painting, new hatch, catwalk, and overflow modifications.

3.7.3 Distribution

Fire Flow Capacity – Figure 3-4 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, some locations are deficient based on the computer hydraulic model. Refer to Figure 8-1 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – Most of the fire flow deficiencies identified in Figure 3-4 can be addressed by upsizing water mains. Suggested Improvements for water main upsizing are shown in Figure 8-1.

3.7.4 Telemetry

Grandview's telemetry control system was installed in 2005 and is controlled by a master Programmable Logic Controller (PLC), which is located at the City's public works office. The Human Machine Interface (HMI) computer is the City's connection to the master PLC for making operational adjustments to the water system. A new HMI computer and SCADA software will be purchased and implemented in 2015 as discussed in CHAPTER 8.

3.8 SELECTION AND JUSTIFICATION OF PROPOSED IMPROVEMENT PROJECTS

The following discussion identifies recommended system improvements proposed to eliminate or reduce deficiencies described in the previous section. References to prioritized improvements specified in Section 8.2 and Section 8.3 of this Plan are provided. Further description of the water system improvements is provided in CHAPTER 8 of the Plan.

3.8.1 Supply

Source Well Capacity/Quality – Most of the source wells are operating at a lower capacity than when originally constructed. The wells drawing from the Wanapum aquifer have experienced a greater reduction in capacity than those drawing from the Saddle Mountain aquifer. Rehabilitating or reconstructing the wells will improve the capacity and quality of water entering the water system. The City's water rights allow for future wells, which will add to the capacity as well. **[O&M Improvement Nos. 2, 8, 12 through 17, and Capital Improvement Nos. 7, 15, and 16]**

3.8.2 Storage

Reservoir Cleaning and Maintenance – Routine cleaning and inspection of the City's water storage reservoirs are necessary to maintain water quality and monitor structural integrity. Both reservoirs are due for cleaning and inspection. Both reservoirs will also need to be recoated to preserve water quality and the integrity of the reservoirs. **[O&M Improvement Nos. 3, 7, 10, and 18]**

Storage Capacity – To meet the 20-year projected demand, additional storage capacity is necessary. A new reservoir including transmission main are necessary to meet projected demands and associated storage volumes. **[Capital Improvement No. 8]**

3.8.3 Distribution

Water Main Upsizing and Replacement – As shown in Figure 3-4, there are multiple locations where the required fire flow is not met. Upsizing water mains in these locations will improve fire flow and water pressure. Although there are several additional locations in the City in need of water main replacements due to leakage and corrosion, the improvement locations were limited to critical improvements for fire flow requirements. **[Capital Improvement Nos. 1 through 6, 9, 10, and 13]**

Fire Flow Capacity – As shown in Figure 3-4, there are multiple locations where the required fire flow is not met. Looping water mains at dead ends in these locations will improve fire flow and water quality. **[Capital Improvement Nos. 1, 11, 12, and 14]**

CHAPTER 4 - WATER RESOURCE ANALYSIS & WATER USE EFFICIENCY (WUE)

4.1 WATER USE EFFICIENCY PROGRAM (WUE)

4.1.1 Planning Requirements

In 2003, the Washington State Legislature passed the Municipal Water Supply-Efficiency Requirements Act (commonly called the Municipal Water Law) as part of a multi-year effort to reform the state's water laws. The act requires all municipal water suppliers to use water more efficiently in exchange for water right certainty and flexibility to meet future water demands. The Legislature directed the Department of Health to adopt a rule that establishes water use efficiency requirements for all municipal suppliers. The Water Use Efficiency (WUE) Rule, which became effective on January 22, 2007, includes the following key items:

- WUE Program – This element of the rule requires the collection of water production and consumption data, forecast of future water demands, evaluation of system leakage, evaluation of water rate structures, and the implementation of WUE measures. This Program is a required element of all Water System Plans prepared after January 22, 2008.

- Distribution System Leakage (DSL) Standard – Municipal water suppliers with 1,000 or more connections are required to satisfy a DSL standard equal to 10% or less of total production by July 1, 2010.

- WUE Goal Setting and Performance Reporting – Municipal water suppliers are required to set WUE goals through a public process and report annually on their performance to customers and to DOH. For water systems with 1,000 or more connections, the deadline for establishing systems goals was July 1, 2009. WUE goals must be established through a public process for a six-year period, and should be re-evaluated each cycle.

The rule requirements and compliance deadlines are shown in Table 4-1.

TABLE 4-1 WATER USE EFFICIENCY RULE REQUIREMENTS

Requirement	Deadlines	
	1,000 or more Connections	Under 1,000 Connections
Begin Production & Consumption Data Collection	January 1, 2007	January 1, 2008
Establish WUE Goals	July 1, 2009	July 1, 2010
Include WUE Program in Planning Documents	January 22, 2008	January 22, 2008
Submit First Annual Performance Report	July 1, 2008	July 1, 2009
Submit Service Meter Installation Schedule	July 1, 2008	July 1, 2009
Meet DSL Standard	July 1, 2010	July 1, 2011
Complete Installation of all Service Meters	January 22, 2017	January 22, 2017

A WUE Program is one requirement of the WUE Rule. All Water System Plans submitted to the Department of Health after January 22, 2008, are required to include a WUE Program. WAC 246-290-810(4) requires municipal water suppliers to include the following items in their WUE program:

- Description of the current water conservation program including an estimation of water saved through program implementation over the last six years;

- Description of the chosen WUE goals;

- Evaluation and implementation of WUE measures;

- Projected water savings;

- Customer education;

- WUE program effectiveness; and
- DSL evaluation.

4.1.2 Current Water Conservation Program

Grandview's current Water Conservation Program, or Water Use Efficiency (WUE) Program, was prepared in January 2008. As part of this *Water System Plan*, the City's current WUE Program was expanded and restructured in accordance with WAC 246-290-810(4) and consists of the following elements:

- Water Use Efficiency Goals
- Evaluation and Implementation of Water Use Efficiency Measures
- WUE Measure Implementation
- Customer Education
- Water Use Efficiency Program Effectiveness
- Distribution System Leakage (DSL) Evaluation

Provided in Table 4-2 is a summary of the population, number of water services, water consumption, and per capita water consumption from 2008 to 2013. Further information on historical water use is provided in CHAPTER 2 of this Plan. Since 2008, total system annual water consumption has been reduced by approximately 3%. Annual residential demand and demand per service per day has also decreased since 2008.

TABLE 4-2 WATER CONSUMPTION INFORMATION 2008-2013

Year	Population*	Total Water Services	Annual Water Production (MG)	Annual Water Consumption (MG)	Annual Residential Consumption (MG)	Residential Water Services	Residential Avg. Day Consumption per service (gal/service/day)
2008	10,588	2,709	672.29	598.10	188.03	2,068	248
2009	10,827	2,729	609.20	592.55	188.69	2,082	248
2010	10,862	2,739	579.48	553.62	181.78	2,092	237
2011	10,920	2,767	556.43	523.96	178.79	2,106	232
2012	11,000	2,788	584.24	543.19	177.63	2,122	229
2013	11,010	2,788	606.01	582.27	173.78	2,116	225

Note: Residential water services represents Single-Family Residential user category only.
* From Washington State OFM population estimates.

The City's 2008 *Water Use Efficiency Program* included a goal to reduce total water production from 2008 to 2014 by 25 million gallons. The City's goal was first met in 2009 and since, the City has sustained the 25 million gallon reduction from the 2008 production as shown in Table 4-2. In addition to the production conservation goal, there has been a 7.6% reduction in annual residential consumption and a 9.3% reduction in residential demand per service since 2008.

Since 2008, the City has replaced several water service lines, valves, and distribution mains that were suspected to be leaking. These efforts have assisted in reducing the difference between water production and consumption volumes.

4.1.3 Water Use Efficiency Goals

WUE goals are an integral component of the WUE program, setting the ground work for more efficient use of water. The City of Grandview has observed reductions in single-family residential consumption per service through past conservation measures, resulting in less production. Therefore, the City of Grandview has proposed the following WUE goals for their water system:

1. The City of Grandview will continue to maintain the distribution system to meet the Department of Health's standard of less than 10% distribution system leakage.
2. The City of Grandview's water system will work towards reducing consumption by 10 million gallons during the 6-year reporting period of 2015-2021.

The WUE goals were presented at a public study session on April 28, 2015, and adopted by City Council later that evening. Documentation of the public forum is included in CHAPTER 10 of this Plan. Adoption of the above WUE goal is expected to improve system performance and consequently reduce water production volumes.

4.1.4 Evaluation and Implementation of Water Use Efficiency Measures

Water use efficiency (WUE) measures are necessary actions taken to attain a water system's established efficiency goals. Measures are intended to support the WUE program and should address both supply and demand efficiencies. For this reason, the WUE measures that have been evaluated and/or implemented are separated into two primary categories, demand side and supply side measures. All of the selected WUE measures pertaining to Grandview's WUE goals were presented to the public during the goal setting process.

Demand Side Measures

Municipal water systems are required to evaluate or implement a specified number of demand side water use efficiency (WUE) measures based upon the size of the water system. Table 4-3 shows the minimum number of measures required to be evaluated or implemented by the City of Grandview.

TABLE 4-3 WATER USE EFFICIENCY MEASURES

Number of Service Connections	Number of Water Use Efficiency Measures to be Evaluated
Less than 500	1
500 - 999	4
1,000 – 2,499	5
2,500 – 9,999	6 (Grandview's current requirement)
10,000 – 49,999	9
Greater than 50,000	12

A discussion of the demand side measures that the City of Grandview has evaluated to achieve its specified efficiency goal are provided below, along with the estimated costs to implement the measures and the projected water savings. Evaluation of the following measures for cost-effectiveness is primarily based upon the overall implementation costs as compared to the amount of potential water savings.

Water Conservation School Career Days Outreach Program – Once a year, the City Of Grandview's Water System Operator will attend the local school's Career Day, and teach children about the many ways to protect and conserve the City's water resource. This activity involves preparation of educational programs for school children targeted to increase awareness of local water resources and encourage water conservation practices, and includes school presentations, preparation of curriculum material, and tours of water system facilities. Costs associated with this measure would primarily be in preparation of curriculum material, and time involved in working with the school district for the presentation of the program.

WUE Measure Cost Estimate: $1,000 for preparation of curriculum materials.

Estimated Water Savings: 100,000 gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled annually.

Irrigation Run Time Reduction – Grandview owns and operates a pressurized irrigation system that supplies pressurized irrigation water to approximately 500 residences. The remaining 1,615 single-family residential customers within the City utilize potable water for irrigating lawns, gardens, and other landscaping. The City of Grandview will prepare water wise guidelines and water conservation pamphlets and distribute to customers in promoting reduction of irrigation run times, ultimately reducing potable water consumption.

WUE Measure Cost Estimate: $500 for preparation of materials

Estimated Water Savings: 1.0 million gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2016.

Customer Leak Detection – Grandview Public Works staff will work closely with utility billing staff in identifying high water usage customers. When high usage is revealed, Public Works staff will contact the customer in a timely manner. Staff will provide leak detection services to customers and offer solutions for leak repairs. Following inspections, customers will receive Department of Health pamphlets promoting water conservation and tips toward consumption reduction.

WUE Measure Cost Estimate: $500 for printing materials

Estimated Water Savings: 500,000 gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2017.

DOH Publication Distribution – Grandview Public Works staff will print and deliver Department of Health publications to customers. This will be accomplished through door to door communication. The City has found face to face interaction as the most effective means of communicating with customers.

WUE Measure Cost Estimate: $500 for printing materials

Estimated Water Savings: 500,000 gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2018.

Water Conservation Devices – Grandview Public Works staff will inform customers about available water saving devices and effects of utilizing such devices. Example water conservation devices include:

- Water saving shower heads
- Toilet Tank Bank
- Rain sensors
- Irrigation timers

WUE Measure Cost Estimate: No cost.

Estimated Water Savings: 1.0 million gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2016.

Water Bill Notifications – The City of Grandview plans to place notices on their customer's monthly bills to encourage customers to check for leaks and be aware of excessive water use due to leaks and over watering lawns and gardens. This measure will further educate the public on the purpose of water conservation and the benefits of reducing excessive and/or unnecessary water use. Minimal costs associated with this measure include preparing the notification language and updating the billing software

to print the selected message. The low cost of implementing this measure makes it an effective way to accomplish the specified efficiency goal for specific customer classes:

a. Single-Family Residential
b. Outside Residential
c. Multi-Family Residential
d. Mobile Home Residential

WUE Measure Cost Estimate: $400 for preparation of materials

Estimated Water Savings: Varies per user category, see Table 4-4.

WUE Measure Action Status: Scheduled for implementation in 2018.

City Webpage Additions – The City's current webpage includes a page devoted to the Public Works department, which includes a link to the City's *Water Quality Report* annual publication. The Report describes the quality of Grandview's drinking water, sources, and programs in place to protect water quality. The City plans to add a specific webpage devoted to the City's Water Use Efficiency Program. Information will include conservation tips.

WUE Measure Cost Estimate: $1,000 for updating webpage.

Estimated Water Savings: 100,000 gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2019.

Advertising – During the 2015-2021 reporting period, the City of Grandview will publish water conservation advertisements in the local newspaper (the Grandview Herald). These advertisements will include tips and strategies for conserving water during high usage seasons, from April – November. The advertisements will be published at the beginning of each high usage season, typically April.

WUE Measure Cost Estimate: $500 annually.

Estimated Water Savings: 100,000 gallons over 6-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2016.

It should be noted that water savings attributable to public information activities are difficult to quantify because they are not directly linked to physically saving water. Although these measures cannot be specifically quantified, they are an integral part of the WUE Program, raising awareness of the importance of water conservation and increasing community participation in other conservation activities.

A summary of the estimated costs to implement the selected measures, their estimated water savings, and overall cost-effectiveness are provided in Table 4-4.

TABLE 4-4 SUMMARY OF DEMAND SIDE WUE MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Estimated Water Savings, 6-year period, MG
Water Conservation School Career Days Outreach Program	$1,000	Annually	0.10
Irrigation Run Time Reduction	$500	2016	1.0
Customer Leak Detection	$500	2017	0.50
DOH Publication Distribution	$500	2018	0.50
Water Conservation Devices	None	2016	1.0
Water Bill Notifications – Single-Family Res.	$100	2018	8.0
Water Bill Notifications – Outside Residential	$100	2018	0.20
Water Bill Notifications – Multi-Family Residential	$100	2018	0.20
Water Bill Notifications – Mobile Home Res.	$100	2018	0.60
City Webpage Additions	$1,000	2019	0.10
Advertising	$500	Annually	0.10

The above measures are planned to be implemented as shown in Table 4-6. The City will reevaluate the effectiveness of the measures during each program update to determine its potential for future implementation. Costs to implement these measures are included in the City's water operations budget.

Supply Side Measures

Supply side measures are essential to control distribution system leakage (DSL), improve supply efficiency, and overall system performance. The following are discussions of supply side WUE measures that have already, or will be implemented within the next six years to reduce the system's current DSL percentage and satisfy the City's WUE Program objective. The estimated cost of these measures and anticipated water savings are also provided.

Reservoir Cleaning and Inspection – The City periodically cleans and inspects its reservoirs for leaks and any other deficiencies. Corrosion causes unnecessary leakage directly contributing to distribution system losses (DSL). The City's reservoirs should be cleaned and inspected every five (5) years to identify any corrosion and potential DSL. The approximate cost of inspecting and cleaning each reservoir is generally $10,000, assuming no significant repairs are necessary.

WUE Measure Cost Estimate: Approximately $10,000 per reservoir.

Estimated Water Savings: Unknown.

WUE Measure Action Status: Annual budgeting and inspection schedule.

The following Table 4-5 is a summary of supply side measures implemented by the City.

TABLE 4-5 SUMMARY OF SUPPLY SIDE WUE MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Reservoir Cleaning and Inspection	$10,000 per reservoir	2016	Unknown

4.1.5 WUE Measure Implementation

A summary of the WUE program measures that are planned for implementation is provided in Table 4-6, including measure description, implementation cost, and year of implementation. All of the implemented measures support the system's WUE goals to reduce distribution system leakage and single-family residential consumption.

TABLE 4-6 SUMMARY AND PROJECTED SAVINGS OF WATER USE EFFICIENCY MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Water Conservation School Career Days Outreach Program	$1,000	Annually	0.10
Irrigation Run Time Reduction	$500	2016	1.0
Customer Leak Detection	$500	2017	0.50
DOH Publication Distribution	$500	2018	0.50
Water Conservation Devices	None	2016	1.0
Water Bill Notifications – Single-Family Res.	$100	2018	8.0
Water Bill Notifications – Outside Residential	$100	2018	0.20
Water Bill Notifications – Multi-Family Residential	$100	2018	0.20
Water Bill Notifications – Mobile Home Res.	$100	2018	0.60
City Webpage Additions	$1,000	2019	0.10
Advertising	$500	Annually	0.10
Reservoir Cleaning and Inspection	$10,000 per reservoir	2016	Unknown

The City plans to budget funds each year for the next six-year period to fund the WUE measures listed above in Table 4-6. These budget amounts are reflected in the proposed City of Grandview financial plan in CHAPTER 9 of this Plan as part of the general operational budget and/or O&M improvement costs.

4.1.6 Customer Education

Customer education is intended to inform citizens about the need for, and the methods to achieve water conservation. Customer education involves publicizing and promoting the need for water conservation to all classes of customers. Grandview currently publicizes water conservation information in its annual *Water Quality Report* to inform customers of the City's conservation efforts. In the future, the City plans to provide additional conservation information to customers on their website, to further educate the public on the purpose of using water more efficiently.

Customer education programs that Grandview has considered for further evaluation include the following:

- Program Promotion – Program promotion can include public service announcements, news articles, information provided in the City's annual *Water Quality Report*, bill inserts, providing water use history as part of utility bills, and distribution of inexpensive, easily installed water-saving devices such as shower flow restrictors, toilet tank water displacement bags, and leak detection dye tablets. As previously discussed, Grandview intends to initiate program promotion in 2016 through the use of its annual *Water Quality Report* and water bill notifications.

- Speakers Bureaus – Speakers bureaus involve identifying water conservation speaking opportunities appropriate to various civic, service, community and other groups. Such speaking opportunities focus on increasing public awareness of water resource and conservation issues, and may involve the use of audio and visual aids.

- Theme Shows and Fairs – This activity involves preparation of a portable display of water conservation devices and selected written material, and making this display available at local area theme festivals and activities.

- School Outreach – School outreach involves preparation of educational programs for school children targeted to increase awareness of local water resources and encourage water conservation practices. These may include school presentations, preparation of curriculum material, and tours of water system facilities. As previously discussed, representatives of Grandview's Public Works Department will attend a Career Day at the local schools and teach children about the many ways to protect and conserve the City's water source.

Grandview has identified some of these customer education programs as evaluated WUE measures. Besides those identified, Grandview does not plan to further evaluate or implement any of the additional customer education programs listed above.

4.1.7 Water Use Efficiency Program Effectiveness

The Water Use Efficiency Rule requires the completion of annual performance reporting to system customers and to the Department of Health (DOH). The City will use preparation of the Annual WUE Performance Report as an opportunity to review the effectiveness of the WUE measures, and determine if established goals require revision. The annual effectiveness evaluation and the Annual WUE Performance Report will include the following elements:

- Calculation of distribution system leakage in terms of volume and percent of total water production;
- Identification of WUE goals;
- Evaluation of established WUE goals, including estimating water savings achieved through implemented measures and progress towards satisfying goals.

Grandview will submit its Annual WUE Performance Report to DOH by July 1st of each year. Information contained in the Annual WUE Performance Report will also be included in the City's *Water Quality Report*, which will be published on the City's website. WUE Program effectiveness will also be evaluated every six years when the Water System Plan is updated again. At this time both goals and measures will be reevaluated to determine the most cost-effective method to achieve the updated goals.

4.2 DISTRIBUTION SYSTEM LEAKAGE (DSL)

The distribution leakage standard is a significant element of the WUE requirements. This standard requires that all water systems monitor total water consumption by all services. The difference between water consumption and water production is considered DSL. DSL includes meter inaccuracies, water theft, leaking water mains, and reservoir overflows. DSL may also include un-metered uses such as hydrant use for firefighting, and water used for distribution system flushing (if these uses are un-metered or un-estimated). The WUE Rule requires water distribution leakage to be 10% or less of total production based on a three-year rolling average.

All of Grandview's water sources are metered, and these source meters are read daily. All services in Grandview's distribution system are metered and read monthly. Table 4-7 presents Grandview's water production and water consumption values for the last six years and most recent three-year average (2011 through 2013).

TABLE 4-7 WATER PRODUCTION, CONSUMPTION, AND DSL

Year	Production	Consumption	DSL	% DSL
2008	672,287,227	598,097,748	74,189,479	11.04%
2009	609,202,080	592,551,156	16,650,924	2.73%
2010	579,457,206	553,623,284	25,833,922	4.46%
2011	556,426,009	523,962,256	32,463,753	5.83%
2012	584,243,860	543,186,971	41,056,889	7.03%
2013	606,014,200	582,270,622	23,743,578	3.92%
TOTAL	3,607,630,582	3,393,692,037	213,938,545	5.93%
3-Year Average (2011-2013)	582,228,023	549,806,616	32,421,407	5.57%

Grandview currently meets the 10% DSL standard when considering the current three-year average DSL, which is equal to 5.57%. Although the City currently satisfies the 10% DSL standard, the City plans to

continue making repairs to or replacing potential leaking system components such as service lines, old service meters, and aging and leaking main line water valves to further reduce the DSL percentage.

4.3 WATER LOSS CONTROL ACTION PLAN

As discussed above, the City's current three-year average DSL percentage does not exceed the 10% threshold by DOH. Therefore, the City is not required to develop a Water Loss Control Action Plan (WLCAP) to achieve the primary objective of reducing DSL to meet the 10% standard.

4.4 SOURCE OF SUPPLY ANALYSIS

If 20-year water use projections forecast that demand will exceed existing water rights, the purveyor is required to conduct a *Source of Supply Analysis*. The purpose of the *Source of Supply Analysis* is to evaluate opportunities to obtain or optimize the use of existing sources already developed and to evaluate other innovative methods to meet water needs. Grandview's 20-year water demand projections will not exceed their existing certified and permitted authorizations, but the following *Source of Supply Analysis* may be valuable in the future as projected growth occurs. A *Source of Supply Analysis* for the City of Grandview is presented below.

The *Source of Supply Analysis* includes evaluation and discussion of the following items:

1. Enhanced Conservation Measures
2. Water Rights Changes
3. Interties
4. Artificial Recharge
5. Water Reclamation / Reuse Opportunities
6. Treatment

4.4.1 Enhanced Conservation Measures

Intermediate systems (serving between 10,000 and 100,000 people) are required by the *USEPA Water Conservation Plan Guidelines* to implement intermediate guidelines and Level 2 measures. These measures include universal metering and calibration, water accounting and loss control including telemetry, costing and pricing, and information and education. These measures are already addressed in the City's current WUE Program.

4.4.2 Water Rights Changes

This measure involves examining opportunities to utilize existing water rights via change(s) in water right parameters (change in place of use, change in purpose of use, change in point of diversion or additional points of diversion or withdrawal).

As Grandview continues to grow and serve areas within their future service area, they will pursue the acquisition of the water rights/permitted uses associated with each newly annexed property. In some cases, the City may need to apply for a change in type of use, or change in point of use of the particular water right. These acquisitions may include:

- Permitted domestic or industrial ground or surface water rights associated with the annexed property;
- Permitted irrigation ground or surface water rights associated with the annexed property (these may include those portions supplied by an irrigation district or company); and
- Ground water rights associated with individual residential property (the domestic exemption water rights).

In addition, residential areas currently served by existing small water systems within Grandview's Urban Growth Area may, in the future, become annexed by the City. Grandview should acquire the water rights associated with those existing water systems if they become annexed. These include:

- Bill Garrison Water System
- Wagon Wheel Inn Water System

- J & R Apartments Water System

4.4.3 Interties

This measure involves exploring opportunities for interties with neighboring systems, their feasibility, and pursuing such opportunities if deemed more cost-effective and viable than new source development. Though it would require extensive infrastructure, interties are possible with the following water systems:

- City of Sunnyside
- City of Prosser
- City of Mabton

4.4.4 Artificial Recharge

Artificial recharge is the injection or infiltration of available surface water (usually from high winter flows) or other available water into an aquifer and its subsequent withdrawal. However, Grandview has no surface water right to use for artificial recharge. Grandview may acquire a surface water right through some future annexation, but the City would most likely put such a right to direct use rather than using it for artificial recharge.

4.4.5 Water Reclamation / Reuse Opportunities

This measure involves exploring opportunities for reclaimed water, reuse, non-potable water, and greywater as an approach to providing additional water supply. Grandview's sole source of reclaimed or re-used water is the City's wastewater treatment facility.

Approximately 1.1 million gallons per day could be made available for reuse from the Grandview wastewater treatment facility. Reclaim and re-use of wastewater from Grandview's wastewater treatment plant would involve identification of nearby facilities that could utilize the reclaimed water such as:

- Areas suitable for irrigation (cropland, parks, golf courses, freeway landscapes, school yards, and cemeteries);
- Wetland enhancement; and
- Groundwater recharge areas.

Grandview currently discharges treated wastewater to the Department of Fish and Wildlife's non-overflow pond system located south of the City's wastewater treatment facility. This activity which occurs on a limited basis each year during the months of February and March is permitted under the City's NPDES wastewater discharge permit.

Another possible use of reclaimed water from Grandview's wastewater treatment facility would be to irrigate City parks and/or school ballfields. This would require upgrading Grandview's wastewater treatment facility to Class A reclaimed water standards plus costs associated with construction of a separate reclaimed water distribution system (pumps and pipeline) to deliver the reclaimed water to the various parks and ballfields throughout the City. Grandview's wastewater treatment facility is located at the Yakima River, approximately two miles south of the City.

Industries located within the City constitute other potential sources of water re-use. It may be possible to reuse cooling waters from these industries for other industrial uses, or for irrigation of City parks. Irrigation of parks, although seasonal, would reduce annual water demand and lower demand during the critical summer period. Industrial cooling waters are the property of those individual industries, and using these waters for irrigation will require solving political, technical, environmental, legal, and economic issues.

4.4.6 Treatment

For Grandview, water treatment sources are the same as previously discussed in water reuse and reclamation, such as the Grandview wastewater treatment plant.

4.5 WATER RIGHT STATUS SUMMARY

The City of Grandview currently maintains certificated and permitted water rights from the State of Washington Department of Ecology (Ecology) for the appropriation of ground water from each of its wells. A copy of the City's water right certificates, permits, and claims, and any associated reports of examination (ROE) and water right correspondence documents are provided in CHAPTER 10 of the Plan.

In 2011, the City completed a water right consolidation project, providing them the flexibility in utilizing their water rights throughout their wellfield at 14 existing well locations and up to two future well locations. The City's water rights are divided into two aquifer groups based upon the depths of existing source wells – the shallower Saddle Mountain Basalt Aquifer (SMBA) and deeper Wanapum Basalt Aquifer (WBA). A summary of the City's water right status following the consolidation project, and a copy of the same body of public groundwater and impairment analysis are provided in CHAPTER 10 of the Plan.

Within the SMBA, the City is authorized to pump a total of 2,755 gallons per minute (GPM) and 904 acre-feet per year (afy) from any combination of the existing and two future source wells, plus any water pumped under permit G4-27784P (up 2,500 gpm and 1,613 afy) from future source wells completed in the SMBA, and source S10 (North Willoughby). Each SMBA source well is also limited to its historical instantaneous production rate.

Within the WBA, the City is authorized to pump a total of 1,700 GPM and 1,994 afy from any combination of the three existing and two future source wells, plus any water pumped from WBA source wells under permit G4-27784P (up to 2,500 GPM and 1,742 afy). There is no limitation on instantaneous withdrawal from any individual WBA source. Maximum authorized instantaneous withdrawals from SMBA source wells are summarized in Table 4-8.

TABLE 4-8 INSTANTANEOUS PRODUCTION WATER RIGHT SUMMARY

Aquifer	Well Source No.	Historic Instantaneous Production Limit
SMBA	S01 – West Main	400 GPM
	S03 – Velma	1,000 GPM
	S06 – Euclid	240 GPM
	S07 – Olmstead A	325 GPM
	S08 – Appleway	200 GPM
	S10 – North Willoughby	500 GPM
	S11 – Highland	300 GPM
	S12 – Pecan A	190 GPM
	S16 – Olmstead B	325 GPM
	S17 – Ashael Curtis	600 GPM
	S18 – Pecan B	190 GPM
	Future Well A	250 GPM
	Future Well B	250 GPM

Grandview's water rights status as compared to its existing and future water system demands are shown in Table 4-9, Table 4-10, and Table 4-11. The excess and/or deficiencies in the City's water rights are also shown in these tables.

TABLE 4-9 WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

Permit Certificate or Claim #	Name on Document	Priority Date (list oldest first)	Source Name/Number (Aquifer)	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Existing Consumption		Current Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)
Permit/Certificates										
1. 791-A	Grandview	8/15/1947	Five (5) Wells (WBA)	Primary	566	1,210				
2. 1338-A	Grandview	10/8/1951	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	600	784				
3. 4455-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	240	384				
4. 4456-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	325	520				
5. G3-20381[c]	Grandview	7/27/1972	Five (5) Wells (WBA)	Primary/Alternate Non-Additive	700	784/336				
6. G3-20382	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	200	322				
7. G3-20383	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	300	480				
8. G3-20384	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	400	640				
9. G4-24086	Grandview	8/22/1975	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	190	306				
10. G4-25570	Grandview	10/13/1977	Thirteen (13) Wells (SMBA)	Primary	500	0				
11. G4-27784	Grandview	12/21/1981	Six (6) Wells (SMBA/WBA)	Primary	2,500	1,742				
				SUBTOTAL (SMBA)	5,255	2,517[a]				
				SUBTOTAL (WBA)	3,766	3,736				
				TOTAL	6,521	4,640	4,820[b]	1,860[b]	1,701	2,780

Intertie Name/Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Existing Consumption Through Intertie		Current Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
	TOTAL						

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G4-29972					

[a] Permit G4-27784 authorizes use at all WBA source wells plus SMBA wells S10, Future Well A, and Future Well B. The permit authorizes annual withdrawals of up to 1,742 afy, however, due to limits on instantaneous withdrawals from approved SMBA source wells the maximum that could be exercised from the SMBA aquifer under this permit is 1,613 afy.

[b] The existing instantaneous consumption is based upon the existing combined maximum well pump capacities and the existing annual consumption is based upon the combined 2013 annual volume pumped from each source well.

TABLE 4-10 WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

Permit Certificate or Claim #	Name on Document	Priority Date (list oldest first)	Source Name/Number (Aquifer)	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Forecasted Water Use From Sources (6-Year Demand)		Forecasted Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)
Permit/Certificates										
1. 791-A	Grandview	8/15/1947	Five (5) Wells (WBA)	Primary	566	1,210				
2. 1338-A	Grandview	10/8/1951	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	600	784				
3. 4455-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	240	384				
4. 4456-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	325	520				
5. G3-20381[c]	Grandview	7/27/1972	Five (5) Wells (WBA)	Primary/Alternate Non-Additive	700	784/336				
6. G3-20382	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	200	322				
7. G3-20383	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	300	480				
8. G3-20384	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	400	640				
9. G4-24086	Grandview	8/22/1975	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	190	306				
10. G4-25570	Grandview	10/13/1977	Thirteen (13) Wells (SMBA)	Primary	500	0				
11. G4-27784	Grandview	12/21/1981	Six (6) Wells (SMBA/WBA)	Primary	2,500	1,742				
				SUBTOTAL (SMBA)	5,255	2,517[a]				
				SUBTOTAL (WBA)	3,766	3,736				
				TOTAL	6,521	4,640	4,820[b]	2,076[b]	1,701	2,564

Intertie Name/Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Forecasted Consumption Through Intertie		Forecasted Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
	TOTAL						

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G4-29972					

[a] Permit G4-27784 authorizes use at all WBA source wells plus SMBA wells S10, Future Well A, and Future Well B. The permit authorizes annual withdrawals of up to 1,742 afy, however, due to limits on instantaneous withdrawals from approved SMBA source wells the maximum that could be exercised from the SMBA aquifer under this permit is 1,613 afy.

[b] The total future instantaneous withdrawal rate and annual volume is calculated from the values provided in Chapter 2. The City tracks withdrawals from each of its source wells to ensure that future instantaneous and annual withdrawals do not exceed the authorized quantities.

TABLE 4-11 WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

Permit Certificate or Claim #	Name on Document	Priority Date (list oldest first)	Source Name/Number (Aquifer)	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Forecasted Water Use From Sources (20-Year Demand)		Forecasted Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)	Maximum Instantaneous Flow Rate (Q_i)	Maximum Annual Volume (Q_a)
Permit/Certificates										
1. 791-A	Grandview	8/15/1947	Five (5) Wells (WBA)	Primary	566	1,210				
2. 1338-A	Grandview	10/8/1951	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	600	784				
3. 4455-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	240	384				
4. 4456-A	Grandview	8/14/1962	Thirteen (13) Wells (SMBA)	Primary	325	520				
5. G3-20381[c]	Grandview	7/27/1972	Five (5) Wells (WBA)	Primary/Alternate Non-Additive	700	784/336				
6. G3-20382	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	200	322				
7. G3-20383	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	300	480				
8. G3-20384	Grandview	7/27/1972	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	400	640				
9. G4-24086	Grandview	8/22/1975	Thirteen (13) Wells (SMBA)	Alternate, Non-Additive	190	306				
10. G4-25570	Grandview	10/13/1977	Thirteen (13) Wells (SMBA)	Primary	500	0				
11. G4-27784	Grandview	12/21/1981	Six (6) Wells (SMBA/WBA)	Primary	2,500	1,742				
				SUBTOTAL (SMBA)	5,255	2,517[a]				
				SUBTOTAL (WBA)	3,766	3,736				
				TOTAL	6,521	4,640	4,820[b]	2,557[b]	1,701	2,083

Intertie Name/Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Forecasted Consumption Through Intertie		Forecasted Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
	TOTAL						

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G4-29972					

[a] Permit G4-27784 authorizes use at all WBA source wells plus SMBA wells S10, Future Well A, and Future Well B. The permit authorizes annual withdrawals of up to 1,742 afy, however, due to limits on instantaneous withdrawals from approved SMBA source wells the maximum that could be exercised from the SMBA aquifer under this permit is 1,613 afy.

[b] The total future instantaneous withdrawal rate and annual volume is calculated from the values provided in Chapter 2. The City tracks withdrawals from each of its source wells to ensure that future instantaneous and annual withdrawals do not exceed the authorized quantities.

4.6 WATER SUPPLY RELIABILITY ANALYSIS

4.6.1 Source Reliability

The single most important aspect of a water utility is its domestic water supply source. The City of Grandview's water supply is dependent on ground water sources. As previously discussed in this Plan, the City utilizes 14 source wells. The locations of these wells within the water system are shown in Map A enclosed in the back of this Plan. All 14 City wells are located on property owned by the City, and seven City wells have protective covenants establishing a 100-foot sanitary radius. Copies of the property deeds and protective covenants for each well are provided in CHAPTER 10 of this Plan.

As discussed in CHAPTER 3 of this Plan, there has been no significant change in source well water quality from any of Grandview's wells as demonstrated by inorganic chemical and volatile organic chemical monitoring over time.

Grandview has taken steps to protect its aquifers through implementation of its *Wellhead Protection Plan* and participation in a regional wellhead protection plan. Completed in 2000, Grandview's *Wellhead Protection Plan*, is intended to protect Grandview's aquifers through a combination of regulatory measures, best management practices, and public education and awareness. Details of Grandview's *Wellhead Protection Program* are provided in CHAPTER 5 of this Plan.

The existing City wells all withdraw water from the Columbia River Basalt Group. This geologic formation consists of four distinct hydrogeologic units. Starting with the oldest, these four units are known as the Grande Ronda, Wanapum, and Saddle Mountain Units (made up primarily of basalts of the same name, but also include sedimentary interbeds), and the Overburden Unit.

The Grande Ronda, Wanapum, and Saddle Mountain Units vary in thickness in South-Central Washington. Each unit is composed of numerous to several hundred individual basalt flows, which can range in thickness from a few inches to more than 300 feet, with sedimentary interbeds. Distinct, thick sedimentary interbeds separate the Grande Ronde, Wanapum, and Saddle Mountain Units.

Eleven of Grandview's existing City wells penetrate and withdraw water from the Saddle Mountain Basalt Aquifer and three from the Wanapum Basalt Aquifer of the Yakima Fold Belt. Review of the well logs of each source provided in CHAPTER 10 of this Plan show layers of sand, gravel, clay, shale, sandstone, and basalt consistent with the geologic definition of Saddle Mountain and Wanapum materials.

Irrigation wells for agricultural use also penetrate and withdraw from the above described Formations. Consequently, many of the Yakima area communities have experienced diminishing capacities and/or lowering drawdown levels in their source wells over years. Trends in groundwater levels are one of several factors important in determining source reliability. The United States Geological Survey (USGS) recently completed reports determining and analyzing such trends. The *Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho* (Scientific Investigations Report 2012-5261), published in 2012 by USGS, concluded that groundwater levels in the aquifer have risen since the 1950s in areas heavily irrigated with surface water and have declined since the 1970s in areas irrigated with groundwater. For wells examined in the Report, typical rises in water level under surface-water irrigation areas were 50 feet. Declines of 200 feet or greater were common in areas where pumping groundwater is the dominant source of irrigation water. The USGS Report concluded that 72% of the wells within the aquifer experienced declines over the study period, 1968-2009. Furthermore, the trends for all wells within the aquifer declined at a mean rate of 1.9 ft/year.

Source wells within Grandview were not directly involved with the USGS studies and reports. Because of this exclusion, an accurate determination of diminished capacities and lower drawdown cannot be concluded for the City's source wells. However, the City has not noticed a decline in well capacity as a result of a combination of declining groundwater levels and other performance related reasons. The City will continue to track static and drawdown water levels in the future as wells are rehabilitated to establish a record of water levels and have the ability to anticipate any potential source deficiencies.

Provided below in Table 4-12 is a brief description of each of the 14 Grandview wells. Copies of the well logs, susceptibility assessment surveys, and protective well covenants are included in CHAPTER 10 of this Plan.

TABLE 4-12 SOURCE WELL INFORMATION SUMMARY

	West Main	Balcom & Moe	Velma	Euclid (Emrgncy Source)	Olmstead A	Apple-way*	North Willoughby	Highland	Pecan A*	South Willoughby (Emrgncy Source)	Butternut	Olmstead B	Ashael Curtis*	Pecan B
Source Number	S01	S02	S03	S06	S07	S08	S10	S11	S12	S13	S14	S16	S17	S18
Date Drilled	1977	1944	2005	1962	1963	1999	1978	1999	1999	2007	1991	2004	2004	2006
DOE Well Tag ID	AEP517	AEP522			AAS263	AAS279	AAS245	AAS240	AAS282		AEP519	AAS278	AAS242	AAS161
Ground Elevation	806 ft.	804 ft.	831 ft.	795 ft.	812 ft.	814 ft.	855 ft.	818 ft.	779 ft.	841 ft.	791 ft.	818 ft.	805 ft.	779 ft.
Depth	247 ft.	1,154 ft.	760 ft.	248 ft.	110 ft.	342 ft.	610 ft.	250 ft.	269 ft.	1,200 ft.	1,294 ft.	623 ft.	720 ft.	496 ft.
Casing Diameter / Depth	10”/212’ 8”/247’	12”/243’ 10”/1,150’	10”/308’ 8”/760’	16”/316’ 12”/376’ 10”/430’	8”/52’	12”/134’ 8”/342’	12”/155’ 8”/610’	16”/165’ 12”/184’ 10”/250’	12”102’	16”/683’ 12”/1,200’	16”/739	16”230’ 12”/623’	16”/340’ 12”/720’	12”/304’ 10”/496’
Original Static Water Level	42 ft.	200 ft.	181 ft.	48 ft.	Artesian	85 ft.	17 ft.	140 ft.	31 ft.	187 ft.	159 ft.	Artesian	92 ft.	69 ft.
Initial Flow & Drawdown			559 GPM @ 136 ft.	240 GPM @ 175 ft.	325 GPM @ 70 ft.	93 GPM @ 11 ft.	573 GPM @ 189 ft.	550 GPM @ 50 ft.	155 GPM @ 90 ft.	2,000 GPM @ 349 ft.	1,550 GPM @ 83 ft.	80 GPM @ 269 ft.	180 GPM @ 353 ft.	340 GPM @ 281 ft.
2014 Static Level	161 ft.	284 ft.	122 ft.	176 ft.	30 ft.	65 ft.	64 ft.	74 ft.		284 ft.	163 ft.	171 ft.	87 ft.	231 ft.
2014 Flow & Drawdown	150 GPM @ 8 ft.		110 GPM @ 171 ft.		68 GPM @ 48 ft.		312 GPM @ 73 ft.	46 GPM @ 127 ft.			1,419 GPM @ 0 ft.	159 GPM @ 128 ft.		94 GPM @ 76 ft.
Current Capacity (GPM)	150	440	130	30	170	0	310	50	0	1,490	1,400	60	0	100

* Currently inactive.

4.6.2 Water Right Adequacy

Grandview's total combined certificated and permitted water rights of 6,955 GPM and 4,640 acre-feet per year discussed earlier in CHAPTER 4, are adequate to satisfy the current and future maximum annual and instantaneous demand. Grandview will pursue water conservation measures, continue its annual review of water production and consumption data, and evaluate construction of additional supply sources to perfect current water rights and meet growing demands.

4.6.3 Facility Reliability

Grandview's major water system components have been properly operated and maintained. Table 4-13 provides a list of the City's well pumps, their age, and year the pumps were installed.

TABLE 4-13 WELL PUMP AND BOOSTER STATION AGE SUMMARY

Source Well	Pump Age (From 2015)	Year Installed
S01 West Main	8 years	2007
S02 Balcom & Moe	9 years	2006
S03 Velma	10 years	2005
S06 Euclid	53 years	1962
S07 Olmstead A	11 years	2004
S08 Appleway	16 years	1999
S10 North Willoughby	23 years	1992
S11 Highland	16 years	1999
S12 Pecan A	16 years	1999
S13 South Willoughby	8 years	2007
S14 Butternut	14 years	1991
S16 Olmstead B	11 years	2004
S17 Ashael Curtis	1 year	2014
S18 Pecan B	9 years	2006

Pumps will continue to be maintained as discussed in CHAPTER 6. Recommended O&M improvements related to well pump rehabilitation and replacement will be as described in CHAPTER 8.

4.6.4 Water Shortage Response Planning

In the event the City Council determines that an emergency exists, residential water usage for landscape irrigation can be restricted to "odd-even". Those residences with even-numbered addresses irrigate on even number calendar days, and those with odd-numbered addresses irrigate on odd number calendar days (City Code 13.36.030).

During short-term water shortages, the City should implement the following additional conservation measures:

- City restrictions on irrigation of parks;
- City curtailment of pool use;
- City restrictions on water main and hydrant flushing; and
- Requesting curtailment on non-essential commercial water use.

4.7 WATER SYSTEM INTERTIES

Grandview currently has no interties with any neighboring water systems, and none are currently proposed. If an intertie is proposed, the City will develop an agreement with the other purveyor, obtain approval of the intertie from the Department of Health and the Department of Ecology, modify appropriate water rights to reflect the intertie, and incorporate the intertie into the Water System Plan. The intertie agreement would include the following:

- A discussion on the place of use as authorized in appropriate water rights documents;
- Identification of the specific time period(s) in which water will be provided;
- Quantification of the amount of water available for use;
- A discussion on seasonal or other restrictions on water availability; and
- A discussion of how water conservation programs, data collection and other operational matters will be conducted and coordinated.

To date, there have been no discussions between Grandview, Sunnyside, Prosser, and/or Mabton (Grandview's nearest municipal neighbors) with regard to possible future interties.

CHAPTER 5 - SOURCE WATER PROTECTION

5.1 WELLHEAD PROTECTION PROGRAM

In 2000, Grandview completed and implemented a wellhead protection plan. The purpose of the plan was to:

- Identify potential sources of contamination near the City's ground water supplies;
- Implement management strategies to prevent contamination of those supplies; and
- Develop a contingency plan for contamination mitigation in the event that ground water does become contaminated.

The City of Grandview's *Wellhead Protection Plan*, prepared in accordance with the Department of Health's requirements, consists of the following chapters:

1. Introduction
2. Hydrology
3. Identification of the Wellhead Protection Areas
4. Potential Contaminant Source Inventory
5. Management Strategy
6. Contingency Planning
7. Figures
8. Appendix
9. Well Logs
10. Resource Contact List

The City of Grandview's *Wellhead Protection Plan* is considered a companion document to the City's *Water System Plan*, and should be consulted for specific details and information regarding Grandview's wellhead protection program.

5.2 EXEMPT WELLS

The City of Grandview allows drilling and use of exempt wells within its service area only if the property to be served is located outside of the existing area served by the City's water system. Exempt wells are defined in state law (RCW 90.44.050) as:

> "*. . . any withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for a single or group domestic uses in the amount not exceeding five thousand gallons a day, or for an industrial purpose in the amount not exceeding five thousand gallons a day, is and shall be exempt from the provisions of this section . . .*"

The City requires those areas served by exempt wells to connect to the City's water system when it extends to the property. At that time, any exempt wells on the property shall either be decommissioned in accordance with the applicable Washington Administrative Code (WAC) requirements, or taken over by the City to become part of the City's water system.

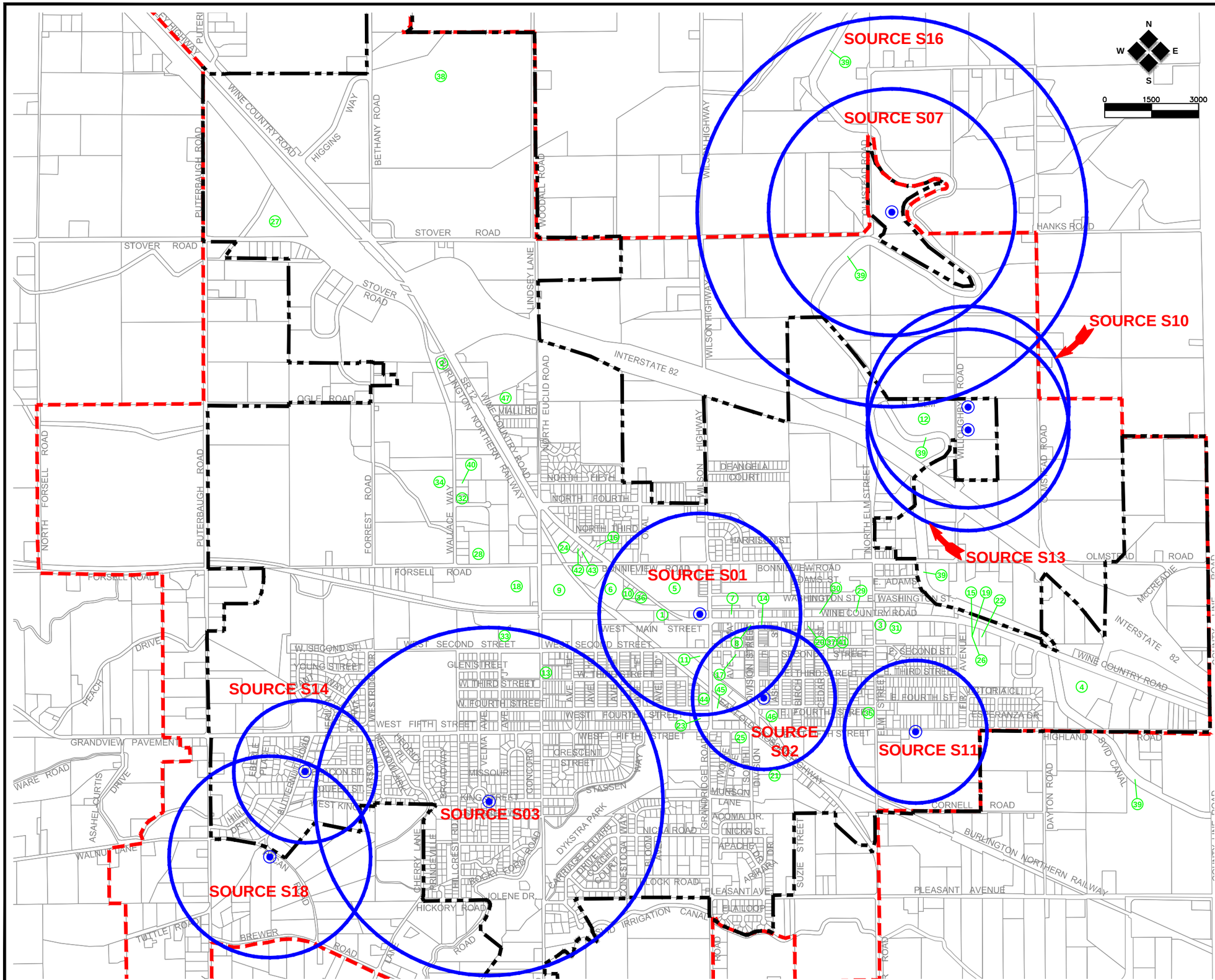
5.3 UPDATES AND MODIFICATIONS TO THE WELLHEAD PROTECTION PLAN

As part of this *Water System Plan* update, the Potential Contaminant Source List and the Notification Source List have been updated and are presented as Table 5-1 and Table 5-2, respectively. The potential contaminant source locations are shown on Figure 5-1 Potential Sources of Contamination. The 6-month, 1-year, 5-year, and 10-year travel time zones for each source well (as specified on the Ground Water Contamination Susceptibility Assessment Survey forms) are summarized on Table 5-3 and shown on Figure 5-2, Figure 5-3, Figure 5-4, and Figure 5-5. Copies of the Ground Water Contamination Susceptibility Assessment Survey forms for each source well are provided in CHAPTER 10 of this Plan.

TABLE 5-1 POTENTIAL CONTAMINANT SOURCE LIST				
Map No.	Property Owner	Address	Description	Rank
1	Ameristar Car Wash	501 W. Main St.	Car Wash	M
2	Ameri-Star Store #8	1005 Wallace Way	Gas Station	
3	Auto Mania	602 E. Wine Country Rd.	Auto Body	H
4	Bleyhl Farm Service Inc.	940 E. Wine Country Rd.	Petroleum, Fertilizer, Gas	H
5	Conrad & Adams Fruit LLC	601 W. Wine Country Rd.	Food Processing	
6	Conrad & Adams Fruit LLC	614 W. Wine Country Rd.	Cold Storage Ammonia Sys.	
7	Cromwell Radiator & Automotive Repair	127 W. Wine Country Rd.	Auto Repair	
8	DeBock's Auto Repair	100 W. Wine Country Rd.	Auto Repair	H
9	Fruitsmart, Inc.	201 N. Euclid	Food Processing	
10	Gas Max	608 W. Wine Country Rd.	Gas Station	
11	Grandview Laundromat & Cleaners	202 Grandridge Rd.	Dry Cleaners	
12	Grandview Cemetary	N. Elm Rd.	Cemetery	M
13	Grandview Medical Center	208 Euclid Rd.	Medical	M
14	Grandview Market	100 Wine Country Rd.	Gas Station	
15	Grandview Mufflers	710 E. Wine Country Rd.	Auto Repair	
16	Grandview Tire Center	805 W. Wine Country Rd.	Tire Sales	
17	Harvest Valley Cleaners	144 W. 2nd St.	Dry Cleaners	H
18	J.M. Smucker Co.	Forsell & Euclid	Food Processing	M
19	JP Body & Fender	710 E. Wine Country Rd.	Auto Body	
20	Juan's Automotive	304 E. Wine Country Rd.	Auto Repair	H
21	Kenyon Zero Storage, Inc.	717 S. Division St.	Cold Storage Ammonia Sys.	
22	Lechuga's Tire	716 E. Wine Country Rd.	Tire Sales	
23	Leinad Resources Inc. DBA Sunfair Marketing	400 Grandridge	Cold Storage Ammonia Sys.	
24	Les Schwab Tires	812 W. Main St.	Tire Sales	L
25	Lower Valley Machine Shop	104 W. Fifth St.	Auto Repair	
26	Manuel S. Auto Repair	710 E. Wine Country Rd.	Auto Repair	
27	Mid Valley Chrysler Dodge Jeep, Inc.	501 Stover Rd.	Auto Sales	
28	Olsen Brothers Ranches Inc.	171 Forsell Rd.	Cold Storage Ammonia Sys.	
29	R.E. Powell Distributing	501 E. Wine Country Rd.	Fuel Distribution	H
30	R.H. Smith Distributing	315 E. Wine Country Rd.	Fuel Distribution	H
31	Safeway Fuel Station #1593	608 E. Wine Country Rd.	Gas Station	
32	Sam's Cycle Service	695 Wallace Way	Cycle Repair	H
33	School Bus Garage	1107 W. 2nd St.	Bus Maintenance	M
34	Shonan (USA) Inc.	702 Wallace Way	Food Processing	
35	Smith Funeral Home	512 E. Fourth St.	Funeral Home	H
36	Son's Of Thunder Auto Sales LLC	600 W. Wine Country Rd.	Auto Sales	
37	Sunshine Car Wash	304 E. Wine Country Rd.	Car Wash	M
38	Swift Transportation Company, Inc.	545 Bethany Rd.	Truck Maintenance & Repair	
39	SVID Canal	120 S. 11th St.	Ag Service	H
40	Valley Spray LLC	697 Wallace Way	Ag Service	H
41	Valley Tire N Rim	304 E. Wine Country Rd.	Tire Sales	
42	Walker's Auto Body	806 W. Wine Country Rd.	Body Shop	H
43	Walker's Cars & Trucks	804 W. Wine Country Rd.	Auto Sales	
44	Welch Food Inc.	401 Grandridge Rd.	Food Processing	
45	Welch Food Inc. Plant #1	504 Birch Ave.	Food Processing	M
46	Welch Food Inc. Plant #2	401 Avenue B	Food Processing	M
47	Wilbur Ellis Co., Inc.	1303 Wine Country Rd.	Farm Chemicals	H
48	Williams Gas Pipeline West	606 S. Oregon Ave. Pasco	Gas Produces	H
Rank: H = High M = Moderate L = Low				

TABLE 5-2 NOTIFICATION SOURCE LIST			
No.	Name	Address	Phone
1	Emergency (Hazardous Spill) Response		(800) 424-8802
2	Washington Department of Ecology, Central Regional Office	15 W. Yakima Ave. Suite 200 Yakima, WA 98902	(509) 575-2490
3	The Office of Drinking Water, Eastern Drinking Water Operations	16201 East Indiana Avenue, Suite 1500 Spokane Valley, WA 99216	(509) 329-2100
4	Grandview Police Department	201 W. 2nd St. Grandview, WA 98930	(509) 882-9223
5	Grandview Fire Department	110 Avenue A Grandview, WA 98930	(509) 882-9224
6	Yakima Co. Sheriff's Department	1822 S. 1st St. Yakima, WA 98907	(509) 865-6695
7	Washington State Patrol	2715 Rudkin Road Union Gap, WA 98903	(509) 575-2320
8	Yakima County Fire District	110 Avenue A Grandview, WA 98930	911
9	Yakima Health District	1210 Ahtanum Ridge Dr. Union Gap, WA 98903	(509) 575-4040
10	Washington St. Dept. of Transportation	1816 N. 4th Pasco, WA 99301	(509) 545-2202

TABLE 5-3 CALCULATED FIXED RADIUS TRAVEL TIMES					
Source No.	Source Name	6-Month	1-Year	5-Year	10-Year
S01	West Main	360 ft.	510 ft.	1,140 ft	1,610 ft.
S02	Balcom & Moe	250 ft.	360 ft.	800 ft.	1,140 ft.
S03	Velma	620 ft.	880 ft.	1,970 ft.	2,780 ft.
S07	Olmstead A	440 ft.	620 ft.	1,390 ft.	1,970 ft.
S10	North Willoughby	360 ft.	510 ft.	1,140 ft.	1,610 ft.
S11	Highland	250 ft.	360 ft.	800 ft.	1,140 ft.
S13	South Willoughby	360 ft.	510 ft.	1,140 ft.	1,610 ft.
S14	Butternut	250 ft.	360 ft.	800 ft.	1,140 ft.
S16	Olmstead B	700 ft.	980 ft.	2,200 ft.	3,110 ft.
S18	Pecan B	360 ft.	510 ft.	1,140 ft.	1,610 ft.



CITY OF GRANDVIEW

Water System Plan Update

POTENTIAL SOURCES OF CONTAMINATION

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- TEN YEAR TRAVEL ZONE
- SOURCE WELL
- POTENTIAL CONTAMINANT SOURCE LOCATION

PROPERTY OWNERS

1 AMERISTAR CAR WASH
2 AMERI-STAR STORE #8
3 AUTO MANIA
4 BLEYHL FARM SERVICE INC
5 CONRAD & ADAMS FRUIT LLC
6 CONRAD & ADAMS FRUIT LLC
7 CROMWELL RADIATOR & AUTOMOTIVE REPAIR
8 DEBOCK'S AUTO REPAIR
9 FRUITSMART, INC.
10 GAS MAX
11 GRANDVIEW LAUNDROMAT & CLEANERS
12 GRANDVIEW CEMETARY
13 GRANDVIEW MEDICAL CENTER
14 GRANDVIEW MARKET
15 GRANDVIEW MUFFLERS
16 GRANDVIEW TIRE CENTER
17 HARVEST VALLEY CLEANERS
18 J.M. SMUCKER CO.
19 JP BODY & FENDER
20 JUAN'S AUTOMOTIVE
21 KENYON ZERO STORAGE, INC.
22 LECHUGA'S TIRE
23 LEINAD RESOURCES INC. DBA SUNFAIR MARKETING
24 LES SCHWAB TIRES
25 LOWER VALLEY MACHINE SHOP
26 MANUEL S. AUTO REPAIR
27 MID VALLEY CHRYSLER DODGE JEEP, INC.
28 OLSEN BROTHERS RANCHES INC.
29 R.E. POWELL DISTRIBUTING
30 R.H. SMITH DISTRIBUTING
31 SAFEWAY FUEL STATION #1593
32 SAM'S CYCLE SERVICE
33 SCHOOL BUS GARAGE
34 SHONAN (USA) INC.
35 SMITH FUNERAL HOME
36 SON'S OF THUNDER AUTO SALES LLC
37 SUNSHINE CAR WASH
38 SWIFT TRANSPORTATION COMPANY, INC.
39 SVID CANAL
40 VALLEY SPRAY LLC
41 VALLEY TIRE N RIM
42 WALKER'S AUTO BODY
43 WALKER'S CARS & TRUCKS
44 WELCH FOOD INC.
45 WELCH FOOD INC. PLANT #1
46 WELCH FOOD INC. PLANT #2
47 WILBUR ELLIS CO., INC.
48 WILLIAMS GAS PIPELINE WEST

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Civil Engineering • Land Surveying • Planning
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Yakima, WA 98902
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www.hlacivil.com

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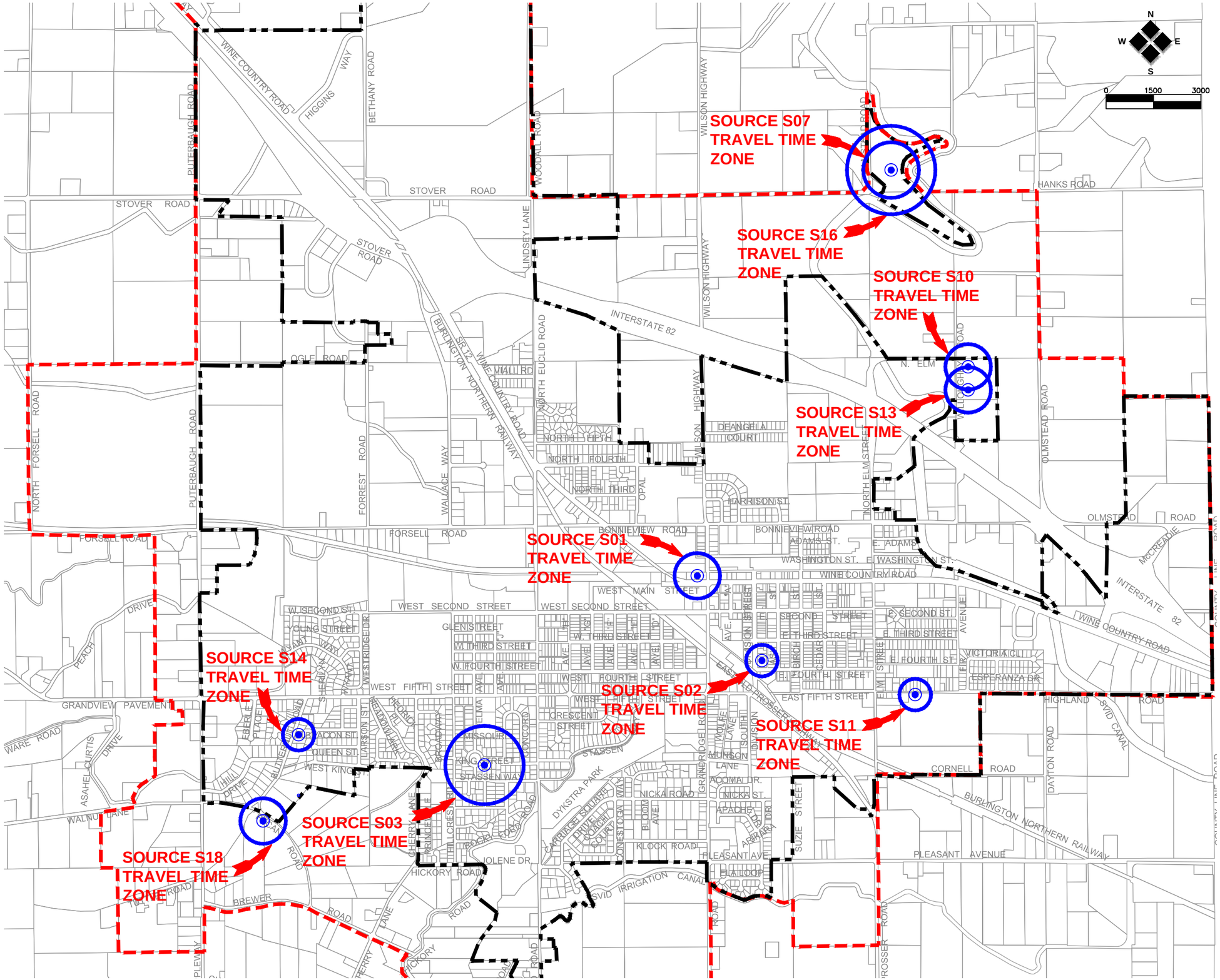
FIGURE 5-1



CITY OF GRANDVIEW

Water System Plan Update

SIX- MONTH TRAVEL TIME ZONE

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- WELL TRAVEL TIME ZONE
- SOURCE WELL

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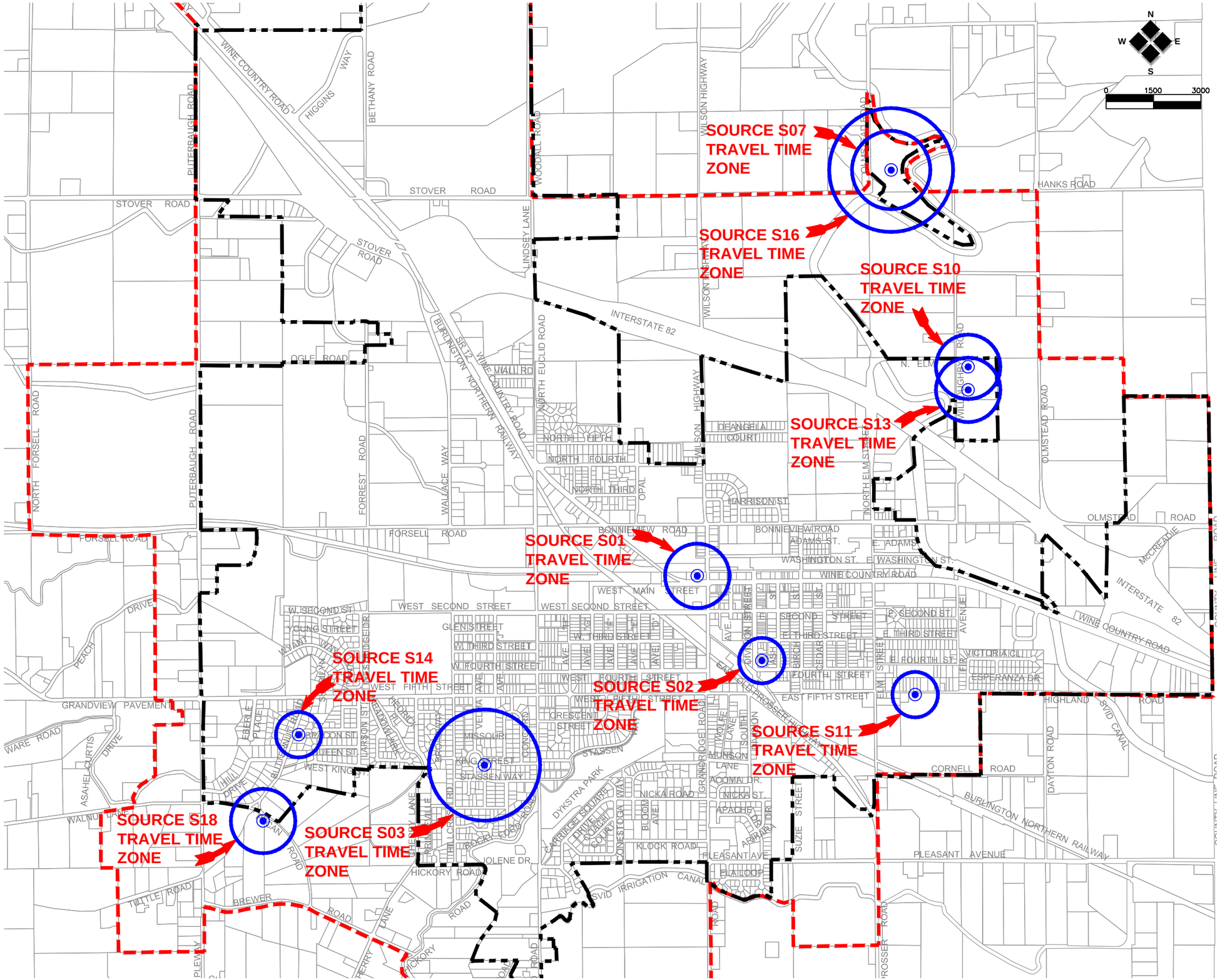
FIGURE 5-2



CITY OF GRANDVIEW

Water System Plan Update

ONE - YEAR TRAVEL TIME ZONE

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- WELL TRAVEL TIME ZONE
- SOURCE WELL

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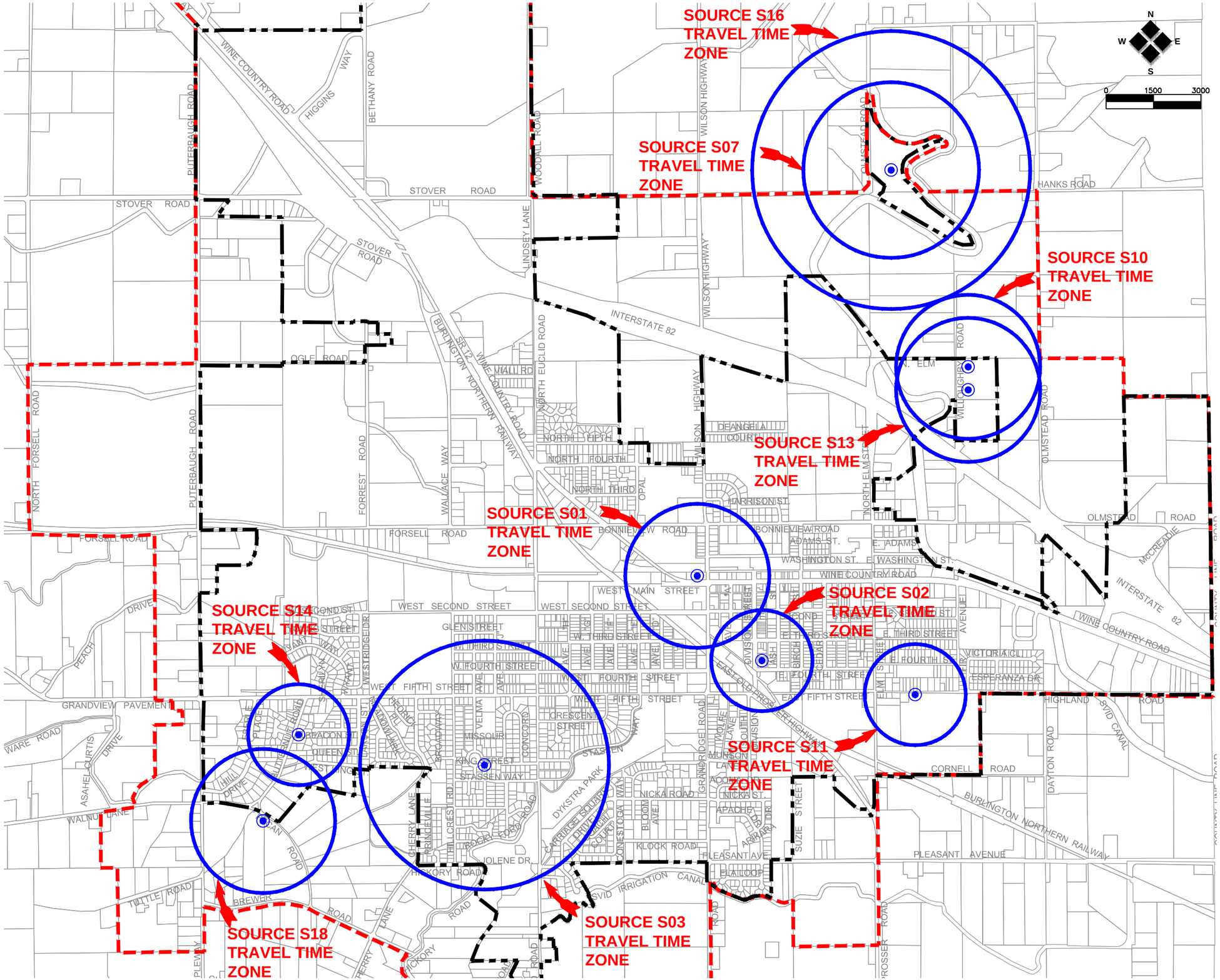
FIGURE 5-3



CITY OF GRANDVIEW

Water System Plan Update

FIVE - YEAR TRAVEL TIME ZONE

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- WELL TRAVEL TIME ZONE
- SOURCE WELL

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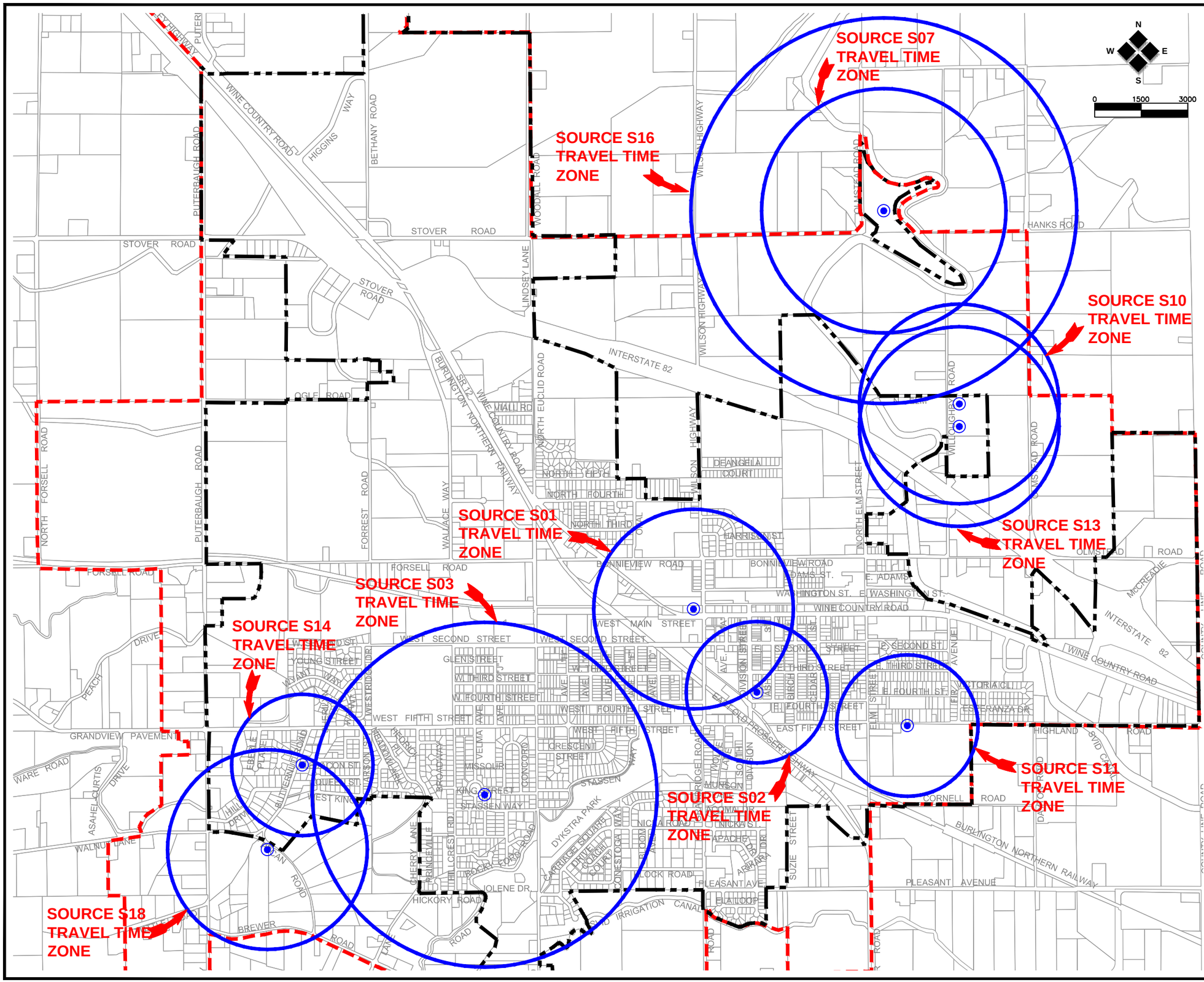
FIGURE 5-4



CITY OF GRANDVIEW

Water System Plan Update

TEN - YEAR TRAVEL TIME ZONE

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- WELL TRAVEL TIME ZONE
- SOURCE WELL

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FIGURE 5-5

CHAPTER 6 - OPERATION AND MAINTENANCE PROGRAM

6.1 WATER SYSTEM MANAGEMENT AND PERSONNEL

The purpose of this section is to identify personnel responsible for the day-to-day operation of the water system and those positions responsible for development and/or approval of the operating budget and capital improvement program.

Water System Management Structure

Figure 6-1 Water System Organizational Chart, is a flow chart which depicts the management hierarchy of Grandview's water system. Brief descriptions of the general responsibilities of each position identified in Figure 6-1 are listed below:

Mayor and City Council: Responsible for establishing all water system policies, including service area boundaries, user rate structures, water system personnel salaries, water department budget, and capital improvements. Approves all expenditures.

City Administrator: Reviews all water system policy changes and expenditures, approves all personnel hiring, and advises Public Works Director on general water department operation.

Public Works Director: Responsible for the direct coordination of all day-to-day water system operation and maintenance tasks. Reports on the status and needs of the water system to the City Administrator, Mayor and City Council. Prepares annual water department budget. Reviews all water system policy changes and expenditures. Establishes staff job descriptions and requirements, and recommends hiring of personnel. Serves as public and press contact regarding water system information.

Assistant Public Works Director: Under the general supervision of the Public Works Director, assists in the management, planning, and organization of the Public Works Department. Provides information on the status and needs of the water system to the Public Works Director. Work requires considerable professional judgment and initiative within the framework of established regulations, policies, and keeps the Water Department in compliance with Department of Health rules and regulations. In the absence of the Public Works Director, this position may assume the duties of the Public Works Director when assigned.

City Treasurer: Responsible for supervision of utility billings and budgeting preparation. Allocates funds for approved expenditures.

Utility Clerk: Responsible for entering water meter reading data into the computer, generating monthly water billings, and maintaining water consumption records.

Consulting Engineer: Assists City in long-range planning; aids Public Works Director in technical aspects of water system; and provides design engineering and construction services for capital improvements.

Water Plant Operator: Under the general supervision of the Assistant Public Works Director and, at times, may serve in a lead capacity. Responsible for water quality testing as required by the Safe Drinking Water Act and the Washington Department of Health. Independently and collaboratively monitors and researches federal and state regulations that will impact operations and/or compliance.

Code Enforcement Officer/Building Inspector/Cross Connection Manager: Under the general supervision of the Assistant Public Works Director, determine cross-connection hazards, collect and analyze data, and complete annual summary report. Consult with, and explain cross connection control requirements to property owners, managers, contractors, government agencies and the general public. Coordinate Cross Connection Control Program activities with other City departments. Prepare and maintain records and files including field test data, surveys, cross connection locations, and approved backflow assembly inventories. Compose correspondence, prepare forms and write reports relating to the Cross Connection Control Program. Issue written warnings to customers as necessary. Oversee certified testers and perform other related duties as assigned.

Public Works Foremen: Under the direction of the Public Works Director, is responsible for supervising, scheduling, and training public works personnel, meeting the public, and assisting in water system planning. Must possess and maintain a valid Washington State Water Distribution Manager 2 Certificate.

Public Works Maintenance Technicians: Responsible for maintaining a complete knowledge of all aspects of the operation, maintenance, preventive maintenance, policies, procedures, and safety aspects of water system facilities. Must be capable of performing all duties required, operating or learning to operate every tool, piece of machinery and equipment within the water department and must have a working knowledge of all types of materials, i.e., pipes, valves, and pumps. Must maintain, or be capable of obtaining a valid Washington State Water Distribution Specialist Class 1 Certificate or better.

6.2 OPERATOR CERTIFICATION

All Group A water systems within the State of Washington are classified according to the population they serve and are required by state regulation to have a certified operator in charge of system operation. Operators are required to be certified at or above the certification level of the distribution system. Grandview's water distribution system, which serves 1,501 and 15,000 persons, is considered a Class 2 system and is, therefore, required to have a Class 2 (or greater) Water Distribution Manager (WDM) responsible for system operation. Grandview is also required to have a Cross-connection Control Specialist (CCS) responsible for the system's cross-connection control program, and is required to have a Backflow Assembly Tester (BAT) responsible for monitoring backflow prevention assemblies.

Included within Figure 6-1 are the water certifications of the various Public Works employees responsible for the operation and maintenance of Grandview's water system. Grandview currently has two public works employees with Water Distribution Manager certification at the Class 3 level, one public works employee with Water Distribution Manager certification at the Class 2 level, and one public works employee with Water Distribution Manager certification at the Class 1 level. In addition, Grandview currently has two public works employees with Cross-Connection Control Specialist certifications. Figure 6-1 provides the current certifications of all of Grandview's water system employees who work in and have water system responsibilities.

CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM ORGANIZATIONAL CHART

MAYOR NORM CHILDRESS
AND
CITY COUNCIL

JESSE PALACIOS
MIKE BREN
JAVIER RODRIGUEZ
BILL MOORE
JOAN SOUDERS
GLORIA MENDOZA
ROBERT OZUNA

CITY ADMINISTRATOR
CUS ARTEAGA, WDM3 (509) 882-9213

PUBLIC WORKS DIRECTOR
CUS ARTEAGA, WDM3 (509) 882-9213

CONSULTING ENGINEER
HUIBREGTSE, LOUMAN ASSOCIATES, INC. (HLA)
(509) 966-7000

ASST. PUBLIC WORKS DIRECTOR
SANTOS TREVINO, WDM2, CCS (509) 882-9212

PUBLIC WORKS FOREMAN
JUAN MORENO, WDM1, (509) 882-9228

WATER PLANT OPERATOR
DANIEL TILIANO, WDM3, WTPO3, (509) 831-5683

CODE ENFORCEMENT OFFICER
CORY TAYLOR, CCS, (509) 882-9225

PUBLIC WORKS EMPLOYEE

FRANK RODRIGUEZ	PW MAINTENANCE TECH
HECTOR MEJIA	PW MAINTENANCE TECH
VICTOR LEDESMA	PW MAINTENANCE TECH
TONY CAVAZOS	PW MAINTENANCE TECH
MANUEL PLATA	PW MAINTENANCE TECH
JASON VILLANUEVA	PW MAINTENANCE TECH
SCOTT SMOTHERMAN	PW MAINTENANCE TECH
DAN LOPEZ	PW MAINTENANCE TECH
RICK ASHER	PW MAINTENANCE TECH

CITY CLERK
ANITA PALACIOS, (509) 882-9208

CITY TREASURER
MATT CORDRAY, (509) 882-9207

UTILITY BILLING CLERK
MARY PADILLA, (509) 882-9201

PUBLIC WORKS ASSISTANT
LILLIAN VELIZ, (509) 882-9231

PUBLIC WORKS OFFICE CLERK
PAM DOBRAUC, (509) 882-9211

LEGEND

WDS1 = WATER DISTRIBUTION SPECIALIST CLASS 1
WDM1 = WATER DISTRIBUTION MANAGER CLASS 1
WDM2 = WATER DISTRIBUTION MANAGER CLASS 2
WDM3 = WATER DISTRIBUTION MANAGER CLASS 3
CCS = CROSS CONNECTION SPECIALIST
WTPO3 = WATER TREATMENT PLANT OPERATOR CLASS 3

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FIGURE 6-1

6.3 SYSTEM OPERATION AND CONTROL

Section 3.3 System Description and Analysis, provides a detailed description of the various water system components and their interrelationship. This interrelationship is depicted in Figure 3-1 and Map A in the back of this Plan. It is important that water department personnel fully understand the system in order to evaluate its operation and maintenance requirements.

Routine System Operation and Preventative Maintenance

An outline of routine operational tasks for the various major system components is provided below:

A. Source Wells and Pumps

1. Daily Tasks

   a. Check all well facilities visually.
   b. Maintain oil levels for well pumps.
   c. Check packing glands.
   d. Check chlorination systems.
   e. Check telemetry system.
   f. Record flow meter totalizer readings.

2. Monthly Tasks

   a. Check and grease well pump packing and pump motor seal bearings.
   b. Check oil level in pump bearing reservoir and fill, if necessary.
   c. Check floor drains and clean, if necessary.
   d. Clean pumphouse floors.
   e. Monitor and record well draw down levels.

3. Seasonal Tasks

   a. Winterize or de-winterize pumphouse facilities.
   b. Check heating and A/C equipment and thermostats, adjust as necessary.
   c. Clean chlorination system equipment.

4. Yearly Tasks

   a. Summarize flow meter totalizer records.
   b. Change oil in motors using DTE Light.
   c. Maintain chlorine detectors.

5. Every Three Years Task

   a. Take sample of raw water from each well and submit to the Washington State Department of Health Lab for an Inorganic Chemical and Physical (IOC) Analysis, for Volatile Organic Chemical (VOC) Analysis, and for Synthetic Organic Chemical (SOC) Analysis, unless sources have been granted a waiver under the susceptibility waiver program.
   b. Take sample of raw water from each well and submit to a state certified laboratory for required lead and copper analysis, as directed by the Washington State Department of Health.

6. Every Four Years Task

   a. Conduct sampling for required radionuclides testing and submit to the Washington State Department of Health Lab.

B. Reservoirs

1. Daily Tasks

   a. Visually inspect reservoir exteriors.
   b. Check pressure transmitter and level controls at Velma Well for 0.5 MG Reservoir.
   c. Clear any vegetation near reservoir base.

2. Monthly Tasks

   a. Check the hatches and the screens on the vent and overflow pipes on all reservoirs.

3. Yearly Tasks

   a. Inspect reservoir interiors as possible without removing from service.

4. Every Five Years Task

   a. Empty reservoirs individually and inspect interiors. Clean, refill, and chlorinate reservoir before removing the next one from service.

5. As Required Tasks

   a. Inspect and video record reservoir interiors using diver, and vacuum remove accumulated debris.

C. Distribution System

1. Weekly Tasks

   a. Conduct free and total chlorine count tests at random sites within the distribution system. Report test results to Public Works and submit to the Washington State Department of Health at month end.

2. Monthly Tasks

   a. Take required number of water samples from various representative sites within the distribution system and submit them to a certified laboratory for bacteriological analysis in accordance with the *Coliform Monitoring Plan*.
   b. Flush selected fire hydrants in various areas within the water system.

3. Seasonal Tasks

   a. Insulate service meters.

4. Yearly Tasks

   a. Operate all valves through their full range and listen for leaks
   b. Operate and flush all fire hydrants. Lubricate hydrant caps and threads. Touch-up paint as required.
   c. Inspect all cross-connection control devices.
   d. Take required number of water samples from various representative sites within the distribution system and submit them for disinfection byproducts analysis in accordance with the *Stage 2 DBP Monitoring Plan*.

5. As Required Tasks

   a. Flush low velocity water mains as required to remove sedimentation.
   b. Review plans for installation of cross-connection control devices on proposed new construction.

c. Inspect installation of required devices on new construction.
d. Repair and/or replace service meters.

D. Telemetry System

1. Daily Tasks

a. Observe telemetry system operation and alarms.

2. Weekly Tasks

a. Check automatic dialer status.

3. Monthly Tasks

a. Check total well production and compare to recorded consumption.
b. Check telemetry system alarms.

4. As Required Tasks

a. Make any required changes to pump Start / Stop settings.

6.4 SAFETY PROCEDURES

All City personnel are instructed to exercise the utmost care when working on any water system facility. Safety of City staff and the public is the number one priority. Provided below is an outline of safety procedures to be followed when working on water system facilities:

A. Pumping Equipment

1. Removing Pump

a. Close valves.
b. Shut off power to the pump, use lockout/tagout policy and procedures.
c. Ensure power is disconnected and then remove electrical cables.
d. Lift pump with proper equipment.

2. Installing Pump

a. Lift pump with proper equipment.
b. Ensure all pipe connections are properly installed and tightened.
c. Employ an electrician to properly connect power cables.
d. Check pump rotation.
e. Open valves.
f. Ensure pump control valve (if present) is operating properly.
g. Turn on power to the pump and remove lockout/tagout tag.

B. Chlorination Equipment

1. Check all chlorine alarms and sensors for proper operation.
2. Verify leak alarm status before entering the room.
3. Immediately check for chlorine odors.
4. Routinely inspect for leaks.
5. Check ventilation system equipment for proper operation.
6. Properly maintain emergency breathing equipment.

C. Reservoir – Interior Inspection

1. Inspection to be conducted by a minimum of two workers, one work to stay outside the reservoir.

2. Ensure the reservoir interior is properly ventilated and illuminated.
3. Properly set and secure ladder before climbing into reservoir.

D. Distribution System – Pipeline Installation

1. All construction work requiring excavation, trenching, and shoring shall be conducted in accordance with the Department of Labor and Industries Safety Standards for Construction Work.
2. Close all valves connecting to pipe segment.
3. Properly set traffic control signing, barricades, and cones.
4. Install shoring or cribbing in all trenches over 48 inches in depth.
5. Install joint restraints or construct thrust blocking, if required, and partially backfill the trench at a minimum prior to charging the pipeline.
6. Flush, disinfect pipe, and conduct bacteriological testing prior to putting new line into service.

6.5 SERVICE AND SUPPLY REPRESENTATIVES

Provided below is a list of service and supply representatives for the various system components:

A. Pipe, Valves, and Fittings

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: 509-248-8400
   Contact: Tim Heary – 509-952-7751

2. Western Utilities
   P.O. Box 11437
   Spokane, WA 99211
   Phone: 509-535-1396

B. Water Service Materials

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: 509-248-8400
   Contact: Tim Heary – 509-952-7751

C. Service Meters – Badger Meter

1. Ferguson Waterworks
   1130 West Washington Street
   Pasco, WA 99301
   Phone: 509-545-2111

D. Chlorination Equipment – Wallace & Tiernan

1. TMG Services
   13202 Second Street East
   Sumner, WA 98390
   Phone: 800-562-2310

E. Chlorine Gas

1. Pioneer Americas
   2001 Thorne Road
   Tacoma, WA 98421
   Phone: 877-272-0500 ext. 100

F. Water Main Tapping

1. Spear Taps, Inc.
   309 NE 159th Street
   Seattle, WA 98155
   Phone: 206-363-8053

G. Electrical

1. Stegeman Electric
   125 West Second Street
   Grandview, WA 98930
   Phone: 509-882-3800

H. Pumps

1. Lower Valley Machine Shop
   104 West Fifth Street
   Grandview, WA 98930
   Phone: 509-882-3881

2. Picatti Brothers
   111 South Third Avenue
   Yakima, WA 98902
   Phone: 509-248-2540

I. Pressure Reducing Valves

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: 509-248-8400
   Contact: Tim Heary – 509-952-7751

J. Telemetry System

1. Conley Engineering, Inc.
   1433 Lakeside Court, Suite 100
   Yakima, WA 98902
   Phone: 509-965-9872

K. Pump, Motor Oil, and Bearing Grease

1. R.E. Powell Distributing
   501 East Wine Country Road
   Grandview, WA 98930
   Phone: 509-882-2115

6.6 COMPREHENSIVE MONITORING PLAN

The City of Grandview monitors its system's water quality in accordance with the requirements of WAC 246-290-300, 246-290-310, and 246-290-320, which define the minimum monitoring requirements, maximum contaminant levels (MCLs) and maximum residual disinfectant levels (MRDLs), and follow-up action requirements for public water systems. The following summarizes the requirements as they pertain to the City of Grandview:

6.6.1 Monitoring Requirements, Location, and Frequency

Bacteriological Analysis: Bacteriological analysis is conducted in accordance with the procedures and locations specified in Grandview's *Coliform Monitoring Plan*, a copy of which is provided in CHAPTER 10 of this Plan. The minimum number of bacteriological samples required per month within the distribution system is based upon the population served and is shown in part in Table 6-1 below:

TABLE 6-1 MINIMUM MONTHLY COLIFORM SAMPLING REQUIREMENTS

Permanent Population Served	Minimum Number of Samples per Month
4,901 - 5,800	6
5,801 - 6,700	7
6,701 - 7,600	8
7,601 - 8,500	9
8,501 - 12,900	10 (Grandview's current requirement)
12,901 - 17,200	15
17,201 - 21,500	20
21,501 - 25,000	25

Disinfection Byproducts (DBPs): Samples are to be collected from two locations within the distribution system identified in the City's *Stage 2 DBP Monitoring Plan*. For Stage 2 monitoring, two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually. These locations must have the highest averages of total trihalomethanes (TTHMs) and haloacetic acids (HAA5).

Inorganic Chemical and Physical Analyses: Generally, a minimum of one sample from each source well is required per compliance period as a result of the IOC waivers. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Nitrate/Nitrite Monitoring: Nitrate and Nitrite samples from each source are generally required once annually and quarterly at three of its wells. The samples generally shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system. Sources S07, S10, S13, and S16 shall be collected from a point representative of the source prior to treatment.

All source wells shall be tested individually, though some sources are blended prior to entering the distribution system. In addition to the individual tests at blended source locations, a sample shall be taken beyond the blending point, prior to entering the distribution system.

Radionuclides: Radionuclide samples from each source are generally required once every three years. However, the Department of Health may reduce monitoring requirements to once every six or nine years. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Volatile Organic Chemicals (VOCs): VOC samples shall be taken at each source once every 3 months for the first 12 months of operation, or as directed by the Department of Health. If no VOCs are detected in the first 12 months from a ground water source, only one annual sample will be required for the first three years of sampling, per 40 CFR 141.24. If no VOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The Department of Health may grant waivers for monitoring requirements. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Synthetic Organic Chemicals (SOCs): SOC samples shall be taken at each source once every 3 months for the first 12 months of operation, or as directed by the Department of Health. If no SOCs are detected in the first 12 months from a ground water source, only one annual sample will be required for the first three years of sampling, per 40 CFR 141.24. If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The Department of Health may grant waivers for monitoring requirements. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Lead and Copper: A minimum of 30 samples at targeted sample tap locations throughout the distribution system are required every three years for lead and copper monitoring. The water system must provide individual sampling results to the persons at each sample location no later than 30 days after receiving the results. Additionally, the water system must complete and submit the signed *Lead and Copper Consumer Notice Certification Form* (CHAPTER 10) and a sample copy of one consumer notice to the Department of Health within 90 days after the end of the monitoring period.

Asbestos: One asbestos sample shall be taken from the water distribution system at one of the City's routine coliform sampling sites that is known to have asbestos concrete (AC) pipe.

Other Substances: Monitoring of other substances in the future will be as required by the Department of Health.

6.6.2 Testing Laboratories

Samples which have been collected must be transported and analyzed in accordance with Department of Health requirements. The analyses must be done by a state public health laboratory or a state certified private laboratory.

The City of Grandview routinely delivers bacteriological samples to Cascade Analytical, Inc. on the same day they are taken. Sample bottles are obtained from the laboratory.

Samples for other required tests, e.g., Inorganic Chemical and Physical Analysis, are delivered to Cascade Analytical, Inc., of Union Gap, WA on the same day they are taken. As with the bacteriological samples, sample bottles are obtained from the laboratory.

6.6.3 Violation Procedures

The City of Grandview is responsible for complying with the standards of water quality identified in WAC 246-290-310. If any substance exceeds its maximum contaminant level (MCL) and/or maximum residual disinfectant levels (MRDLs), the City shall take follow-up action as outlined under WAC 246-290-320.

Maximum Contaminant Levels (MCLs) and Maximum Residual Disinfectant Levels (MRDLs)

Bacteriological – If any coliform bacteria are present in any sample, follow-up action as described under WAC 246-290-320(2) shall be taken in accordance with the City's Coliform Monitoring Plan and the Groundwater Rule (GWR) requirements.

Disinfection Byproducts (DBPs) and Residuals – MCLs and MRDLs for disinfection byproducts and residuals are as shown in Table 6-2.

TABLE 6-2 DISINFECTION BYPRODUCTS AND RESIDUALS

DISINFECTION BYPRODUCT	MCL (mg/l)
Total Trihalomethanes (TTHMs)	0.080
Haloacetic acids (HAA5)	0.060
Bromate	0.010
Chlorite	1.0
DISINFECTION RESIDUAL	**MRDL (mg/l)**
Chlorine	4.0 (as $C1_2$)
Chloramines	4.0 (as $C1_2$)
Chlorine Dioxide	0.8 (as $C1O_2$)

Inorganic Chemical and Physical (IOC) – MCLs for inorganic chemical and physical properties are as shown in Table 6-3.

TABLE 6-3 INORGANIC CHEMICAL MCLS	
Chemical or Physical Characteristics	MCL (mg/l)
Primary Substances	
Antimony (Sb)	0.006
Arsenic (As)	0.010
Asbestos	7 million fibers/liter
Barium (Ba)	2.0
Beryllium (Be)	0.004
Cadmium (Cd)	0.005
Chromium (Cr)	0.1
Copper (Cu)*	1.3
Cyanide (HCN)	0.2
Fluoride (F)	4.0
Lead (Pb)*	0.015
Mercury (Hg)	0.0020
Nickel (Ni)	0.10
Nitrate (as N)	10.0
Nitrite (as N)	1.0
Selenium (Se)	0.05
Sodium (Na)*	20
Thallium (Tl)	0.002
Secondary Substances	
Chloride (Cl)	250.0
Fluoride (F)	2.0
Iron (Fe)	0.3
Manganese (Mn)	0.05
Silver (Ag)	0.1
Sulfate (SO_4)	250.0
Zinc (Zn)	5.0
Color	15 Color Units
Specific Conductivity	700 umhos/cm
Total Dissolved Solids (TDS)	500
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.	

Radionuclides – MCLs for Radionuclides are as shown in Table 6-4.

TABLE 6-4 RADIONUCLIDE MCLS	
RADIONUCLIDE	MCL
Combined Radium-226 and Radium-228	5 pCi/l
Gross alpha particle activity (excluding uranium and radon)	15 pCi/l
Beta particle and photon radioactivity	4 mrem/year
Uranium	30 µg/l

Volatile Organic Chemicals (VOCs) – MCLs for VOCs are as shown in Table 6-5.

TABLE 6-5 VOLATILE ORGANIC CHEMICAL MCLS	
VOLATILE ORGANIC CHEMICAL	MCL (mg/l)
Benzene	0.005
Carbon Tetrachloride	0.005
para-Dichlorobenzene	0.075
Trichloroethylene	0.005
Vinyl Chloride	0.002
1,1,1-Trichloroethane	0.2
1,1-Dichloroethylene	0.007
1,2 Dichloroethane	0.005
cis-1,2-Dichloroethylene	0.07
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
Trans-1,2-Dichloroethylene	0.1
Xylenes	10
1,2-Dichloropropane	0.005
Dichloromethane	0.005
1,1,2-Trichloroethane	0.005
1,2,4-Trichlorobenzene	0.07

Synthetic Organic Chemicals (SOCs) – MCLs for SOCs are as shown in Table 6-6.

TABLE 6-6 SYNTHETIC ORGANIC CHEMICAL MCLS	
SYNTHETIC ORGANIC CHEMICAL	MCL (mg/l)
Alachlor	0.002
Atrazine	0.003
Carbofuran	0.04
Chlordane	0.002
EDB	0
DBCP	0.0002
Heptachlor	0.0004
Heptachlor Epoxide	0.0002
Lindane	0.0002
Methoxychlor	0.04
Toxaphene	0.0003
PCBs	0.0005
Pentachlorophenol	0.001
2,4-D	0.07
2,4,5-TP	0.05
PAHs (Benzo(a)pyrene)	0.0002
Dalapon	0.2
Di(ethylhexyl)-Adipate	0.4
Di(ethylhexyl)-Phthalate	0.006
Dinoseb	0.007
Diquat	0.1
Endothall	0.1
Endrin	0.002
Glyphosate	0.7
Hexachlorobenzene	0.001
Hexachlorocyclo-Pentadiene	0.05
Oxymal	0.2
Picloram	0.5
Simazine	0.004
2,3,7,8-TCDD (Dioxin)	0

6.6.4 Follow-up Action

1. General:

   a. If water quality exceeds any MCL or MRDL listed in WAC 246-290-310, the purveyor shall notify the Department and take follow-up action as described in this section.
   b. When a primary MCL violation occurs, the purveyor shall:

      i. Notify the Department within 48 hours in accordance with WAC 246-290-480;
      ii. Notify the public according to the procedures outlined under WAC 246-290-71001;
      iii. Determine the cause of the contamination; and
      iv. Take corrective action as required by the Department.

   c. When a secondary MCL violation occurs, the purveyor shall notify the Department and take corrective action as directed by the Department.

2. Bacteriological:

a. When coliform bacteria are present in any sample and the sample is not invalidated under e. of this subsection, the purveyor shall ensure the following actions are taken:

i. The sample is analyzed for fecal coliform or E. coli. When a sample with a coliform presence is not analyzed for E. coli or fecal coliforms, the sample shall be considered as having a fecal coliform presence for MCL compliance purposes;
ii. Repeat samples are collected in accordance with b. of this subsection;
iii. Collect triggered source samples in accordance with c. of this subsection and have them tested for E. coli.
iv. The Department is notified in accordance with WAC 246-290-480; and
v. The cause of the coliform presence is determined and corrected.

b. Repeat samples: The purveyor shall collect and submit for analysis a set of repeat samples for every sample in which the presence of coliforms is detected in accordance with the following:

i. A set of three (3) repeat coliform samples is required for Group A systems collecting more than one routine coliform sample each month and shall be collected at the following locations:

(1) At the site of the previous sample with a coliform presence.
(2) Within five active services <u>upstream</u> of the site of the sample with a coliform presence.
(3) Within five active services <u>downstream</u> of the site of the sample with a coliform presence.

ii. For Group A systems, all samples in a set of repeat samples shall be collected on the same day and submitted for analysis within 24 hours after notification by the laboratory of a coliform presence. If the purveyor can demonstrate to the satisfaction of the Department that logistical problems beyond the purveyor's control make analysis of the samples in the repeat sample set impractical because the time between sample collection and analysis will exceed 30 hours, then the purveyor shall collect the required set of repeat samples as directed by the Department.

iii. When repeat samples have coliform presence, the purveyor shall:

(1) Contact the Department and collect a minimum of one additional set of repeat samples as directed by the Department; or
(2) Collect one additional set of repeat samples for each sample where coliform presence was detected.

iv. If a sample with a coliform presence was collected from the first two or last two active services, the purveyor shall monitor as directed by the Department.

v. The purveyor may change a previously submitted routine sample to a sample in a set of repeat samples when the purveyor:

(1) Collects the sample within five adjacent service connections of the location from which the initial sample with a coliform presence was collected;
(2) Collects the sample after the initial sample with a coliform presence was submitted for analysis;
(3) Collects the sample on the same day as other samples in the set of repeat samples, except under b. ii. of this subsection; and
(4) Requests and receives approval from the Department of the change.

vi. The Department may waive the requirement to collect sets of repeat samples under this subsection during a month when a non-acute coliform MCL violation is determined for the system.

c. Triggered Source Sampling: In accordance with the Groundwater Rule (GWR) requirements, triggered source samples must be collected and tested for E. coli when coliform bacteria are

present in any routine distribution sample. Triggered source sampling shall be conducted as follows:

i. Triggered source samples must be collected within 24 hours of notification of the total coliform positive result.
ii. Each source that was in operation at the time the routine sample was collected must be tested prior to treatment.
iii. If one of the triggered source samples is E. coli positive, corrective action shall be taken as directed by the DOH, or five additional source samples must be taken within 24 hours.
iv. If any of the five additional source samples is E. coli positive, one or more of the following corrective actions may need to be taken, as directed by the DOH:

(1) Provide an alternate source of water.
(2) Eliminate the source of contamination.
(3) Provide 4-log treatment.

v. Customers must be notified within 24 hours of receiving an E. coli positive triggered source sample.

d. Monitoring frequency following a coliform presence: Group A systems having one or more coliform presence samples that were not invalidated during the previous month shall collect and submit for analysis the minimum number of routine samples shown in Table 6-1.

i. The Department may waive the monitoring frequency requirement when one or more samples with a coliform presence were collected during the previous month, if the purveyor proves to the satisfaction of the Department:

(1) The cause of the sample with a coliform presence; and
(2) The problem is corrected before the end of the next month the system provides water to the public.

ii. If the Department waives this monitoring frequency requirement:

(1) The purveyor shall collect and submit at least the minimum number of samples required when no samples with a coliform presence were collected during the previous month; and
(2) The Department shall make available a written description explaining:

(a) The specific cause of the coliform presence; and
(b) Action taken by the purveyor to correct the cause of coliform presence.

e. Invalid samples.

i. The Department shall consider coliform samples with no coliform presence detected invalid when:

(1) A certified laboratory determines that the sample results show:

(a) Multiple tube technique cultures are turbid without appropriate gas production;
(b) Presence-absence technique cultures are turbid in the absence of an acid reaction;
(c) There are confluent growth patterns or growth of TNTC (too numerous to count) colonies without a surface sheen using a membrane filter analytic technique;
(d) There is excess debris in the sample; or
(e) That improper sample collection and analysis occurred.

ii. The Department may also invalidate a coliform sample when:

(1) The Department determines a nondistribution system problem occurred as indicated by:

(a) All samples in the set of repeat samples collected at the same location as the original coliform presence sample also have coliform presence; and

(b) All other samples in the set of repeat samples are free of coliform.

(2) The Department determines a coliform presence result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, when the Department invalidates a sample:

(a) The purveyor shall collect a set of repeat samples following the sample invalidation in accordance with 2.b. above; and
(b) The Department's rationale for invalidating the sample shall be documented in writing and made available to the public. The documentation shall state the specific cause of the coliform presence and what action the purveyor has taken or will take.

iii. When a coliform sample is determined invalid, the purveyor shall collect and submit for analysis:

(1) An additional coliform sample from the same location as each invalid sample within 24 hours of notification of the invalid sample; or
(2) If determined that invalid sample resulted from circumstances not reflective of distribution system water quality, collect a set of samples as outlined in section b. i. of this subsection; and
(3) Additional coliform samples as directed by the Department.

iv. When the Department or laboratory invalidates a sample, the sample shall not count towards the purveyor's minimum coliform monitoring requirements.

3. Inorganic Chemical and Physical (IOC): When an initial analysis of any substance exceeds the MCL, the purveyor shall take the following action:

a. For nitrate, immediately take one additional sample from the same sampling point. If the average of the two samples exceeds the MCL, a violation is confirmed, or
b. For all other inorganic chemical and physical substances, within 30 days take three additional samples from the same sample point. If the average of all four samples exceeds the MCL, a violation is confirmed.

4. Inorganic Turbidity: When the turbidity exceeds the maximum allowable limit identified under WAC 246-290-310 for longer than one hour monitored continuously, the purveyor shall report to the Department within 48 hours. When the results of a manual turbidity analysis exceeds maximum allowable limit, another sample shall be collected within one hour. When the repeat sample confirms the maximum allowable limit has been exceeded, the purveyor shall notify the Department.

5. Volatile Organic Chemicals (VOCs): The purveyor shall be responsible for the following follow-up actions:

a. After the purveyor's receipt of the first VOC analysis results from the laboratory, the purveyor shall provide notice to persons served by the system as described under WAC 246-290-71001.
b. When a List 1 VOC is verified at a concentration above the detection limit, the purveyor shall, at a minimum:

i. Sample the source once every three months for at least three years; and
ii. Make analysis results available to consumers within three months of receipt from the laboratory as described under WAC 246-290-71006.

c. When a List 1 VOC is verified at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL, the purveyor shall repeat sample the source as soon as possible. If a concentration greater than an MCL is confirmed, the purveyor shall:

i. Notify the Department within seven days of receipt of the repeat sample analysis results;
ii. Provide consumer information in accordance with WAC 246-290-71006;

iii. Submit documentation to the Department describing the water system's strategy for gathering and analyzing additional data, and identify plans for keeping the public informed; and
iv. Sample the source a minimum of once every three months for at least three years.

d. When the running annual average of a List 1 VOC is greater than an MCL, or one sample analysis result causes the annual average to exceed an MCL, the purveyor shall:

i. Notify the Department within seven days of receipt of analysis results;
ii. Notify the public as described under WAC 246-920-71006, including mandatory health effects language;
iii. Submit an action plan to the Department for approval addressing follow-up activities, including corrective action. The purveyor shall submit the action plan within four months of receipt of Department notice that the annual average exceeds the MCL. The purveyor's action plan shall, at a minimum, contain:

(1) Tabulation of VOC sample analysis results, including the location where VOCs were detected;
(2) Description of monitoring plans for system sources;
(3) Strategy for informing the public of monitoring results and investigations; and
(4) Description of short and long-term plans to minimize exposure and/or eliminate the source of contamination.

iv. Implement the action plan within one year of the Department's approval. The Department may require the purveyor's earlier compliance, if necessary, to eliminate an immediate health threat, or may require a revision of the action plan based upon additional sample results. The Department may extend the purveyor's period of compliance when the Department determines:

(1) Substantial construction is required; and
(2) The purveyor has taken all appropriate measures to protect the health of consumers served by the public water system.

If the Department grants the purveyor an extension, the purveyor shall issue a notice identifying the MCL exceeded and the amount by which the repeat sample analysis results exceeded the MCL. The purveyor shall include the notice in all bills mailed to affected customers until the Department determines that the purveyor complies with the MCL.

v. Sample the source a minimum of once every three months for at least three years.

e. When a List 2 or List 3 VOC is verified at a concentration above the detection limit, the purveyor shall:

i. Submit the sample analysis results to the Department within seven days of receipt from the laboratory; and
ii. Sample the source a minimum of once every three months for one year, and then annually thereafter during the three-month period when the highest previous measurement occurred.

f. If the Department determines that a List 2 or List 3 VOC is verified at a level greater than a state advisory level (SAL), the Department shall notify the purveyor in writing. The purveyor shall repeat sample the source as soon as possible after initial Department notice that an SAL has been exceeded. The purveyor shall submit the analysis results to the Department within seven days of receipt from the laboratory. If any repeat sample confirms that an SAL has been exceeded, the purveyor shall:

i. Provide consumer information in accordance with WAC 246-290-71006;
ii. Sample the source a minimum of once every three months for at least three years; and
iii. Submit documentation to the Department listing VOC analysis results, describing the water system's strategy for gathering and analyzing additional data, and identifying plans for keeping the public informed. The purveyor shall submit this information to the Department

within six months of the date of the first notice from the Department that an SAL has been exceeded.

g. The Department may reduce the purveyor's monitoring requirement for a source detecting a List 1 VOC if, after three years of quarterly monitoring, all analysis results are less than the MCL. The purveyor's reduced monitoring frequency shall be no less than one sample per year.
h. The Department may reduce the purveyor's monitoring requirement for a source detecting a List 2 or List 3 VOC if the source has been monitored annually for at least three years, and all analysis results are less than the SAL.
i. In establishing SAL's for List 2 and List 3 VOCs, the Department shall use the most recent edition of the Department document titled "Procedures and References for Determination of State Advisory Levels for Drinking Water Contaminants" which has been approved by the State Board of Health. Copies are available from the Department upon request.
j. When List 1, List 2 (exclusive of TTHMs), or List 3 VOCs are verified in well fields, the purveyor shall repeat sample individual wells within the well field.
k. When the sum of all trihalomethanes detected exceeds 0.100 mg/L, the purveyor shall sample within three months for total trihalomethanes as required under WAC 246-290-300(5).
l. The Department may collect samples from a water system or may require that specified quality assurance techniques be used to collect samples.

6. For any additional substance exceeded, follow-up action shall be determined by the Department when the MCL violation occurs.

Public Notification

1. Responsibility: The purveyor of a Group A water system shall notify the water system users and the Department for any of the following conditions:

   a. Exceedances of maximum contaminant levels (MCLs) or maximum residual disinfectant levels (MRDLs);
   b. Violation of treatment techniques;
   c. Monitoring and testing procedure violations;
   d. Failure to comply with the schedule of a variance or exemption;
   e. Operation under a variance or exemption;
   f. Occurrence of a waterborne disease outbreak or other waterborne emergency;
   g. Exceedance of the secondary maximum contaminant level for fluoride; and
   h. Availability of unregulated contaminant monitoring results.

   These conditions are grouped into three categories, and require public notification in English and in Spanish within different time periods as described below:

   a. Tier 1 Conditions require public notification within 24 hours. Such conditions include:

      i. Violation of the MCL for total coliform, when fecal coliform or E. coli are present in the water distribution system, or failure to test for fecal coliform or E. coli when any repeat sample tests positive for coliform;
      ii. An E. coli positive groundwater source sample;
      iii. Violation of the MCL for nitrate, nitrite, or total nitrate and nitrite; or when a confirmation sample is not taken within 24 hours of the system's receipt of the first sample showing exceedance of the nitrate or nitrite MCL;
      iv. Violation of the turbidity MCL of 5 NTU, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not occur in 24 hours after the system learns of violation;
      v. Violation of the treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not take place in 24 hours after the system learns of violation;
      vi. Occurrence of a waterborne disease outbreak, as defined in 40 CFR 141.2, or other waterborne emergency; and

vii. Other violations or situations with significant potential to have serious adverse effects on human health as a result of short term exposure, as determined by the primary agency, either in its regulations or on a case-by-case basis.

b. Tier 2 conditions require public notification within 30 days. Such conditions include:

i. All violations of the MCL, MRDL, and treatment technique requirements except where Tier 1 notice is required;
ii. Violations of the monitoring requirements where the primary agency determines that a Tier 2 public notice is required, taking into account potential health impacts and persistence of the violation; and
iii. Failure to comply with the terms and conditions of any variance or exemption in place.

c. Tier 3 conditions require public notification within one year. Such conditions include:

i. Monitoring violations, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
ii. Failure to comply with an established testing procedure, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
iii. Operation under variance granted under §1415 or exemption granted under §1416 of the Safe Drinking Water Act;
iv. Availability of unregulated contaminant monitoring results; and
v. Exceedance of the secondary maximum contaminant level for fluoride.

2. Content: Notices in English and in Spanish shall provide:

a. A clear, concise, and simple explanation of the violation;
b. Discussion of any potential adverse health effects and any segment of the population which may be at higher risk;
c. Mandatory health effects information in accordance with subsection (4) of this section;
d. A list of steps the purveyor has taken or is planning to take to remedy the situation;
e. A list of steps the consumer should take including advice on seeking an alternative water supply if necessary; and
f. The purveyor's name and phone number.

The purveyor may provide additional information to further explain the situation.

3. Distribution:

a. Public notice of a Tier 1 condition shall occur within 24 hours after learning of the condition by placing notices on the front door of every system user. The public notice shall be written in both English and in Spanish.
b. Public notice of a Tier 2 condition shall occur within 30 days after learning of the condition and shall be provided in both English and in Spanish.
c. Public notice of a Tier 3 condition shall occur within 1 year after learning of the condition and shall be provided in both English and in Spanish.
d. The purveyor of a COMMUNITY water system shall give a copy of the most recent public notice for all outstanding violations to all new billing units or new hookups before or at the time water service begins.
e. The purveyor shall provide the Department with a copy of the public notification at the time the purveyor notifies the public.

4. Mandatory Language:

a. The purveyor shall provide specific health effects language in English and Spanish in the notice when a violation involves:

i. A primary VOC MCL;
ii. A secondary fluoride MCL;
iii. An acute coliform MCL;

iv. A non-acute coliform MCL;
v. Granting or continuation of exemption or variance; or
vi. Failure to comply with a variance or exemption schedule.

b. Required specific language is contained in the Department guideline titled “Health Effects Language for Drinking Water Public Notification.”

5. VOC Notification Procedure:

a. Availability of results: After receipt of the first analysis results, the purveyor of a COMMUNITY or NTNC water system shall notify persons served by the system of the availability of results and shall supply the name and telephone number of a contact person.

i. The purveyor shall initiate notification within three months of the purveyor's receipt of the first VOC analysis results. This notification is only required one time.
ii. Notification shall occur by:

(1) Inclusion in the first set of water bills issued after receipt of the results;
(2) Newspaper notice which shall run at least one day each month for three consecutive months;
(3) Direct mail;
(4) Posting if NTNC system; or
(5) Any other method approved by the Department.

iii. Within three months of receipt of analysis results, purveyors selling water to other public water systems shall provide copies of the analysis results to the purchasing system.
iv. Within 30 days of receipt of analysis results, purveyors purchasing water shall make results available to their customers. The purveyor's notification shall occur by the method outlined under (a)(i) of this subsection.

b. Consumer information:

i. The purveyor shall provide consumer information within 21 days of receipt of confirmation sample results when:

(1) A List 1 VOC is confirmed at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL; or
(2) The Department determines a List 2 or List 3 VOC is confirmed at a level greater than an SAL.

ii. Consumer information shall include:

(1) Name and level of VOC detected;
(2) Location where the VOC was detected;
(3) Any health effects the VOC could cause at its present concentration;
(4) Plans for follow-up activities; and
(5) Phone number to call for further information.

iii. Consumer information shall be distributed by any of the following methods:

(1) Notice placed in the major newspaper in the affected area;
(2) Direct mail to customers;
(3) Posting if NTNC system; or
(4) Any other method approved by the Department.

6. Fluoride Notification Procedure: When a secondary MCL violation occurs, the purveyor of a community water system shall send notice to:

a. The Department annually;
b. Water system users annually; and

c. New billing units added while the violation exists.

7. When circumstances dictate the purveyor give a broader or more immediate notice to protect public health, the Department may require the purveyor's notification by whatever means necessary.

8. When the State Board of Health grants a public water system a waiver, the purveyor shall notify customers and new billing units or new hookups before water service begins. The purveyor shall provide a notice annually and send a copy to the Department.

9. The Department may give notice to the water system users as required by this section on behalf of the water purveyor. However, the purveyor remains responsible for ensuring the Department's requirements are met.

6.7 EMERGENCY RESPONSE PROGRAM

On June 12, 2002, the Public Health Security and Bioterrorism Preparedness and Response Act (PL 107-188, referred to as the Bioterrorism Act) was signed into law. The law specifies actions a community water system must take to improve the security of its drinking water infrastructure. In addition, the operations and maintenance section of the WAC Chapter 246-290-415 (2)(d) requires public water systems to have an emergency response plan as part of a water system plan. It also requires that public water systems employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump houses, and distribution systems from possible damage or intruders.

Grandview's *Emergency Response Program* is a plan addressing the City's response to and operation of the water system during unplanned emergency events. The *Emergency Response Program* consists of the following elements:

- System Information
- Chain of Command
- Emergency Events
- Severity of Emergencies
- Emergency Notification
- Water Quality Sampling
- Response Actions for Specific Events
- Alternative Water Sources
- Returning to Normal Operations

6.7.1 System Information

The following is current information pertinent to the Grandview Water System:

System Name:	City of Grandview Water System
System Identification Number:	28970J
System Address:	207 West Second Street Grandview, WA 98930
System Phone Number:	(509) 882-9200
City Mayor:	Norm Childress
Public Works Director/Water System Manager:	Cus Arteaga
System Consulting Engineer:	Huibregste, Louman Associates, Inc. (HLA) 2803 River Road Yakima, WA 98902 (509) 966-7000 Jeffery T. Louman, PE
System Service Population:	11,010
System Service Connections:	2,986
Emergency Plan Responsible Party:	Cus Arteaga, (509) 882-9211

6.7.2 Chain of Command

When an emergency occurs, there can be confusion, lack of coordination, and poor communication. Timely and effective response can minimize the effects of an emergency. Often, the initial response sets the tone for how the entire emergency is handled.

Having a chain of command that defines clear lines of authority and responsibilities for system personnel during an emergency speeds up response time and helps eliminate confusion. Water system personnel need to know who to report the emergency to, who manages the emergency, who makes decisions, and what their own responsibilities are.

The first step in any emergency is to notify the person at the top of the chain of command - the person responsible for managing the emergency and making key decisions. This lead person will assess the situation and initiate a series of response actions based on the type and severity of emergency. In addition to an individual having the lead responsibility, other key duties that should be assigned to system personnel include the following:

- Handling incoming phone calls and administrative support.
- Providing information to the public and the media.
- Contacting and providing information to system customers.
- Assessing the water system's facilities, condition, and ability to operate.
- Organizing and completing system repairs.

Table 6-7 shows the Grandview Water System's emergency chain of command and responsibilities of individuals during water system emergencies:

TABLE 6-7 EMERGENCY CHAIN-OF-COMMAND AND RESPONSIBILITIES		
Name / Title	Responsibilities	Contact Numbers
Norm Childress Mayor	Is the lead person for providing information to the public and the media.	Phone: 882-9200
Cus Arteaga City Administrator WDM III	Coordinates responses and actions of the PWD, and assists the Mayor as requested.	Phone: 882-9200 Cell: 830-9213
Cus Arteaga Public Works Director (PWD) WDM III	Overall management and decision making for the water system. Is the lead person for managing the emergency, providing information to regulatory agencies. Operation of the water system, performing inspections, maintenance and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9200 Cell: 830-9213
Lillian Veliz Public Works Assistant	Administrative functions including receiving phone calls and keeping a log of events.	Phone: 882-9211
Pam Dobrauc Public Works Office Clerk	Administrative functions including receiving phone calls and keeping a log of events.	Phone: 882-9211
Santos Trevino Jr. Assistant Public Works Director WDM III, CCS	Operation of the water system, performing inspections, maintenance and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9211 Cell: 830-1060
Juan Moreno Public Works Foreman (PWF) WDM I	Operation of the water system, performing inspections, maintenance and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9211 Cell: 830-2148
Daniel Tiliano Water Plant Operator WDMIII, WTPOIII	Perform duties, functions, and activities as directed by the PWD or PWF. Responsible for water quality testing as required by the Safe Drinking Water Act and the Washington Department of Health.	Phone: 882-9211 Cell: 831-5683
Cory Taylor Code Enforcement Officer CCS	Perform duties, functions, and activities as directed by the PWD or PWF. Coordinate cross connection control program.	Phone: 882-9211 Cell: 830-0311
Frank Rodriguez P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Phone: 882-4735 Cell: 305-7948
Hector Mejia P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 305-1472
Victor Ledesma P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 439-0612
Tony Cavazos P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 391-6021
Jason Villanueva P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 203-5236
Manuel Plata P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 781-0156
Scott Smotherman P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 831-4153
Dan Lopez P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 830-0757
Rich Asher P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 830-5383

6.7.3 Emergency Events

Emergencies happen for a variety of reasons including:

- Natural disasters including high winds, excessive snowfall and ice storms, floods, drought, well contamination, landslides and earthquakes, and volcanic eruptions.
- Accidents.
- Deliberate acts of vandalism or terrorism.

- System neglect, poor operation, or deferred maintenance.

6.7.4 Severity of Emergencies

Emergencies usually have a wide range of severity. Defining categories of severity can significantly aid in determining appropriate response actions. Knowing the severity of the emergency and being able to communicate it to others will help system personnel keep their response balanced and effective.

Making a decision on severity should be collaborative among system personnel, but is ultimately made by the person in charge of the emergency. The person in charge may also choose to coordinate with external parties, especially if partnerships have been formed in advance of the event. The information for making the decision will accumulate over time, and may result in the level of severity being changed.

An assessment of severity, once determined, must be communicated immediately to all those dealing with the emergency. Make sure staff have cell phones, pagers, and/or radios when they are in the field. Remember to have an alternate method of communicating if cell phones and pagers won't work.

The following is a four-level emergency severity classification system for the Grandview Water System.

A. Level 1 - Routine Emergencies

Routine emergencies are normally resolved within 24 hours, and with minimal outside assistance. The Grandview Water System considers the following to be Level 1 emergencies:

- Short power outages.
- Minor mechanical problems in pumphouses and booster stations.
- Distribution line breaks.
- Other minor situations where it is not likely that public health will be jeopardized.

B. Level 2 - Minor Emergencies

Minor emergencies are those where the water system experiences minor disruption in supply, or has indications of possible contamination. In these types of emergencies, public health may be jeopardized, the system may need to coordinate with DOH, and the City may consider issuing a health advisory to customers. It is important for water system personnel to be on alert and to initiate a quick response. Minor emergencies can usually be resolved within 72 hours. The Grandview Water System considers the following to be Level 2 emergencies:

- Disruption of supply such as a transmission line break, pump failure with a potential for backflow, and loss of pressure.
- Storage is not adequate to handle disruption in supply.
- An initial positive coliform or E. coli sample test result.
- An initial primary chemical sample test result above the DOH standard.
- A disruption in chlorine feed to the water supply.
- A minor act of vandalism.

C. Level 3 - Significant Emergencies

The system experiences a significant mechanical or contamination problem where disruption in supply is inevitable, and issuance of a health advisory is necessary to protect public health. Significant emergencies should be reported to DOH as soon as possible to determine the best available means to protect the health of the system users. Resolution of the emergency may require the aid and assistance of outside entities, and may take longer than 72 hours to resolve. The Grandview Water System considers the following to be Level 3 emergencies:

- A verified sample test result above a DOH standard requiring immediate consideration of a health advisory notice to customers.
- A loss or failure of a major water system component resulting in a water shortage or requiring system shutdown.

- An act of vandalism or terrorist threat such as intrusion or damage to a major water system component.

D. Level 4 - Catastrophic Disasters/Major Emergencies

The water system experiences major damage or contamination from a natural disaster, an accident, or an act of terrorism. Such incidents usually require immediate notification of local law enforcement and local emergency management services. Immediate issuance of health advisories and declaration of water supply emergencies are critical to protect public health. These events often take several days or weeks to resolve before the system returns to normal operation. The Grandview Water System considers the following to be Level 4 emergencies:

- An earthquake or landslide that shuts down the system or impacts sources, lines, etc.
- An act of terrorism possibly contaminating the water system with biological or chemical agents.
- A significant chemical spill in close proximity to one of the system's sources.
- A storm that significantly damages system facilities.

6.7.5 Emergency Notification

During most emergencies, it will be necessary to quickly notify a variety of parties. Preparation for such notification has the following three essential components:

- Assigning responsibility to oversee and carry out the notifications.
- Assembling comprehensive call-up lists with names and contact numbers.
- Writing out procedures for quickly disseminating information to appropriate parties.

Valuable response time can be lost without readily available notification information or the means to deliver it. Having well-formed partnerships will help during these times.

In addition to phone, email, and media (radio, television, newspaper) for notification, the water system may consider forming partnerships with local community groups to assist in delivering information to customers when needed.

Call-up lists should be comprehensive, including local law enforcement, Yakima County Emergency Management, Yakima County Health District, DOH Drinking Water, WDOE, county and neighboring city officials, service and repair providers, and water testing laboratories. A list of priority customers, such as nursing homes, medical clinics, and schools should also be maintained for immediate notification. Provided in Table 6-8, Table 6-9, Table 6-10, and Table 6-11 are notification lists to be used during emergency situations.

TABLE 6-8 LOCAL NOTIFICATION LIST	
Entity	Contact Numbers
Grandview Public Works (Water) Department	daytime phone: 882-9211
Grandview City Hall	daytime phone: 882-9200
Grandview Police Department	daytime phone: 882-9223 24-hour phone: 882-9223
Yakima County Sheriff's Office	daytime phone: 574-2500 24-hour phone: 574-2500
Yakima County Office of Emergency Management	daytime phone: 574-1900 24-hour phone: 574-2500
Yakima Health District	daytime phone: 575-4040 24-hour phone: 575-4040
Yakima County Public Works Department	daytime phone: 574-2300 24-hour phone: 574-2300
City of Prosser Water Department	daytime phone: 786-2332 24-hour phone: 786-2112
City of Sunnyside Water Department	daytime phone: 837-3782 24-hour phone: 836-6200
Water Testing Laboratory: Cascade Analytical, Inc.	daytime phone: 452-7707
Newspaper: Yakima Herald Republic Grandview Herald	daytime phone: 248-1251 daytime phone: 882-3712
Radio Stations: KIT - 1280 AM	daytime phone: 972-5481
Television Stations: KAPP KNDO KIMA	daytime phone: 453-0351 daytime phone: 225-2300 daytime phone: 575-0029

TABLE 6-9 STATE NOTIFICATION LIST	
Entity	Contact Numbers
Department of Health (DOH), Eastern Region	daytime phone: (509) 329-2100 24-hour phone: 1-877-481-4901
Washington Department of Ecology (WDOE)	daytime phone: 575-2490 24-hour phone: 575-2490
DOH Drinking Water After-Hours Emergency Hotline	1-877-481-4901

TABLE 6-10 SERVICE / REPAIR NOTIFICATION LIST	
Entity	Contact Numbers
Electrical: American Electric Tolman Electric Stegeman Electric	 daytime phone: 946-0320 daytime phone: 830-1164 daytime phone: 882-3800
Pumps: Lower Valley Machine Shop Picatti Brothers	 daytime phone: 882-3881 daytime phone: 248-2540
Telemetry System: Conley Engineering, Inc.	 daytime phone: 965-9872
Water System Materials: H.D. Fowler Co. Western Utilities	 daytime phone: 952-7751 daytime phone: (509) 535-1396

TABLE 6-11 SENSITIVE USERS NOTIFICATION LIST	
Entity	Contact Numbers
Schools: Grandview School District	 daytime phone: 882-8500
Medical / Dental Facilities: Birch St. Medical Center Grandview Medical Center Farm Workers Medical Center Mountain View Woman's Center Valley Family Dentistry Westside Family Dental	 daytime phone: 882-3500 daytime phone: 882-1855 daytime phone: 882-3444 daytime phone: 882-4700 daytime phone: 882-3423 daytime phone: 882-3151
Nursing Homes: Grandview Health Care Orchard House	 daytime phone: 882-1200 daytime phone: 882-4400
Red Cross:	daytime phone: 457-1690

Notification procedures describe who is responsible for conducting notifications, who assists in the notifications, how to make notifications to specific parties, and what methods are used to complete the notifications. Notification procedures include how to issue a health advisory in the event the water supply is unsafe for drinking or use.

Other procedures include:

- Notifying water system personnel who are on-call and/or off-duty.
- Notifying customers, priority customers, and industrial users.
- Alerting local law enforcement, local emergency management, local health officials, drinking water officials, and water testing laboratories when appropriate.
- Contacting service and repair contractors.
- Contacting neighboring water systems for assistance, if necessary.
- Arranging for alternative water supplies.

Table 6-12 through Table 6-16 provide notification procedures for the Grandview Water System.

TABLE 6-12 CUSTOMER NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) should consult with the Mayor and the City Administrator as part of the decision-making process, whether to notify customers regarding a potential water shortage, water contamination, or other situation that results in water use restrictions. Once the decision is made to notify customers, procedures for notification should be initiated.
Procedures:	The Mayor, the City Administrator, and the PWD develop the message to be delivered to the customers and to the media. PWD consults with Department of Health regarding the problem and response alternatives. The PWD continues to investigate problem and make repairs/take action as necessary. Notice to customers will be distributed by: Water System staff placing water notices on customers' doors and on signs posted on travel routes throughout the City. City Administrator contacts media requesting issuance of notice and information on the problem. Administrative support person will provide a pre-scripted message to phone callers and log in each phone call. The PWD continuously updates the Mayor and the City Administrator on the current condition of the problem. Once the problem is resolved: Water System staff re-notify customers through signs on doors. City Administrator notifies media regarding problem resolution.

TABLE 6-13 LAW ENFORCEMENT, EMERGENCY MANAGEMENT, COUNTY HEALTH, DOH, AND WDOE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for notifying law enforcement, emergency management, county health, DOH, and WDOE.
Procedures:	PWD consults with the Mayor and the City Administrator regarding if and when to notify law enforcement, emergency management, county health, DOH, and WDOE. PWD consults with DOH regarding the problem and response alternatives. PWD informs law enforcement, emergency management, county health, and WDOE, and requests assistance as appropriate.

TABLE 6-14 SERVICE AND REPAIR CONTRACTOR NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for contacting service and repair contractors.
Procedures:	The PWD determines what repairs and/or services are needed to return the water system to normal operation. PWD contacts service and repair contractors, and monitors the progress of the work.

TABLE 6-15 NEIGHBORING WATER SYSTEM NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for contacting neighboring water systems.
Procedures:	PWD consults with the Mayor and with the City Administrator regarding if and when a neighboring water system will be contacted, and what assistance will be requested. PWD contacts neighboring water system and requests appropriate assistance.

TABLE 6-16 HEALTH ADVISORY ISSUANCE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for issuing a health advisory.
Procedures:	PWD consults with DOH regarding problem and response procedures.

6.7.6 Water Quality Sampling

Many types of emergencies can jeopardize the quality of water and potentially sicken those using the water. Because the most important goal for any water system is to protect human health, the system must know how to act quickly and make decisions on whether to issue a health advisory.

Contamination of drinking water, whether intentional or unintentional, comes in many forms, and are classified in the following four general categories:

- Bacteriological organisms.
- Inorganic substances such as metals or cyanide.
- Organic substances such as pesticides or volatile compounds.
- Radionuclides.

The Grandview Water System monitors its system's water quality in accordance with DOH requirements. Grandview's regular water testing program was described earlier in this Chapter.

If there is reason to believe that the water has been contaminated, the Public Works Director should consult with DOH and consider issuing a health advisory as soon as possible - often before conducting water quality sampling.

If Grandview determines that water quality sampling and testing should be conducted, the City should immediately contact the laboratory that will be performing the analysis to obtain appropriate sampling bottles, and sampling and chain-of-custody procedures. Grandview typically uses Cascade Analytical for its water quality analysis.

Cascade Analytical, Inc.
1008 West Ahtanum Road
Union Gap, WA 98903
Phone: 452-7707

Bacteriological testing should be conducted in accordance with the City's current *Coliform Monitoring Plan*. A copy of that document is included in CHAPTER 10 of this Plan.

6.7.7 Response Actions for Specific Events

For any emergency, there are a series of general steps that a water system should take:

1. Confirm and analyze the type and severity of the emergency.
2. Take immediate action to save lives.
3. Take action to reduce injuries and system damage.
4. Prioritize and accomplish system repairs.

5. Return the system to normal operation.

Table 6-17 through Table 6-25 identify the assessment, response actions, notifications, and follow-up actions required for various emergency situations.

TABLE 6-17 RESPONSE ACTIONS FOR POWER OUTAGES	
Assessment	The Grandview Water System experiences an average of 2 outages per year that last 20 minutes to several hours. Three of the system's source wells (West Main, North Willoughby, and South Willoughby) are equipped with emergency electrical generators. Historically, power outages have been of short duration such that reservoir storage has been able to supply the City with water until power is restored.
Immediate Actions	1. Assess whether the outage is likely to last more than 2 hours. If no, be on alert for changing conditions and monitor reservoir levels. If yes, complete the following: a. Ensure the standby generators West Main, North Willoughby, and South Willoughby are in operation. b. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Notifications	1. Pacific Power (power company) - Let them know that a public water system is experiencing an outage. 2. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Follow-Up Actions	1. Turn off and disconnect standby generators at West Main, North Willoughby, and South Willoughby. 2. Return system to general power supply. 3. Inspect reservoirs and pumping facilities to ensure proper operation and to assess any damages.

TABLE 6-18 RESPONSE ACTIONS FOR WATER MAIN BREAK	
Assessment	Visually determine the physical nature of the problem.
Immediate Actions	Visually assess the problem. Return to the area if the water needs to be turned off to effect repairs.
Notifications	Notify customers prior to shutting off water.
Follow-Up Actions	Check with all customers to ensure water has been returned to normal service. Take water samples for bacteriological testing.

TABLE 6-19 RESPONSE ACTIONS FOR DISINFECTION EQUIPMENT FAILURE	
Assessment	Determine the cause of the failure.
Immediate Actions	Replace and/or repair broken equipment.
Notifications	Inform the Public Works Director.
Follow-Up Actions	Return the equipment to service, ensure that it is operating satisfactorily, and check for leaks or other operational problems. Take water samples for bacteriological testing.

TABLE 6-20 RESPONSE ACTIONS FOR MICROBIAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the reason for the cause or source and the locations of the contamination.
Immediate Actions	Inform the Public Works Director, who will review the assessment with the appropriate personnel. Immediately take corrective actions.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and additional steps to resolve the problem. Acute maximum containment levels (MCL) violations require public notification within 24 hours, and a boil water order will almost always be issued.
Follow-Up Actions	If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-21 RESPONSE ACTIONS FOR CHEMICAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the cause or source and the location(s) of the contamination.
Immediate Actions	Inform the Public Works Director, who will review the assessment with the appropriate personnel. Immediately take corrective action.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and steps to resolve the problem. Maximum containment levels (MCL) violations require public notification within 24 hours.
Follow-Up Actions	Follow-up actions for chemical contamination monitoring and sampling frequency will be conducted under the procedures listed in WAC 246-290-320 and the Code of Federal Regulation 141.24. If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-22 RESPONSE ACTIONS FOR EARTHQUAKE	
Assessment	Visually determine the nature and extent of damage to the water system.
Immediate Actions	Inform the Mayor, the City Administrator, and the Public Works Director, of the nature and extent of damage/disruption to the water system.
Notifications	Notify affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-23 RESPONSE ACTIONS FOR HAZARDOUS MATERIAL SPILL	
Assessment	Assess the nature and extent of the spill.
Immediate Actions	Contact local agencies including DOH, WDOE, Grandview Police, Yakima County Sheriff, and Yakima County Office of Emergency Management.
Notifications	Notify any and all affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-24 RESPONSE ACTIONS FOR ELECTRONIC EQUIPMENT FAILURE	
Assessment	Assess the nature and extent of the failure.
Immediate Actions	Contact certified electrician.
Notifications	Notify all affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-25 RESPONSE ACTIONS FOR VANDALISM OR TERRORIST ATTACK	
Assessment	Assess the nature and extent of the situation/condition.
Immediate Actions	Contact Grandview Police Department.
Notifications	Notify any and all affected customers.
Follow-Up Actions	Repair all known problems.

6.7.8 Alternative Water Sources

Water contamination or disruption of supply may require that the water system obtain water from another source to meet basic community needs, and water systems should plan ahead to provide safe water during an emergency. It is important to evaluate potential alternative water supplies ahead of time to ensure the water is safe and the supply is available.

In 2012, the City of Grandview, City of Prosser, City of Sunnyside, and City of Mabton entered into an interlocal agreement (Resolution No. 2011-51) regarding the cooperative use of facilities, equipment, and personnel. The agreement encourages and promotes coordination and use of facilities in the event assistance is needed by any of the agencies involved. This Resolution is included in CHAPTER 10.

Table 6-26 provides information regarding alternative water sources.

TABLE 6-26 ALTERNATIVE WATER SOURCES				
Alternative Source	Name	Phone	Availability	Safe for Drinking?
City of Prosser in conjunction with tanker trucks	City of Prosser L.J. DaCorsi	786-2332	yes	yes
City of Sunnyside in conjunction with tanker trucks	City of Sunnyside Shane Fisher	837-5206	yes	yes
City of Mabton in conjunction with tanker trucks	City of Mabton Mario Martinez	894-4096	yes	yes
Bottled Water	Central Vending	248-1212	yes	yes
	Crystal Springs Water Co.	225-7822	yes	yes
	Culligan Water Conditioning	452-6601	yes	yes
	Independent Water Service	457-3631	yes	yes

6.7.9 Returning to Normal Operations

As the emergency passes, the system must prepare to return to normal operation. This may be a very simple or very complex process, depending on the type and severity of the emergency. Returning to normal operation may simply mean the system restores power and the portable generator is disconnected, or it could mean the system has to be repeatedly disinfected to obtain the proper number of satisfactory coliform tests necessary to lift a health advisory.

Many factors may need to be considered before a water system is returned to normal operation. Examples include:

- Has the system been repaired to the point that it can meet demand?
- Has the system manager made a safety and operational inspection of all system components?
- Has the system been properly flushed, disinfected, and pressure tested?
- Has the water been adequately tested in accordance with sampling regulations?
- Does the water meet drinking water standards?
- Is there adequate staff to operate and manage the system?
- Do federal, state, and local agencies support returning the system to normal operation?
- Have the proper public messages and notifications been developed?

Table 6-27 presents a guide of actions and activities for returning the system to normal operation.

TABLE 6-27 ACTIONS FOR RETURNING THE SYSTEM TO NORMAL OPERATION	
Action / Activity	Description
Inspect, flush, and disinfect the system	Public Works Director (PWD) and support staff inspect all system facilities and verify that the system has been flushed and disinfected and that all water quality tests have been done.
Verification of water quality	PWD verifies water quality sampling results.
Coordinate with DOH	PWD coordinates with DOH regarding system condition and water quality results.
Notify customers	PWD meets with City Administrator and communications lead to write and distribute notice to customers.

6.8 CROSS-CONNECTION CONTROL PROGRAM

In 2003, Grandview developed and implemented a cross-connection control program intended to protect the City's water distribution system from the possibility of contamination due to existing or potential cross-connections. Grandview's cross-connection program includes the following elements:

1. Adoption of a written ordinance authorizing the establishment and implementation of a cross-connection control program (City Ordinance No. 1649, enacted 2003, now exists as Chapter 13.18 – Cross-Connection Control, within the City of Grandview Municipal Code);
2. Written procedures for implementing the cross-connection control program;
3. Identification of a staff position delegated for organization and implementation of the cross-connection control program, and the qualifications required of personnel working in the cross-connection control program;
4. Detailed procedures for conducting surveys of new and existing facilities to identify all existing and potential cross-connections;
5. A list of approved backflow assemblies;
6. A procedure to ensure all required backflow assemblies are tested upon installation, after a repair or relocation, and on a routine basis as established by State regulation;
7. A record system which includes a list identifying the location of all required cross-connection control devices, the type of device, the testing schedule, the performance results, a description of repairs and/or repair recommendations, and the tester's name and certification number; and
8. A description of the process which will provide cross-connection control information to existing and future users.

Any cross-connection violations shall be enforced and penalties imposed in accordance with Chapter 15.72 of the Grandview Municipal Code.

A copy of Grandview's *Cross-Connection Control* municipal code chapter and the *2013 Water Quality Report*, are included within CHAPTER 10 of this Plan.

6.9 CUSTOMER COMPLAINT RESPONSE PROGRAM

The City of Grandview maintains a Water System Customer Complaint Response Program. The program is designed to formally receive, track, and record complaints received regarding the City's water system. Water system complaints typically include taste, cloudy and/or discolored, odor, low or excessive pressure, and leaky or broken service connections or water mains. 26 complaints have been received by the City for the reporting period between 2008 and 2013, as shown in Table 6-28.

TABLE 6-28 GRANDVIEW WATER SYSTEM COMPLAINTS 2008-2013						
Year	Taste	Cloudy and/or Discolored	Odor	Low/High Pressure	Leaky/Broken Service Connections	Other
2008						
2009			1			
2010		4	4			
2011				1		
2012		3	4	2		
2013	1	3	2	1		
TOTALS	1	10	11	4		

Complaints received by the City are recorded onto a *Citizen Contact Record f*orm. The complaint information and form are routed to the Public Works staff for investigating and resolving the problem. Actions taken to resolve the problem are recorded on the form and kept on file at the Public Works Office. A copy of the *Citizen Contact Record* form is included in CHAPTER 10 of this Plan.

6.10 RECORD KEEPING AND REPORTING

The City of Grandview keeps and maintains records on its water system as shown in Table 6-29.

TABLE 6-29 GRANDVIEW WATER SYSTEM RECORDS		
Record Type	Location of Records	Retained For:
Water Consumption (by user category)	City Hall	10 Years
Water Production (by well)	Public Works Department	10 Years
Well Water Level Measurements	Public Works Department	6 Years
Water Quality Testing Results	Public Works Department	System Life
Equipment Maintenance	Public Works Department	6 Years
Water System Complaints	Public Works Department	6 Years
Backflow Assembly Testing	Public Works Department	6 Years

Water quality monitoring results are reported to the Department of Health as required.

6.11 O&M IMPROVEMENTS

Improvements required for operation of the existing water system, including routine sanitary surveys by the DOH, planning document updates, and other miscellaneous operational improvements are discussed in CHAPTER 8 of this Plan. System operational costs associated with water quality testing and administrative tasks are included in the City's general water operational budget and have not been identified or estimated separately.

Recommended improvements necessary for maintenance of the existing system, such as well rehabilitation, reservoir cleaning and inspection, and other miscellaneous maintenance related improvements, are also discussed in detail in CHAPTER 8 of this Plan. CHAPTER 8 also includes a schedule for completion of both routine and individual O&M improvements, including their estimated costs.

CHAPTER 7 - DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 PROJECT REVIEW PROCEDURES

The City of Grandview requires that all water system improvements proposed by others (e.g., developers, industries, etc.) be designed and appropriate construction documents prepared by a professional engineer licensed to practice in the State of Washington. The City may require a project report prior to design and document preparation if the proposed work includes pumps, reservoirs, and/or other unique characteristics.

Project reports and/or construction plans and specifications for water distribution main improvements shall be submitted to the City for review. Review of said documents is undertaken by the City's Public Works Department, Fire District, and engineering consultant under the provisions of WAC 246-290-125(2). Comments and/or required changes are then forwarded to the proponent. Resubmittal of the revised documents, review and City approval are required before construction may proceed. Following completion of construction and acceptance by the City, a completed DOH Construction Completion Report form shall be submitted to the City.

In addition to being reviewed and approved by the City Public Works Department, City Fire Department, and engineering consultant, project design reports and/or construction plans and documents for all projects with the exception of distribution-related projects, as defined in WAC 246-290-010, must be submitted to and approved by the Department of Health as specified in WAC 246-290-120 before construction may proceed. Required documents shall be submitted by the proponent to the following address:

Washington State Department of Health
Office of Drinking Water
Eastern Drinking Water Operations
16201 East Indiana Avenue, Suite #1500
Spokane Valley, WA 99216

7.2 POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES

Grandview will provide water service to properties outside the City Limits, but within its service area in accordance with the service area policies of Chapter 13.28 of the City's Municipal Code. Customers outside the City Limits must execute an outside utility agreement and will be assessed water rates which are higher than those charged to customers within the City Limits. A copy of the City's Municipal Code is provided in CHAPTER 10 of this Plan.

As a prerequisite to obtaining domestic water service, Grandview requires property owners to hook onto sanitary sewers which are within 200 feet or less of the nearest property corner. If sanitary sewers are not available within 200 feet, the property owner is required to sign a waiver prohibiting the property owner from opposing a future Local Improvement District (LID) for sewer service.

All costs associated with extending water mains to unimproved properties are the responsibility of the developer, including any required inspection fees by the City. Requirements to be met by developers when extending the City's water system are identified in the *Extension by Developers Policy* and the *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements*. Copies of these documents are provided in CHAPTER 10 of this plan. In addition, Grandview has established, by City Code Chapter 13.28.160, a "Latecomer's Agreement" for extension of water mains. A copy of this chapter is provided in CHAPTER 10 of this plan.

7.3 DESIGN STANDARDS AND CONSTRUCTION STANDARDS

All water system improvements must conform to Grandview's most current design and construction standards, *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements*. A copy of the design and construction standards is provided in CHAPTER 10 of this Plan.

7.4 CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES

Grandview confirms that water system extensions are constructed in accordance with City requirements through construction inspection by City Public Works staff and observation of pressure testing of new

water lines by the developer. Construction inspection procedures are addressed in the *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements* and in the "Extension by Developers Policy" as provided in CHAPTER 10 of this Plan. The City may reject construction for which it has not had ample opportunity for inspection.

CHAPTER 8 - IMPROVEMENT PROGRAM

8.1 IMPROVEMENT PROGRAM OBJECTIVE

The development of a water system improvement program is a primary goal of this Water System Plan. Through the analysis of existing system demands, capabilities and deficiencies, and by projecting future system growth, improvements have been identified throughout the Plan.

In previous sections of this Plan, deficiencies in the existing City of Grandview water system have been identified and specific improvements have been recommended. The costs of such improvements often prohibit their completion within a short time period without seriously impacting budgets and user rates. It is prudent, therefore, to group improvements so they might be reasonably accomplished over a number of years.

Recommended system improvements have been categorized into three main categories: 1) Operational and Maintenance (O&M) Improvements, 2) Major Capital Improvements, and 3) Future Capital Improvements (Planning). The O&M improvements are necessary for system operation and maintenance of existing facilities, including well and reservoir rehabilitation, water use efficiency (WUE) measure implementation, and other miscellaneous improvements. Major capital improvements are those necessary to improve a system deficiency such as fire flow, source and/or storage capacity, water quality, or replacement of aging and/or undersized system components. The future planning improvements category is improvements that would be necessary to accommodate system expansion to serve the future service area as a result of new development.

In each improvement category section, with the exception of the future planning improvements section, a prioritized listing of the recommended system improvements, together with a brief description of the need, anticipated construction elements, and estimated project costs (based on 2015 construction costs). Actual costs will vary from those shown in the following estimates because of changes in the construction industry, the competitive bid process, the availability of materials and equipment, and the timing of the improvements. The estimated improvement costs should be increased by the rate of inflation for each subsequent year after 2015.

8.2 OPERATIONAL AND MAINTENANCE (O&M) IMPROVEMENTS

The following is a prioritized listing of the required and/or recommended O&M improvements, including a brief description of the need for each improvement and projected year the improvement will take place. A six-year schedule for completion of the recommended O&M improvements is provided at the end of this Section, in Table 8-1. The estimated improvement costs are also provided in Table 8-1, as well as the total projected yearly cost. The estimated costs in Table 8-1 have been inflated for each year after 2015 to reflect the possible future costs, based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2021 have been inflated to reflect year 2022 costs, although some of these improvements may take place after the year 2022.

1. PHASE 2 TELEMETRY SYSTEM IMPROVEMENTS

Phase 1 of the telemetry system improvements consists of hardware and software upgrades to the City's existing HMI computer. This phase of work is scheduled for completion in 2016. Phase 2 of the telemetry system improvements will consist of servicing, replacing, and adding chlorination system equipment, submersible level transducers, and door intrusion sensors to existing source controls to be able to remotely monitor all system components. This phase of improvements will include upgrades to sources S03, S07/16, S10, S13, S14, and S18, and modification of the existing HMI computer to add flow, level and alarm tags to display new instruments. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Chlorination Equipment, Complete	LS	–	–	$53,000
Submersible Level Tranducers, Complete	LS	–	–	$15,000
Door Limit Switches, Complete	LS	–	–	$17,000
			Construction Cost Subtotal	$95,000
			Sales Tax (7.9%)	$7,500
			Subtotal	$102,500
			Contingency (15%)	$15,400
			Subtotal	$117,900
			Engineering & Administration (15%)	$17,700
			Construction Engineering (15%)	$17,700
			TOTAL ESTIMATED COST	$153,300

2. SOURCE WELL S17 REHABILITATION

Source well S17 (Ashael Curtis Well) has been offline since 2009 due to loss in capacity, continual pump failures, and water quality issues. The loss of capacity and poor water quality are likely due to significant biofouling that may be caused by highly oxidative water conditions and high bacterial populations that are known to exist in other Grandview source wells. The original capacity of this source well was approximately 180 GPM. This improvement project will include an initial pump testing, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and redevelopment methods to use. Following cleaning and redevelopment of the well a final video log and pump testing will be completed to determine the improved well capacity and select a replacement pump. Telemetry system improvements similar to the phase 2 and phase 3 improvements will also be included as part of this project. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$10,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Well Cleaning and Redevelopment, Complete	LS	-	-	$30,000
New Well Pump and Motor, Complete	LS	-	-	$20,000
Chlorination Equipment, Complete	LS	-	-	$12,000
Submersible Level Transducer, Complete	LS	-	-	$2,500
			Construction Cost Subtotal	$96,500
			Sales Tax (7.9%)	$7,600
			Subtotal	$104,100
			Contingency (15%)	$15,600
			Subtotal	$119,700
			Engineering & Administration (12%)	$14,400
			Construction Engineering (15%)	$18,000
			TOTAL ESTIMATED COST	$152,100

3. RESERVOIR CLEANING AND INSPECTION

The City's 3.0 MG and 0.5 MG reservoirs were last cleaned and inspected in 2008 and 2007, respectively. It is recommended that the City have its reservoirs cleaned and inspected approximately every five to ten years. The estimated cost of this improvement is $10,000 per reservoir.

4. PHASE 3 TELEMETRY SYSTEM IMPROVEMENTS

Phase 3 of the telemetry system improvements will consist of installing telemetry control panels and radios at sources S01 and S11, which currently do not have telemetry control panels for remote monitoring. This improvement project with also include servicing, replacing, and adding chlorination system equipment, submersible level transducers, and door intrusion sensors to be able to remotely monitor all system components, and modification of the existing HMI computer to add flow, level and alarm tags to display the new control panel instruments. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$8,000
Control Panels and Wiring, Complete	LS	–	–	$35,000
Chlorination Equipment, Complete	LS	–	–	$23,000
Submersible Level Tranducers, Complete	LS	–	–	$5,000
Door Limit Switches, Complete	LS	–	–	$5,000
			Construction Cost Subtotal	$76,000
			Sales Tax (7.9%)	$6,000
			Subtotal	$82,000
			Contingency (15%)	$12,300
			Subtotal	$94,300
			Engineering & Administration (15%)	$14,100
			Construction Engineering (15%)	$14,100
			TOTAL ESTIMATED COST	$122,500

5. SOURCE WELLS PROTECTIVE COVENANTS

Only source wells S01, S03, S07, S08, S12, S16 and S17 currently have protective covenants. The remaining wells are S06, S10, S11, and S18. The City owns sufficient property around each of the remaining wells to establish protective covenants at each location. Provided in the Appendix of the Plan is a "Declaration of Covenant", which is used when the well site property is owned by the municipality. A "Declaration of Covenant" should be executed and filed with the Yakima County Auditor's Office for the remaining wells. The estimated cost for this project is $20,000.

6. CROSS CONNECTION CONTROL (CCC) FOR HIGH HAZARD PREMISES

The Department of Health requires that a priority should be given to completing the evaluation and installing the cross-connection control (CCC) for high standard premises. The City has had a hazard evaluation performed on some of its hospital/medical facilities, along with the appropriate backflow assembly installed at the aforementioned sites. However, hazard evaluations and installation of backflow assemblies still need to be performed at some of the hospital/medical facilities. Monies allocated for the completion of the remaining sites are already incorporated into the City's operations and maintenance budget, and therefore does not require additional funds to accomplish this task.

7. 2021 WATER SYSTEM PLAN UPDATE

The Department of Health requires Water System Plans to be reviewed and updated every six years. The total estimated cost to review and update the Water System Plan is $100,000.

8. RESERVOIR RECOATING

The existing 3.0 MG standpipe and 0.5 MG elevated tank reservoirs were last recoated in 1995 and 2007, respectively. The anticipated life of a reservoir coating system is approximately 20 to 30 years. It is recommended the tanks be routinely cleaned and inspected to determine if repair and recoating is necessary, the estimated project costs are $800,000 and $500,000, respectively, for the 3.0 MG and 0.5 MG reservoirs. This estimated cost does not include structural or mechanical repairs to the reservoirs.

9. INLINE VALVE INSTALLATIONS

The City's 16-inch transmission and distribution main from the 3MG reservoir site to Bonnieview Road and Wilson Highway has very few isolation valves for system control. This project will include installation of new inline isolation valves near the intersection of Bonnieview Road and Wilson Highway. The estimated cost of the inline valve installation is $100,000.

10. SOURCE WELL S08 REHABILITATION

Similar to source well S17, source well S08 (Appleway Well) has been offline since 2005 due to loss in capacity, continual pump failures, and water quality issues. The loss of capacity and poor water quality is also likely due to significant biofouling that may be caused by highly oxidative water conditions and high bacterial populations that are known to exist in other Grandview source wells. The original capacity of this source well was approximately 93 GPM. Like the S17 rehabilitation, this improvement project will include an initial pump testing, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and redevelopment methods to use. Following cleaning and redevelopment of the well a final video log and pump testing will be completed to determine the improved well capacity and select a replacement pump. Upon successful rehabilitation of the source, telemetry system improvements similar to the phase 2 and phase 3 improvements will be completed as part of this project. Source well S08 currently does not have a control panel. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$11,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspections, Complete	LS	-	-	$2,000
Well Cleaning and Redevelopment, Complete	LS	-	-	$30,000
New Well Pump and Motor, Complete	LS	-	-	$20,000
Control Panels and Wiring, Complete	LS	-	-	$16,000
Chlorination Equipment, Complete	LS	-	-	$12,000
Submersible Level Transducer, Complete	LS	-	-	$2,500
Door Limit Switches, Complete	LS	-	-	$2,000
			Construction Cost Subtotal	$115,500
			Sales Tax (7.9%)	$9,100
			Subtotal	$124,600
			Contingency (15%)	$18,700
			Subtotal	$143,300
			Engineering & Administration (12%)	$21,500
			Construction Engineering (15%)	$21,500
			TOTAL ESTIMATED COST	$186,300

11. MISCELLANEOUS SOURCE WELL REHABILITATION

Grandview's source well numbers S01, S07, S10, S11, S16, and S18 have also had a history of diminishing capacity, similar to sources S08 and S17. All of these well sources tap the same saddle mountain basalt aquifer formation as described in Chapter 4 of the Plan. Sources S01, S07, S10, S11, S16, and S18 are all currently active, but will need to be rehabilitated in the future to regain some of their original capacity and maintain their current capacity. Upon successful completion of the source S08 and S17 rehabilitation, similar methods may be used to rehabilitate these sources in the future. The estimated cost to rehabilitate each of these sources is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$30,000
New Well Pump and Motor, Complete	LS	–	–	$20,000
			Construction Cost Subtotal	$82,000
			Sales Tax (7.9%)	$6,500
			Subtotal	$88,500
			Contingency (15%)	$13,300
			Subtotal	$101,800
			Engineering & Administration (12%)	$12,200
			Construction Engineering (15%)	$15,300
			TOTAL ESTIMATED COST	$129,300

TABLE 8-1 SCHEDULE OF RECOMMENDED O&M IMPROVEMENTS										
Priority No.	Improvement Description	Estimated Cost in 2015 Dollars	Completion Year							Funding Source
			2016	2017	2018	2019	2020	2021	2022 to 2036	
1	Phase 2 Telemetry System Improvements	153,300	153,300							City
2	Source Well S17 Rehabilitation	152,100	156,700							City
3	0.3 MG Reservoir Cleaning and Inspection	10,000		10,600						City
4	Phase 3 Telemetry System Improvements	122,500		130,000						City
5	Source Wells Protective Covenants	20,000		21,200						City
6	Cross Connection Control (CCC) for High Hazard Premises	N/A								City
7	0.5 MG Reservoir Cleaning and Inspection	10,000			10,900					City
8	Source Well S10 Rehabilitation	129,300				145,500				City
9	2021 Water System Plan Update	100,000						119,400		City
10	3.0 MG Reservoir Recoating	800,000							983,900	City
11	Inline Valve Installation	100,000							123,000	City
12	Source Well S01 Rehabilitation	129,300							159,000	City
13	Source Well S07 Rehabilitation	129,300							159,000	City
14	Source Well S08 Rehabilitation	186,300							229,100	City
15	Source Well S11 Rehabilitation	129,300							159,000	City
16	Source Well S16 Rehabilitation	129,300							159,000	City
17	Source Well S18 Rehabilitation	129,300							159,000	City
18	0.5 MG Reservoir Recoating	500,000							615,000	City
	TOTAL COSTS	2,776,700	314,600	161,800	10,900	145,500	0	119,400	2,746,000	

Note: Improvement costs for years following 2015 include 3% inflation per year.

8.3 MAJOR CAPITAL IMPROVEMENTS

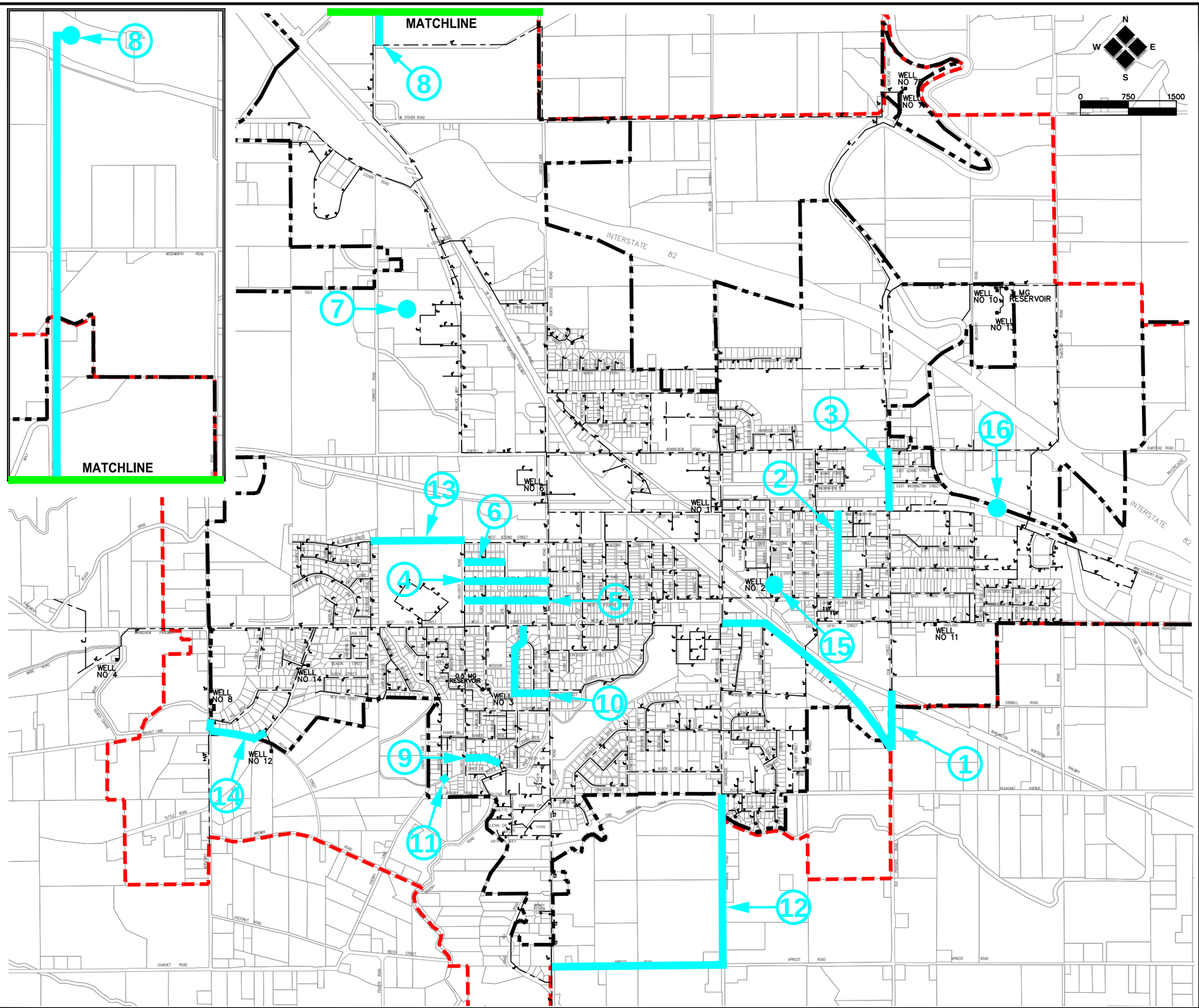
The following listing of recommended major capital improvements has been sub-divided into two categories: 1) year 2015 through year 2021 prioritized improvements and 2) year 2022 through year 2035 prioritized improvements, since not all of the recommended improvements can be completed within the next six years. The recommended improvements from both categories are identified in Figure 8-1.

8.3.1 Year 2015 through Year 2021 Prioritized Improvements

1. O.I.E.H. AND ELM ST. WATER MAIN LOOP AND UPSIZING (DWSRF LOAN SECURED)

This project consists of installing a new 12-inch water main loop from the existing dead-end mains on the east end of Old Inland Empire Highway and the south end of Elm Street. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	$42,000	$42,000
Temporary Traffic Control	LS	-	$50,000	$50,000
Clearing and Grubbing	LS	-	$5,000	$5,000
Planing Bituminous Pavement	SY	11,000	$2	$22,000
HMA Cl 1/2 In. PG 64-28 (3")	TON	1,600	$90	$144,000
12-Inch Water Main	LF	3,400	$40	$136,000
12-Inch Gate Valve	EA	10	$1,600	$16,000
Fire Hydrant Assembly	EA	3	$3,500	$10,500
HMA Surface Repair	SY	1,900	$50	$95,000
Service Connection	EA	19	$800	$15,200
Shoring or Extra Excavation	LF	3,400	$1	$3,400
Select Backfill	CY	200	$30	$6,000
Pavement Markings	LS	-	$7,000	$7,000
Landscape Restoration	LS	-	$4,000	$4,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$571,100
			Contingency (15%)	$85,700
			Subtotal	$656,800
			Environmental Compliance	$10,000
			DOH Review/Approval Fee	$3,000
			Project Administration	$15,000
			Sales Tax (7.9%)	$51,900
			Engineering & Administration (12%)	$78,800
			Construction Engineering (13%)	$85,400
			TOTAL ESTIMATED COST	$900,900



CITY OF GRANDVIEW

Water System Plan Update

RECOMMENDED WATER SYSTEM CAPITAL IMPROVEMENTS

LEGEND

RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)

FUTURE SERVICE AREA (URBAN GROWTH AREA)

IMPROVEMENTS

1. O.I.E.H. AND ELM ST. WATER MAIN LOOP AND UPSIZING (DWSRF LOAN SECURE)
2. CEDAR ST. WATER MAIN UPSIZING
3. N. ELM ST. WATER MAIN UPSIZING
4. W. 3RD ST. WATER MAIN UPSIZING
5. W. 4TH ST. WATER MAIN UPSIZING
6. GLEN ST. WATER MAIN UPSIZING
7. FUTURE WELL A/C
8. NEW RESERVOIR AND TRANSMISSION MAIN
9. HILLCREST RD. AND VISTA DR. WATER MAIN LOOP AND UPSIZING
10. W. CONCORD AVE. WATER MAIN UPSIZING
11. PRINCEVILLE ST. WATER MAIN LOOP
12. GRANDRIDGE RD. AND APRICOT RD. WATER MAIN LOOP
13. W. 2ND ST. WATER MAIN UPSIZING
14. PECAN ST. WATER MAIN LOOP
15. BALCOM & MOE WELL S02 RECONSTRUCTION
16. FUTURE WELL B/D

CITY OF GRANDVIEW

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FIGURE 8-1

2. CEDAR ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along Cedar Street between 4th Street and Wine Country Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$20,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	1,400	$1	$1,400
Select Backfill	CY	45	$30	$1,350
8-Inch Water Main	LF	1,400	$45	$63,000
8-Inch Gate Valve	EA	6	$1,400	$8,400
Water Service Connection	EA	38	$1,200	$45,600
HMA Surface Repair	SY	950	$40	$38,000
Hydrant Assembly	EA	4	$4,500	$18,000
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$215,750
			Sales Tax (7.9%)	$17,000
			Subtotal	$232,750
			Contingency (15%)	$34,900
			Subtotal	$267,650
			Design Engineering & Administration (12%)	$32,100
			Construction Engineering (15%)	$40,100
			TOTAL ESTIMATED COST	$339,850

3. N. ELM STREET WATER MAIN UPSIZING

This improvement project will replace the existing 8-inch water main pipes with 10-inch along North Elm Street between Wine Country Road and Bonnieview Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$15,000
Temporary Traffic Control	LS	-	-	$5,000
Shoring or Extra Excavation	LF	1,000	$1	$1,000
Select Backfill	CY	130	$30	$3,900
10-Inch Water Main	LF	1,000	$50	$50,000
10-Inch Gate Valve	EA	8	$1,400	$11,200
Water Service Connection	EA	9	$1,200	$10,800
HMA Surface Repair	SY	700	$40	$28,000
Hydrant Assembly	EA	3	$4,500	$13,500
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$148,400
			Sales Tax (7.9%)	$11,700
			Subtotal	$160,100
			Contingency (15%)	$24,000
			Subtotal	$184,100
			Design Engineering & Administration (12%)	$22,100
			Construction Engineering (15%)	$27,600
			TOTAL ESTIMATED COST	$233,800

4. W. 3RD ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along West 3rd Street between Hillcrest Road and Euclid Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$20,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	1,350	$1	$1,350
Select Backfill	CY	170	$30	$5,100
8-Inch Water Main	LF	1,350	$45	$60,750
8-Inch Gate Valve	EA	6	$1,400	$8,400
Water Service Connection	EA	29	$1,200	$34,800
HMA Surface Repair	SY	900	$40	$36,000
Hydrant Assembly	EA	5	$4,500	$22,500
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$208,900
			Sales Tax (7.9%)	$16,500
			Subtotal	$225,400
			Contingency (15%)	$33,800
			Subtotal	$259,200
			Design Engineering & Administration (12%)	$31,100
			Construction Engineering (15%)	$38,900
			TOTAL ESTIMATED COST	$329,200

5. W. 4TH ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along West 4th Street between Hillcrest Road and Avenue "J". The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$10,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	700	$1	$700
Select Backfill	CY	70	$30	$2,100
8-Inch Water Main	LF	700	$45	$31,500
8-Inch Gate Valve	EA	6	$1,400	$8,400
Water Service Connection	EA	29	$1,200	$34,800
HMA Surface Repair	SY	470	$40	$18,800
Hydrant Assembly	EA	2	$4,500	$9,000
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$135,300
			Sales Tax (7.9%)	$10,700
			Subtotal	$146,000
			Contingency (15%)	$21,900
			Subtotal	$167,900
			Design Engineering & Administration (12%)	$20,150
			Construction Engineering (15%)	$25,200
			TOTAL ESTIMATED COST	$213,250

6. GLEN ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along Glen Street between Hillcrest Road and Avenue "J". The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$10,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	650	$1	$650
Select Backfill	CY	90	$30	$2,700
8-Inch Water Main	LF	650	$45	$29,250
8-Inch Gate Valve	EA	5	$1,400	$7,000
Water Service Connection	EA	15	$1,200	$18,000
HMA Surface Repair	SY	450	$40	$18,000
Hydrant Assembly	EA	3	$4,500	$13,500
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$119,100
			Sales Tax (7.9%)	$9,400
			Subtotal	$128,500
			Contingency (15%)	$19,300
			Subtotal	$147,800
			Design Engineering & Administration (12%)	$17,750
			Construction Engineering (15%)	$22,150
			TOTAL ESTIMATED COST	$187,700

7. FUTURE WELL A/C

This project consists of constructing a new 250 GPM source well located within the fairgrounds at a location to be determined. This source well will draw from the Saddle Mountain Aquifer, a depth of less than 700 feet. Should the City desire to draw from the Wanapum Basalt Aquifer, the well will need to be drilled deeper and aeration treatment will likely be necessary. This project will improve the source capacity of Grandview's water system, allowing for future growth, and utilizing the City's water rights. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$85,000
Drill Well	LF	600	$250	$150,000
Furnish and Install Well Casing	LF	600	$200	$120,000
Cement Grout Casing	LF	300	$60	$18,000
Furnish and Install Well Screen (Incl. Filter Pack)	LF	150	$350	$52,500
Well Development and Testing	LS	-	-	$60,000
Well Pump and Level Transducer	LS	-	-	$60,000
Electrical and Control System	LS	-	-	$80,000
Well Building Including Internal Piping	LS	-	-	$150,000
Site Piping	LS	-	-	$30,000
Site Grading and Drainage	LS	-	-	$20,000
HVAC	LS	-	-	$30,000
Chlorination Equipment	LS	-	-	$50,000
Fencing	LS	-	-	$10,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$930,500
			Sales Tax (7.9%)	$73,500
			Subtotal	$1,004,000
			Contingency (15%)	$150,600
			Subtotal	$1,154,600
			Engineering & Administration (12%)	$138,550
			Construction Engineering (15%)	$173,200
			TOTAL ESTIMATED COST	$1,466,350

8. NEW RESERVOIR AND TRANSMISSION MAIN

This major capital improvement project assumes the construction of a 1.7 MG standpipe reservoir located north of the SVID canal at Bethany Road. 1.5 MG is needed between elevations 897.5 feet and 941.6 feet to meet storage requirements. Other alternatives may be investigated at the City's request. This improvement will provide additional storage, and also improve fire flow for a large portion of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$300,000
Temporary Traffic Control	LS	-	-	$1,000
Reservoir Excavation and Backfill	LS	-	-	$150,000
Site Grading and Drainage	LS	-	-	$50,000
16-Inch Transmission main	LF	7,700	$75	$577,500
1.7 MG Standpipe Reservoir	LS	-	-	$1,700,000
Inlet/Outlet Valve and Site Piping	LS	-	-	$150,000
Submersible Mixer	LS	-	-	$45,000
Electrical, Telemetry, and Control System	LS	-	-	$80,000
HMA Surfacing	SY	500	$40	$20,000
Property Purchase	LS	-	-	$200,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$3,288,500
			Sales Tax (7.9%)	$259,800
			Subtotal	$3,548,300
			Contingency (15%)	$532,250
			Subtotal	$4,080,550
			Design Engineering & Administration (12%)	$489,650
			Construction Engineering (15%)	$612,100
			TOTAL ESTIMATED COST	$5,182,300

8.3.2 Year 2022 through Year 2035 Prioritized Improvements

9. HILLCREST RD. AND VISTA DR. WATER MAIN LOOP AND UPSIZING

This improvement project will connect two branches of the water distribution system with 8-Inch water main. The improvement will improve both fire flow capacity, system reliability, and water quality in the southern residential area of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$5,000
Temporary Traffic Control	LS	-	-	$5,000
Select Backfill	CY	70	$35	$2,450
8-Inch Water Main	LF	600	$45	$27,000
8-Inch Gate Valve	EA	2	$1,400	$2,800
HMA Surface Repair	SY	400	$40	$16,000
Service Connection	EA	19	$1,200	$22,800
Hydrant Assembly	EA	2	$4,500	$9,000
Minor Change	FA	-	-	$5,000
			Construction Cost Subtotal	$95,050
			Sales Tax (7.9%)	$7,500
			Subtotal	$102,550
			Contingency (15%)	$15,400
			Subtotal	$117,950
			Engineering & Administration (12%)	$14,150.00
			Construction Engineering (15%)	$17,700
			TOTAL ESTIMATED COST	$149,800

10. W. CONCORD AVE. WATER MAIN UPSIZING

This improvement project will replace the existing 4-inch and 6-inch water main pipes with 8-inch along West Concord Avenue. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$16,500
Temporary Traffic Control	LS	-	-	$20,000
Shoring or Extra Excavation	LF	1700	$1	$1,700
Select Backfill	CY	80	$30	$2,400
8-Inch Water Main	LF	1700	$45	$76,500
8-Inch Gate Valve	EA	7	$1,400	$9,800
Water Service Connection	EA	28	$1,200	$33,600
HMA Surface Repair	SY	1150	$40	$46,000
Hydrant Assembly	EA	4	$4,500	$18,000
Minor Change	FA	-	-	$10,000
			Construction Cost Subtotal	$234,500
			Sales Tax (7.9%)	$18,550
			Subtotal	$253,050
			Contingency (15%)	$37,950
			Subtotal	$291,000
			Engineering & Administration (12%)	$34,900
			Construction Engineering (15%)	$43,650
			TOTAL ESTIMATED COST	$369,550

11. PRINCEVILLE ST. WATER MAIN LOOP

This project loops an existing 2-inch water main to an existing dead-end 6-inch water main with a new 8-inch water main. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$1,000
Temporary Traffic Control	LS	-	-	$500
8-Inch Water Main	LF	100	$45	$4,500
8-Inch Valve	EA	1	$1,200	$1,200
Gravel Surface Repair	SY	40	$20	$800
Hydrant Assembly	EA	1	$4,500	$4,500
Easement Acquisition	SF	1,000	$5	$5,000
Minor Change	FA	-	-	$2,000
			Construction Cost Subtotal	$19,500
			Sales Tax (7.9%)	$1,550
			Subtotal	$21,050
			Contingency (15%)	$3,150
			Subtotal	$24,200
			Engineering & Administration (12%)	$2,900
			Construction Engineering (15%)	$3,650
			TOTAL ESTIMATED COST	$30,750

12. GRANDRIDGE RD. AND APRICOT RD. WATER MAIN LOOP

This project consists of looping an existing 6-inch water main located at the corner of Euclid Road and Apricot Road with a 10-inch water main and connecting the line to an existing 10-inch water main located at the corner of Grandridge Road and Pleasant Avenue. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$40,000
Temporary Traffic Control	LS	-	-	$30,000
10-Inch Water Main	LF	5400	$50	$270,000
10-Inch Gate Valve	EA	6	$1,600	$9,600
Hydrant Assembly	EA	5	$4,500	$22,500
HMA Surface Repair	SY	3600	$40	$144,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$531,100
			Sales Tax (7.9%)	$41,950
			Subtotal	$573,050
			Contingency (15%)	$85,950
			Subtotal	$659,000
			Engineering & Administration (12%)	$79,100
			Construction Engineering (15%)	$98,850
			TOTAL ESTIMATED COST	$836,950

13. W. 2ND ST. WATER MAIN UPSIZING

This project consists of replacing an existing 8-inch water main with a 12-inch water main located along West 2nd Street between Hillcrest Road and Westridge Drive. The improvement will improve both fire flow capacity and system reliability in this area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$30,000
Temporary Traffic Control	LS	-	-	$60,000
12-Inch Water Main	LF	1450	$50	$72,500
12-Inch Butterfly Valve	EA	2	$1,600	$3,200
Service Connection	EA	3	$1,200	$3,600
HMA Surface Repair	SY	1000	$40	$40,000
Minor Change		-	-	$10,000
			Construction Cost Subtotal	$219,300
			Sales Tax (7.9%)	$17,350
			Subtotal	$236,650
			Contingency (15%)	$35,500
			Subtotal	$272,150
			Engineering & Administration (12%)	$32,650
			Construction Engineering (15%)	$40,800
			TOTAL ESTIMATED COST	$345,600

14. PECAN ST. WATER MAIN LOOP

This project consists of looping an existing 6-inch water main located at the corner of Pecan Road and Appleway Road with an 8-inch water main and connecting the line to an existing 6-inch water main located at the corner of Pecan Road and Butternut Road, and replacing the 2-inch water main that dead-ends. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$1,500
Temporary Traffic Control	LS	-	-	$25,000
8-Inch Water Main	LF	1000	$45	$45,000
8-Inch Gate Valve	EA	2	$1,400	$2,800
6-Inch Gate Valve	EA	2	$1,200	$2,400
Hydrant Assembly	EA	1	$4,500	$4,500
HMA Surface Repair	SY	15	$40	$600
Gravel Surface Repair	SY	250	$20	$5,000
Minor Change	FA	-	-	$5,000
			Construction Cost Subtotal	$91,800
			Sales Tax (7.9%)	$7,250
			Subtotal	$99,050
			Contingency (15%)	$14,850
			Subtotal	$113,900
			Engineering & Administration (12%)	$13,650
			Construction Engineering (15%)	$17,100
			TOTAL ESTIMATED COST	$144,650

15. BALCOM & MOE WELL S02 RECONSTRUCTION

This project consists of demolishing the existing well building, installing a new booster pump and well enclosure, and constructing a new treatment building complete with aeration and chlorination equipment, electrical, and HVAC. This improvement will add 700 GPM to the water system, improving fire flow and improving water quality. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$65,000
Demolition	LS	-	-	$30,000
Aeration Equipment	LS	-	-	$100,000
Chlorination Equipment	LS	-	-	$50,000
HVAC	LS	-	-	$30,000
Booster Pump (Aeration)	LS	-	-	$40,000
Site Piping	LS	-	-	$30,000
Building (900 SF)	LS	-	-	$200,000
Electrical and Control System	LS	-	-	$150,000
Well Enclosure	LS	-	-	$15,000
Site Grading and Drainage	LS	-	-	$20,000
Fencing	LF	200	$20	$4,000
30' Gate	EA	1	$500	$500
HMA Surface Repair	SY	140	$40	$5,600
Gravel Surface Repair	SY	340	$35	$11,900
Cement Conc. Sidewalk	SY	40	$50	$2,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$769,000
			Sales Tax (7.9%)	$60,750
			Subtotal	$829,750
			Contingency (15%)	$124,450
			Subtotal	$954,200
			Engineering & Administration (12%)	$114,500
			Construction Engineering (15%)	$143,150
			TOTAL ESTIMATED COST	$1,211,850

16. FUTURE WELL B/D

This project consists of constructing a new 250 GPM source well located within NE ¼, NW ¼, S24, T9N, R23E at a location to be determined. This source well will draw from the Saddle Mountain Aquifer, a depth of less than 700 feet. Should the City desire to draw from the Wanapum Basalt Aquifer, the well will need to be drilled deeper and aeration treatment will likely be necessary. This project will improve the source capacity of Grandview's water system, allowing for future growth, and utilizing the City's water rights. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$85,000
Drill Well	LF	600	$250	$150,000
Furnish and Install Well Casing	LF	600	$200	$120,000
Cement Grout Casing	LF	300	$60	$18,000
Furnish and Install Well Screen (Incl. Filter Pack)	LF	150	$350	$52,500
Well Development and Testing	LS	-	-	$60,000
Well Pump and Level Transducer	LS	-	-	$60,000
Electrical and Control System	LS	-	-	$80,000
Well Building Including Internal Piping	LS	-	-	$150,000
Site Piping	LS	-	-	$30,000
Site Grading and Drainage	LS	-	-	$20,000
HVAC	LS	-	-	$30,000
Chlorination Equipment	LS	-	-	$50,000
Fencing	LS	-	-	$10,000
Minor Change	FA	-	-	$15,000
			Construction Cost Subtotal	$930,500
			Sales Tax (7.9%)	$73,500
			Subtotal	$1,004,000
			Contingency (15%)	$150,600
			Subtotal	$1,154,600
			Engineering & Administration (12%)	$138,550
			Construction Engineering (15%)	$173,200
			TOTAL ESTIMATED COST	$1,466,350

8.3.3 Major Capital Improvement Schedule

Table 8-2 provides a six-year schedule for completion of some of the recommended major capital improvements. Scheduling of the remaining improvements beyond this six-year period should be reviewed yearly as priorities and City growth patterns change and progress. The estimated improvement costs are provided in Table 8-2, as well as the total projected yearly cost. The estimated costs in Table 8-2 have been inflated for each year after 2015 to reflect the possible future costs based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2021 have been inflated to reflect year 2022 costs although many of these improvements will take place after the year 2022.

TABLE 8-2 SCHEDULE OF RECOMMENDED MAJOR CAPITAL IMPROVEMENTS

Priority No.	Improvement Description	Estimated Cost in 2015 Dollars	Completion Year							Funding Source
			2016	2017	2018	2019	2020	2021	2022 to 2035	
1	O.I.E.H. and Elm St. Water Main Loop and Upsizing (DWSRF Loan Secured)	900,900		900,900*						SRF Loan/City
2	Cedar St. Water Main Upsizing	339,850			371,363					SRF Loan/City
3	N. Elm St. Water Main Upsizing	233,800			255,480					SRF Loan/City
4	W. 3rd St. Water Main Upsizing	329,200			359,726					SRF Loan/City
5	W. 4th St. Water Main Upsizing	213,250			233,024					SRF Loan/City
6	Glen St. Water Main Upsizing	187,700			205,105					SRF Loan/City
7	Future Well A/C	1,529,350					1,772,936			SRF Loan/City/ CERB/Private
8	New Reservoir and Transmission Main	5,182,300						6,187,937		SRF Loan/City/ CERB/Private
9	Hillcrest Rd. and Vista Dr. Water Main Loop and Upsizing	149,800							184,235	SRF Loan/City
10	W. Concord Ave. Water Main Upsizing	369,550							454,500	SRF Loan/City
11	Princeville St. Water Main Loop	30,750							37,819	SRF Loan/City
12	Grandridge Rd. and Apricot Rd. Water Main Loop	836,950							1,029,343	SRF Loan/City
13	W. 2nd St. Water Main Upsizing	345,600							425,044	SRF Loan/City
14	Pecan St. Water Main Loop	144,650							177,901	SRF Loan/City
15	Balcom & Moe Well S02 Reconstruction	1,211,850							1,490,423	SRF Loan/City
16	Future Well B/D	1,466,350							1,880,426	SRF Loan/City
	TOTAL COSTS	13,535,041	0	900,900	1,424,697	0	1,772,936	6,187,937	5,602,690	

Note: Improvement costs for years following 2015 include 3% inflation per year.
* DWSRF Loan secured.

8.4 FUTURE MAJOR CAPITAL IMPROVEMENTS (PLANNING)

A general plan for future major capital improvements that would be a result of system expansion is shown in Figure 8-1. Recommended major capital improvements discussed in Section 8.3 are also shown in Figure 8-1 for reference. This plan represents the projected water mains/structures, including estimated sizes, required as development expands beyond what the existing system serves within the City's current and future service area boundaries. Although conditions and circumstances in the City's water system may change the exact location and/or configuration of needed improvements, the general plan shown in Figure 8-1 allows the City to review proposed development with respect to system expansion. Also, as new development is proposed and/or occurs, the City will need to further evaluate the improvement required and review the effects that the system expansion plans will have on the existing distribution system.

CHAPTER 9 - FINANCIAL PROGRAM

9.1 PAST AND PRESENT FINANCIAL STATUS

Development of a comprehensive financial program requires an understanding of the water system's current financial status and past budgetary trends. Presented below in Table 9-1 are the City's Water Operating Fund beginning and ending balance histories for the six-year period, 2009 through 2014.

TABLE 9-1 WATER OPERATING FUND BALANCES

Year	2009	2010	2011	2012	2013	2014
Beginning Fund Balance	$2,214,332	$1,791,937	$1,709,658	$2,195,662	$2,649,706	$2,938,390
Ending Fund Balance	$1,791,937	$1,709,658	$2,195,662	$2,649,706	$2,938,390	$3,545,053
Net Increase (Decrease)	($422,395)	($82,279)	$486,004	$454,044	$288,684	$606,663

Presented below in Table 9-2 is a summary of the City's Water Operating Fund actual revenues and expenditures history for the six-year period, 2009 through 2014. Over this 6-year period, water department operating revenues (not including loan/bond proceeds) have increased by approximately 28% in total. Over the same period, operating expenses have decreased by approximately 6% in total. Although the fund balances have remained positive and recent trends present net increases, implementation of the recommended system improvements presented in CHAPTER 8 requires a close examination of the City's future financial plan and rate structure. Funding has already been secured for the O.I.E. Highway and Elm Avenue Water Main Loop and Upsizing, but the other recommended system improvements will require financing by the City Operating Fund or alternative funding sources. The proposed financial plan to fund recommended improvements is presented later in Table 9-4.

TABLE 9-2 WATER OPERATING FUND REVENUES AND EXPENDITURES						
Year Ending	2009	2010	2011	2012	2013	2014
REVENUES						
Water Service Fees	1,415,733	1,448,464	1,523,141	1,623,830	1,709,445	1,803,316
Connection Fees	5,090	15,790	21,114	5,282	53,594	8,832
Interest Earnings	40,016	29,538	27,659	20,584	20,905	21,073
Rent & Leases	0	0	0	345	345	3,575
Other Water Revenue/Adjustments	318	450	646	5,352	2,921	6,989
Utility Tax	485,000	350,528	368,600	392,967	413,686	436,402
Subtotal Operating Revenues	1,946,157	1,844,770	1,941,160	2,048,360	2,200,896	2,280,187
Loan/Bond Proceeds	0	302,135	133,788	0	0	42,070
TOTAL - REVENUES	1,829,792	2,171,458	2,098,354	2,110,023	2,263,385	2,390,083
EXPENDITURES						
Water Operations						
Salaries and Wages	319,769	320,939	338,240	284,244	298,440	258,484
Benefits	136,649	149,788	175,118	144,038	168,268	113,632
Supplies	32,028	89,130	52,801	57,488	76,359	70,904
Other Serivces and Charges	934,345	459,131	366,411	305,269	570,727	459,276
Utility Tax	0	375,081	392,006	454,630	476,175	436,402
Operating Transfers Out	32,860	30,400	30,200	30,500	130,500	30,500
Subtotal - Water Operations	1,455,651	1,424,469	1,354,776	1,276,169	1,720,469	1,369,198
Capital Outlay						
Major Capital Improvements	335,000	548,800	0	123,906	0	181,339
Misc. Capital Improvements	93,008	33,678	0	0	0	0
Machinery and Equipment	14,928	0	0	0	0	0
Subtotal - Capital Outlay	442,936	582,478	0	123,906	0	181,339
Debt Service						
99 PWTF Well Rehab	39,355	39,355	39,355	39,355	39,355	0
03 SRF Loan Well Rehab	30,121	29,850	29,579	29,308	29,036	28,765
Yakima Co SIED Loan Downtown	161,019	159,619	158,219	156,819	155,419	154,019
USDA Note '09 & '10 Water Imp			28,500	28,500	28,500	28,500
DWSRF Loan '13 OIE	16,615	17,966	21,192	21,192	21,192	21,192
Transfers to Bond Redemption	106,490	0	(19,271)	(19,270)	(19,270)	407
Subtotal - Debt Service	353,600	246,790	257,574	255,904	254,232	232,883
TOTAL - EXPENDITURES	2,252,187	2,253,737	1,612,350	1,655,979	1,974,701	1,783,420
NET INCREASE (DECREASE)	(422,395)	(82,279)	486,004	454,044	288,684	606,663

9.2 AVAILABLE REVENUE SOURCE

Recommended system improvements are scheduled for completion in annual increments for the next six years. In addition, as areas outside the current service area develop, extension of the City's water system will be necessary. Future transmission mains, sources of supply, and reservoirs will undoubtedly require major local bond funding and/or outside funding participation to offset the high costs of the improvements.

There are five basic categories of potential financing for domestic water-related improvements:

1. Local Public Enterprise Funds
2. Use of Local Public Powers
3. State Assisted or Guaranteed Resources
4. Federally Assisted or Guaranteed Resources
5. Private Development

Current availability of funding is limited with a number of the sources within these categories. Many also restrict the use of funds to certain projects and others limit their participation to a percentage of the total cost. Each of these categories is described briefly below.

1. Local Public Enterprise Funds

   Reserves in the Enterprise Fund are accumulated from available revenues from water user fees. The amount of the reserves will depend on the balance of operation and maintenance costs of the system versus total revenue generated by the fees. These reserves may be used to finance any water system related project allocated by the City Council.

   Funds for future projects may be generated by increases in user fees, thus building the reserves in the Enterprise Fund. With this method of financing, often called the "pay-as-you-go" approach, the City is collecting interest on the reserves as opposed to paying interest on a loan balance. One method used by some communities to accumulate reserves is through the development of a capital recovery charge system. This approach is similar to assessing connection fees, except the amount is based on the capital costs of constructing collection system trunk lines and treatment facilities, and the collected funds are usually set aside as capital reserves for future projects.

2. Use of Local Public Powers

   In this section, three primary bonding techniques will be presented: general obligation bonds, revenue bonds, and special assessment bonds. There are advantages and disadvantages to each. The type of bond issued to finance a community improvement depends in part on custom and in part on the circumstances of a particular offering. General information about the three principal types of municipal bonds follows.

   General Obligation Bonds: These bonds pledge the unlimited taxing power and the full faith and credit of the issuing government to meet the required principal and interest payments.

   Special Assessment Bonds (LID Bonds): LID bonds are used to finance improvements where the property specially benefited can be identified. Special assessment bonds are frequently used to make capital improvements in a particular neighborhood. Principal and interest payments for these bonds are made by special assessment on the property benefiting from the improvement. Before special assessment bonds are issued, estimated costs are mailed to property owners, a public hearing is held to allow the affected property owners to say whether or not they want the improvement, and a 30-day protest period elapses during which property owners may protest the improvements prior to City Council action formally establishing the project. Debt financed by special assessment bonds is not subject to debt limitations.

   Revenue Bonds: Revenue bonds are frequently used to finance City-owned utilities, industrial parks, and other municipal public facilities. The bonds pledge the revenue from a particular revenue source to meet the principal and interest payments. Revenue bonds are appropriate debt instruments when the enterprise fund can be expected to generate sufficient revenue to meet both operating and debt service cost. Revenue bonds generally do not become a general obligation of the government issuing them. Communities may have to pay higher rates of interest on these bonds than on general obligation bonds, because revenue bonds are considered less secure. But, revenue bonds also have an important advantage over general obligation bonds in that the amount of the revenue bonds is not included in the amount of indebtedness subject to state debt limitations. The legal requirements for issuing revenue bonds are more complex than those for issuing general obligation bonds. When revenue bonds are issued, a special authority (Water Fund) operates the facility and a special revenue fund receives and disburses all funds. A trust agreement to provide for the monthly reimbursement of revenues and containing provisions to protect the bond holders must be formulated.

3. State Assisted or Guaranteed Resources

   Public Works Trust Fund (PWTF): This fund was created in 1985 to provide loans for replacement of public works facilities. Applications for construction funds may be submitted once each year (in

May), and applications for pre-construction funds (for such items as engineering design, bid document preparation, right of way acquisition and environmental studies) may be submitted once each month. Projects are evaluated based on:

a. Merits of the project as to need;
b. Degree of capital improvement planning;
c. Adequacy of existing rate structure;
d. Degree of local participation in financing project; and
e. Whether the area is economically distressed.

Current allocations of funds have been allowed for a wide variety of projects, including domestic water system replacement projects. The interest rates on PWTF loans generally range from 0.5% to 2% depending on the amount of matching money provided by the City.

PWTF loans have recently become less reliable due to legislative transfers from the PWTF into the general fund as a result of budget deficits.

Drinking Water State Revolving Fund (DWSRF): This fund provides low-interest loans to publicly and privately owned water systems for projects which improve water systems and ensure public health. Up to 100% of eligible project costs are fundable through this program. Applications are accepted once a year in September.

Community Economic Revitalization Board (CERB): CERB is a state board focused on economic development through job creation in partnership with local governments. The Board has the authority to finance public infrastructure improvements that encourage new private business development and expansion. However, by law CERB may only fund construction projects which can demonstrate that either significant private job creation or significant private investment will occur as a result of the public project. CERB is primarily a loan program with grants awarded on a case-by-case basis. The interest rates on CERB loans are 2.5% for distressed areas and 3.0% for non-distressed areas. Applications are accepted year around, while the Board considers applications every two months.

4. Federally Assisted or Guaranteed Resources

Three federally financed funding sources are available for domestic water system construction: 1) the USDA's Rural Development, Rural Utilities Service (RUS) Program; 2) the Economic Development Administration's (EDA) Public Works Grants and Loans Program; and 3) the Department of Housing and Urban Development's (HUD) Community Development Block Grants administered by the State Department of Community Planning and Development.

Rural Utilities Service Water & Waste Disposal Direct Loans and Grants Program: This program is one of several programs established by the USDA to provide public works assistance to small communities in rural areas. Public entities such as municipalities, counties, special purpose districts or authorities, Indian tribes, and nonprofit corporations or cooperatives are eligible in areas with a population under 10,000. Priority will be given to public entities in areas smaller than 5,500 people to restore a deteriorating water supply, or to improve, enlarge, or modify a water facility. Preference will also be given to requests which involve the merging of small facilities and those serving low-income communities. Loans and grant funds may be used to construct, repair, improve, expand, or otherwise modify rural water supply and distribution, including reservoirs, pipelines, wells, and pumping stations. Targeted at the most needy communities, grants are designed to keep costs economical. Grants are limited to reducing the facility per user costs for debt service to a minimum of 1% of the area's family income. Loans in the past have also been available at a 5% interest rate for the useful life of the facility, or the statutory limit on the applicant's borrowing authority, or for a maximum of 40 years.

Currently, Grandview does not qualify for this program due to population.

Public Works Grants and Loans Program: This program is funded by the Economic Development Administration (EDA) and is used to encourage long-range development gains in jurisdictions where economic growth is lagging, or where the economic base is shifting. The program

provides public works and development facilities needed to attract new industry and provide business expansion. Financial aid may be used to acquire and develop land and improvements for public works, and to acquire, construct, rehabilitate, alter, expand or improve such facilities, including related machinery and equipment. When completed, such projects are expected to bring additional private investment to the area.

U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Program: This program is administered by the State Department of Community Development. Communities with a population under 50,000 can apply for grants to undertake activities in providing adequate housing, expanded economic opportunities, and correcting deficiencies in public facilities which affect public safety and health of an area or community of residents. The program is designed to aid low and moderate income people and is also directed to have a maximum impact on stated community problems. Its primary focus is to assist blighted communities, or communities suffering a particular community or economic development problem.

5. Private Development

Expansion of domestic water facilities to newly developing areas outside the existing service area is a common requirement of the private developer. Installation of public utilities within housing subdivisions is normally financed entirely by the developer. The City may participate by paying the cost of over-sizing the water main for possible extension at a later time.

Although funding has been curtailed in a number of programs within the last few years, projects are still receiving financing statewide. Competition for available funds, however, has increased significantly. Projects which show the greatest need and have the largest local funding participation or benefit to low-income families are receiving the majority of financing from these programs. Careful planning and packaging of the project is necessary so that the most effective dollar use, including local participation, may obtain the maximum benefit for the greatest number of people.

Table 9-3 provides a summary of funding sources and projects which are eligible under each program.

TABLE 9-3 FUNDING SOURCE SUMMARY

FUNDING SOURCE	ELIGIBLE PROJECTS
Domestic Water Enterprise Fund	All water system projects
General Obligation Bond	All water system projects
Revenue Bond	All water system projects
Special Assessment Bond	Local Improvement District projects
Public Works Trust Fund	Replacement of existing water system facilities
Drinking Water State Revolving Fund (DWSRF)	All water system projects
Community Economic Revitalization Board (CERB)	All water system projects demonstrating job creation or private investment
USDA RUS Rural Water Grant	All water system projects
USDA RUS Rural Water Loan	All water system projects
EDA Public Works Grant	Water system projects to attract new industries and provide for business expansion
EDA Public Works Loan	Water system projects to attract new industries and provide for business expansion
HUD Community Development Block Grant	Water system projects which directly benefit low and moderate-income families
Private Development	All water system projects necessary for new housing and / or commercial developments

9.3 RECOMMENDED FINANCING STRATEGY

Provided in Table 9-4 is a financial program for the City's Water Operating Fund, which incorporates projected water service fees, operating costs, improvements, and loan costs for the next six-year period. The values for year 2015 are the budgeted figures used by the City.

The projected water department revenue from water service fees after 2015 includes additional revenue from a combination of projected increases in the number of services and rate increases at the beginning of the year. These projected revenue increases are necessary to complete the recommended system improvements, while maintaining a positive balance in the water fund. If conditions change that reduce the projected future revenue or increase future water department expenses, the financial program shown in Table 9-4 should be revised to account for the reduced revenue, or modifications to successive year rate increases will have to be made. Project financing methods presented are subject to change based on availability of funding programs, criteria of those programs, and funding limits. Financing strategies for each project will be sought at least one year prior to the project implementation year listed in the capital improvement program. Should financing options become unavailable, the City will consider raising rates or postponing projects to future years.

Future water department expenses were estimated based upon an average inflation rate of 2% per year, as shown in Table 9-4.

The City of Grandview will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the *Water System Plan* update in 2021. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

TABLE 9-4 PROPOSED WATER OPERATING FUND FINANCIAL PROGRAM							
Year Ending	2015[a]	2016	2017	2018	2019	2020	2021
BEGINNING FUND BALANCE	3,545,053	3,788,248	3,985,532	4,341,758	4,791,969	5,024,210	5,450,027
REVENUES							
Water Service Fees	1,735,000	1,769,700	1,805,094	1,841,196	1,878,020	1,915,580	1,953,892
Connection Fees	10,000	12,000	12,000	12,000	12,000	12,000	12,000
Interest Earnings	21,000	18,941	19,928	21,709	23,960	25,121	27,250
Rent & Leases	4,245	4,000	4,000	4,000	4,000	4,000	4,000
Other Water Revenue/Adjustments	1,200	1,224	1,248	1,273	1,299	1,325	1,351
Utility Tax	485,000	428,267	436,833	445,569	454,481	463,570	472,842
Subtotal Operating Revenues	2,256,445	2,234,133	2,279,103	2,325,748	2,373,759	2,421,597	2,471,335
Loan/Bond Proceeds	31,000	0	836,840	1,424,697	0	1,772,936	6,187,937
TOTAL - REVENUES	2,287,445	2,234,133	3,115,943	3,750,445	2,373,759	4,194,533	8,659,272
EXPENDITURES							
Water Operations							
Salaries and Wages	347,200	357,616	368,344	379,395	390,777	402,500	414,575
Benefits	160,720	165,542	170,508	175,623	180,892	186,319	191,908
Supplies	63,000	64,890	66,837	68,842	70,907	73,034	75,225
Other Serivces and Charges	443,100	456,393	470,085	484,187	498,713	513,674	529,085
Utility Tax	505,000	428,267	436,833	445,569	454,481	463,570	472,842
Operating Transfers Out	0	0	0	0	0	0	0
Subtotal - Water Operations	1,519,020	1,472,708	1,512,607	1,553,616	1,595,769	1,639,098	1,683,635
Capital Outlay							
Major Capital Improvements	246,480	0	836,840	1,424,697	0	1,772,936	6,187,937
Misc. Capital Improvements	10,000	314,600	161,800	10,900	145,500	0	119,400
Machinery and Equipment	37,500	20,000	20,600	21,218	21,855	22,510	23,185
Subtotal - Capital Outlay	293,980	334,600	1,019,240	1,456,815	167,355	1,795,446	6,330,522
Debt Service							
99 PWTF Well Rehab	28,500	28,223	27,952	27,680	27,409	0	0
03 SRF Loan Well Rehab	152,630	151,218	149,818	148,418	147,017	145,617	144,217
Yakima Co SIED Loan Downtown	28,510	28,500	28,500	28,500	28,500	28,500	0
USDA Note '09 & '10 Water Imp	21,610	21,600	21,600	21,600	21,600	21,600	21,600
DWSRF Loan '13 OIE	0	0	0	63,605	54,140	53,685	53,230
New DWSRF Loan '18 (Imp. 2-6)	0	0	0	0	99,729	84,769	84,057
New Loan '20 (Imp. 7)	0	0	0	0	0	0	124,106
New Loan '21 (Imp. 8)	0	0	0	0	0	0	0
Transfers to Bond Redemption	0	0	0	0	0	0	0
Subtotal - Debt Service	231,250	229,541	227,870	289,803	378,395	334,171	427,210
TOTAL - EXPENDITURES	2,044,250	2,036,849	2,759,716	3,300,234	2,141,519	3,768,715	8,441,367
ENDING FUND BALANCE	3,788,248	3,985,532	4,341,758	4,791,969	5,024,210	5,450,027	5,667,932
NET INCREASE (DECREASE)	243,195	197,284	356,227	450,211	232,241	425,817	217,905
Projected Revenue Annual Increase	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

[a] 2015 figures are consistent with actual budget by the City.

[b] Water Operations expenditures include 2% inflation per year.

9.4 WATER RATES

Grandview's current water rates and rate structure were adopted in 2014, Ordinance No. 2014-16. A summary of the current water service rates for the City is provided below. All consumption beyond the consumption threshold is charged at the overage rate shown. The complete list of the City's current water rates is provided in Ordinance No. 2014-16, a copy of which is provided in CHAPTER 10 of this Plan.

a) Within City Limits:

Meter Size	Rate
5/8 to 3/4 inch	$23.53
1 inch	$27.45
1 1/4 inch	$32.23
1 1/2 inch	$36.17
2 inch	$53.60
3 inch	$70.79
4 inch	$91.01
6 inch	$174.44
8 inch	$351.39

b) Consumption charges:

Consumption in Gallons	Rate
1,000 to 3,000	$0.36
3,001 to 15,000	$2.17
15,001 to 30,000	$1.74
30,000 and above	$1.50

c) Outside City Limits:

Rates shall be 150 percent of the applicable rate within the city limits, including standby or fire protection service charges.

Based on the above rates, the typical monthly charge for a Single-Family residential customer (1" meter) within the corporate limits, consuming 8,000 gallons of water in a month would be equal to $29.62. This monthly service charge is very reasonable, compared with neighboring cities of a similar size and amount of water use.

The City's current rates and/or total revenue will need to be increased in future years to maintain a positive operating fund balance, pay for rising O & M costs, fund necessary improvement projects, and make the necessary debt service payments for prior and future improvement projects. The annual rate increases will have a minor impact on customers, but will be necessary for operations, maintenance, and system improvements.

A more detailed rate analysis will be necessary in the future to determine the rate structure required to achieve the recommended revenue increases as shown in the financial program. Following the proposed rate analysis, annual review of the proposed rates and revenue increases will be necessary to determine required adjustments to either base rates, usage charges, or both.

With the City's current rate structure, customers pay more with increased water usage. Further conservation may be possible by changing to an inclining block rate or similar structure. This type of conservation rate structure would penalize customers that use excessive amounts of water, encouraging more efficient use of water. Further evaluation of the City's water rate structure will be considered in the future.

CHAPTER 10 - MISCELLANEOUS DOCUMENTS

10.1 MISCELLANEOUS DOCUMENTS INDEX

State Environmental Policy Act (SEPA) Checklist
SEPA Determination of Non-Significance (DNS)
2013 Water Facility Inventory
Consumer Meeting & Water System Plan Adoption
Local Government Consistency Review Checklist(s)
Water Use Efficiency Program and Goal Adoption Process Documentation
City of Grandview Municipal Code, Ordinances, and Resolutions

Chapter 13.04	General Provisions
Chapter 13.18	Cross Connection Control
Chapter 13.24	Water Service Regulations
Chapter 13.28	Rates and Charges
Chapter 13.30	Low-Income Senior Citizens and Low-Income Disabled Persons Utility Rates
Chapter 13.36	Water Use
Chapter 13.40	Capital Facilities Plan for Public Works Facilities
Chapter 13.44	Recommended Standards for Water Works
Ordinance 2014-16	Domestic Water Rates
Resolution 2011-51	Quad City Agreement
Resolution 2008-5	Water Use Efficiency Goals
Resolution 2001-33	Prosser Sunnyside Wellhead Protection

Extension by Developers Policy
Property Deeds
Declaration of Covenants
- S01 – West Main
- S03 – Velma
- S07 & S16 – Olmstead A & B
- S08 – Appleway
- S12 – Pecan A
- S17 – Ashael Curtis

Well Logs
- S01 – West Main
- S02 – Balcom & Moe
- S03 – Velma
- S06 – Euclid
- S07 – Olmstead A
- S08 – Appleway
- S10 – North Willoughby
- S11 – Highland
- S12 – Pecan A
- S13 – South Willoughby
- S14 – Butternut
- S16 – Olmstead B
- S17 – Ashael Curtis
- S18 – Pecan B

Water Right Status Summary Memorandum – 10/24/2011
Water Right Documents
Same Body of Public Groundwater and Impairment Analyses Memorandum – 08/25/2009
Susceptibility Assessment Forms
- S01 – West Main
- S02 – Balcom & Moe
- S03 – Velma
- S07 – Olmstead A
- S08 – Appleway
- S10 – North Willoughby
- S11 – Highland
- S12 – Pecan A
- S13 – South Willoughby
- S14 – Butternut
- S16 – Olmstead B

S17 – Ashael Curtis
S18 – Pecan B
USGS Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho
2015 Coliform Monitoring Plan
2013 Water Quality (Consumer Confidence) Report
Disinfection Byproducts Monitoring Plan
2015 Water Quality Monitoring Schedule
S01 West Main Well Chemical Analysis
Inorganic Chemical Analysis – 8/9/2010; 9/29/2009; 8/13/2007
VOC Chemical Analysis – 4/15/2014; 7/12/2007; 8/11/2004
SOC Chemical Analysis – 7/5/2007
Nitrate/Nitrite Chemical Analysis – 6/11/2014; 4/8/2013; 4/4/2012
Radionuclide Chemical Analysis – 6/4/2010; 5/11/2009; 10/17/2007
S02 Balcom & Moe Well Chemical Analysis
Inorganic Chemical Analysis – 5/15/2009; 7/17/2007; 7/1/2003
VOC Chemical Analysis – 4/15/2009; 7/17/2007; 8/11/2004
SOC Chemical Analysis – 4/23/2013; 3/18/2008; 6/7/2001
Nitrate/Nitrite Chemical Analysis – 6/11/2014; 5/6/2013; 6/4/2012
Radionuclide Chemical Analysis – 4/12/2011; 5/26/2009; 10/22/2007
S03 Velma Well Chemical Analysis
Inorganic Chemical Analysis – 4/20/2010; 4/17/2007; 7/1/2003
VOC Chemical Analysis – 4/15/2009; 4/17/2007; 4/1/2003
SOC Chemical Analysis – 3/18/2008; 6/14/2007
Nitrate/Nitrite Chemical Analysis – 6/11/2014; 5/6/2013; 5/7/2012
Radionuclide Chemical Analysis – 5/26/2009; 10/17/2007; 9/11/2007
S07 Olmstead A Well Chemical Analysis
Inorganic Chemical Analysis – 9/11/2007
VOC Chemical Analysis – 4/15/2009; 5/30/2006
SOC Chemical Analysis – 9/11/2007
Nitrate/Nitrite Chemical Analysis – 12/1/2014; 10/6/2014; 5/6/2014
Radionuclide Chemical Analysis – 4/4/2012; 9/10/2009; 12/18/2007
S10 North Willoughby Well Chemical Analysis
Inorganic Chemical Analysis – 9/11/2007; 12/23/1997
VOC Chemical Analysis – 7/9/2013; 28/9/2009; 6/12/2006
SOC Chemical Analysis – 7/5/2007
Nitrate/Nitrite Chemical Analysis – 10/6/2014; 12/2/2013; 11/4/2013
Radionuclide Chemical Analysis – 4/4/2012; 9/10/2009; 10/17/2007
S11 Highland Well Chemical Analysis
Inorganic Chemical Analysis – 4/17/2007; 5/5/2003; 5/19/1999
VOC Chemical Analysis – 4/15/2009; 12/13/2006; 8/20/2002
SOC Chemical Analysis – 4/4/2012; 3/18/2008; 6/14/2007
Nitrate/Nitrite Chemical Analysis – 6/11/2014; 4/8/2013; 3/6/2012
Radionuclide Chemical Analysis – 4/12/2011; 11/11/2009; 9/18/2007
S12 Pecan A Well Chemical Analysis
Inorganic Chemical Analysis – 5/29/2002
Nitrate/Nitrite Chemical Analysis – 12/6/2005; 9/13/2005; 6/20/2005
Radionuclide Chemical Analysis – 11/7/2005; 5/23/2005; 5/6/2003
S13 South Willoughby Well Chemical Analysis
Inorganic Chemical Analysis – 1/17/2012; 8/15/2011; 4/11/2011
VOC Chemical Analysis – 5/11/2009; 6/12/2006
SOC Chemical Analysis – 9/10/2009; 12/28/1998
Nitrate/Nitrite Chemical Analysis – 12/6/2011; 9/6/2011; 6/6/2011
Radionuclide Chemical Analysis – 11/11/2009; 12/12/2005; 6/6/2005
S14 Butternut Well Chemical Analysis
Inorganic Chemical Analysis – 11/10/2009; 12/21/2000; 12/23/1997
VOC Chemical Analysis – 4/15/2009; 8/11/2004; 4/22/1997
SOC Chemical Analysis – 4/16/2009
Nitrate/Nitrite Chemical Analysis – 9/17/2014; 9/9/2013; 1/7/2013
Radionuclide Chemical Analysis – 4/20/2010; 12/12/2005; 7/26/2005

S16 Olmstead B Well Chemical Analysis
- Inorganic Chemical Analysis – 8/9/2010; 8/9/2006; 9/24/2003
- VOC Chemical Analysis – 4/15/2014; 12/13/2006; 9/11/2006
- SOC Chemical Analysis – 9/18/2007
- Nitrate/Nitrite Chemical Analysis – 10/6/2014; 12/2/2013; 11/4/2013
- Radionuclide Chemical Analysis – 8/27/2012; 5/11/2010; 12/18/2007

S17 Ashael Curtis Well Chemical Analysis
- Inorganic Chemical Analysis – 1/25/2010; 7/6/2006; 3/16/2004
- VOC Chemical Analysis – 1/28/2010; 10/17/2006; 9/11/2006
- SOC Chemical Analysis – 3/25/2008; 3/16/2004
- Nitrate/Nitrite Chemical Analysis – 1/17/2012; 12/6/2011; 9/6/2011
- Radionuclide Chemical Analysis – 1/19/2010; 12/18/2007; 9/18/2007

S18 Pecan B Well Chemical Analysis
- Inorganic Chemical Analysis – 7/8/2013; 6/4/2010; 6/14/2006
- VOC Chemical Analysis – 4/23/2013; 10/17/2007; 9/18/2007
- SOC Chemical Analysis – 3/27/2007
- Nitrate/Nitrite Chemical Analysis – 9/17/2014; 4/4/2012; 6/6/2011
- Radionuclide Chemical Analysis – 6/4/2010; 9/11/2007; 6/14/2006

Lead & Copper Chemical Analysis
Disinfection Byproducts Chemical Analysis
Bacteriological Analysis
Potential Contaminant Notification Letter
Computer Printout of Hydraulic Analysis Results
Telemetry Control System Screen Print-Outs
City of Grandview Design and Construction Standards and Specifications for Public Works Improvements
Citizen Contact Record Form
Grandview Fire Department Hydrant Flow Test
Grandview Fire Department Fire Flow Letter
Map A - Existing Water System
Map B - Hydraulic Analysis Nodes and Pipes